Field research

Papers, abstracts and posters from cooperation activities in Africa - 2017

MEDICI CON L'AFRICA CUAMM
Doctors with Africa

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Padua, March 2018

"Research in the field is a fundamental part of broader research efforts aimed at defining new development models and activities"

Prof. Anacleto Dal Lago
Doctors with Africa CUAMM
December 14th, 1984

PREFACE

Don Dante Carraro
Director, Doctors with Africa CUAMM

Doctors with Africa CUAMM has wrapped up another year of operational research, **twelve months of hard work, new experiences and fruitful partnerships** that led to the publication of **19 articles in international scientific journals** and the sharing of **12 posters** and **3 oral presentations at medical conferences both in Italy and abroad**. Our goal to match our 2016 operational research performance was an ambitious one, but we are pleased to have met it and to be able now to provide this overview of CUAMM's activities in 2017.

This year too, our core focus continued to be **maternal and child health** both in terms of our activities on the ground and our research, with the end goal of **reducing the number of deaths** of mothers and children and identifying the factors that facilitate or impede women's access to maternal health services. In South Sudan, a country still marked by great fragility and insecurity, we did qualitative research to learn more from traditional birth attendants and the community about the cultural and material barriers affecting access to maternal healthcare. In Uganda we used a quasi-experimental analytical method to investigate the cost-effectiveness of incentives aimed at encouraging women to use assisted childbirth services. In Tanzania we studied the correlation between the use of maternity waiting homes, the socioeconomic profiles of the women using them and the outcomes for their newborns, while in Ethiopia we undertook an econometric analysis to document the vital – and cost-effective – role that ambulances can play in preventing neonatal and maternal mortality.

In the area of **infectious diseases** we continued to **investigate the most common pathologies** still afflicting sub-Saharan countries, pathologies that are now occurring ever more frequently in combination with other diseases, both communicable and non-communicable. We carried out research to further explore the sensitive topic of HIV among youth and teenagers (the population most at risk of contracting the virus) in Mozambique, while in Tanzania we implemented the "test and treat" **strategy to diagnose and treat HIV**. We also focused attention on **tuberculosis** (TB), with a spotlight on the **association of this infectious disease with mood disorders** such as depression, and with non-communicable diseases including diabetes.

Indeed, even while many countries pay little attention to them, **chronic diseases** are increasingly becoming a focal point for CUAMM as we note their growing significance for Africa. More specifically, we conducted research on critical issues associated with cases of **diabetes/ TB comorbidity** in Mozambique and Angola, with the aim of finding a way to simultaneously manage and treat both diseases in an effective and sustainable manner in upcoming years.

We also continued our work in the area of **nutrition** in 2017, with a special focus on the delivery of apposite services to treat acute **malnutrition in under-5 children**. Our partnership in Uganda with the Trieste-based Burlo Garofolo Institute for Maternal and Child Health made it possible to carry out a new randomized controlled trial focused on the role that quality nutritional services can play in the effective management of acute malnutrition.

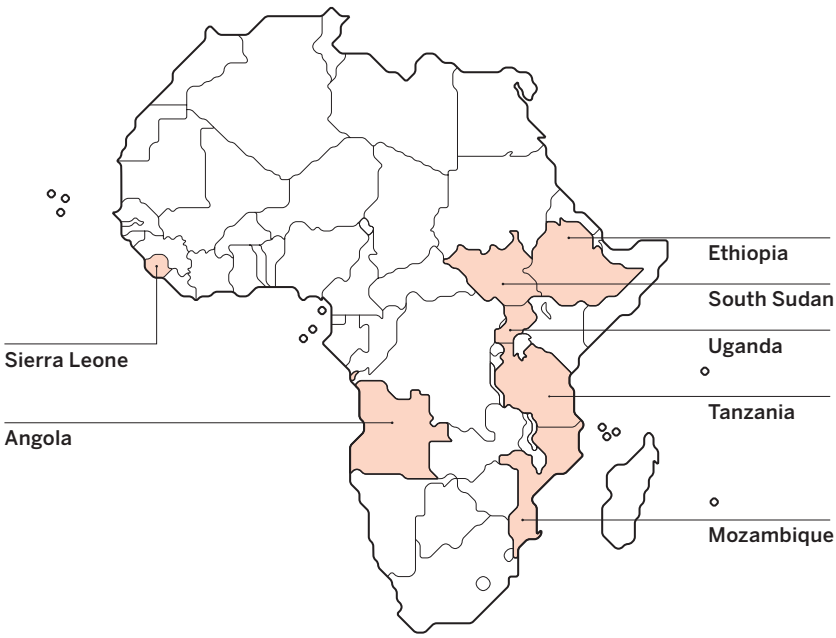
Last but not least, we published studies on **rare clinical cases**.

CUAMM continues to work to perfect the quality of our interventions, first and foremost by training health staff in cooperation with local authorities in the countries where we are active as well as by continuing to **build networks with international research institutes**. In 2017 we continued to partner with academic experts and peer institutions including the University of Bari, the University of Padua, the University of Palermo, the University of Rome, the Bruno Kessler Foundation in Trento, the Burlo Garofolo Institute in Trieste and others.

It is not easy to work in countries where access to healthcare is extremely limited, with far-reaching repercussions for people's health and life expectancy. **Advancing health research in the global South** means tackling social and economic inequalities and the rapid socio-cultural changes typical of developing countries on a daily basis. That's why in 2017 we also endorsed another type of research alongside those mentioned above, one that uses low-cost tools to help close the gap between quality research and the social setting in which it is conducted, all the while ensuring the utmost consideration for the local culture and traditions.

This is the course that we have set for ourselves, in our resolve to both help **improve the health conditions** of the most vulnerable and build a solid, and most importantly, **quality model for international development cooperation**.

Doctors with Africa CUAMM



Doctors with Africa CUAMM currently works in Angola, Ethiopia, Mozambique, Sierra Leone, South Sudan, Tanzania and Uganda with:

72
key cooperation projects and around 100 micro-support actions, providing assistance to:

23
hospitals

45
districts (public health initiatives, mother and child care, the fight against AIDS, TB and malaria)

3
schools for nurses and midwives (Lui, Matany and Wolisso)

1
university (Beira)

Doctors with Africa CUAMM is the largest Italian NGO working to **improve the health of vulnerable communities in Sub-Saharan Africa**. CUAMM carries out **long-term projects in 7 countries** in the region and partners with **universities and research centers** in Italy and abroad to raise awareness about people's right to health care. CUAMM also organizes **courses on global health** for medical students and health professionals and conducts **research** with international partners, convinced that such endeavors are vital to developing **quality international healthcare programs**.

Operational research in 2017

5 main thematic areas, **19 published studies, 12 posters** and **3 oral presentations** shared at conferences in Italy and abroad. Operational field research carried out with over 30 Italian, African and other international partners to **improve the quality of our interventions** on the ground and help **develop effective health policies** even in countries with limited resources.

- Maternal and child health
- Infectious and tropical diseases
- Universal coverage and equity
- Nutrition
- Chronic diseases

RESEARCH AND EVALUATION: NEXT STEPS

In keeping with our strategic plan for 2016-2030, in 2018 CUAMM will continue to conduct operational research in the seven countries in which we are active, working closely with local populations to **meet their health needs** while delving further both into the key areas of inquiry we have identified in recent years and some new ones.

The end goal of this work is to continually improve **maternal and child health**. In Tanzania, in partnership with the University of Siena, we will carry out an analysis using the geographical information system (GIS) method to identify health facilities able to provide comprehensive emergency obstetric care (CEmOC) to manage maternal complications through interventions such as Caesarean sections and blood transfusions. Following the qualitative research done in 2017, we will investigate how women, health workers and district authorities in Uganda perceive incentives meant to facilitate pregnant women's access to assisted childbirth. In Sierra Leone we will evaluate the infant and maternal healthcare provided at Pujehun Hospital two years after the Ebola outbreak, while in Freetown we are planning one study on the use of mobile devices to detect vital signs in patients and another – in partnership with the University of Bari and the Academic Medical Centre (Amsterdam) – on pulmonary complications.

In terms of **neonatal care**, we are planning to conduct a multicenter randomized controlled trial (RCT) in conjunction with the University of Bergen (Norway), University of Karolinska (Sweden), University of Padua (Italy), Makerere University (Uganda) and Beira Central Hospital (Mozambique) to evaluate the use in newborns of laryngeal mask airways instead of face masks. In partnership with the University of Padua's Department of Pediatrics and Rome's Bambino Gesù Pediatric Hospital, we also plan to do research in Ethiopia and Mozambique on the stimulation of infants following birth, umbilical cord clamping, and congenital disorders as one of the main causes of early child death in countries with limited resources.

In our work on **infectious diseases** we will step up our Test & Treat project in Tanzania by incorporating a new research component. The main foci will be HIV drug resistance, the social and economic aspects of HIV/AIDS, TB/HIV co-infection and the use of biometric data in the clinical management of HIV patients. Apropos of specific efforts to strengthen epidemiological surveillance systems, we will complete our study on Ethiopia's measles epidemic in partnership with Trento's Bruno Kessler Foundation.

As to CUAMM's **nutrition-related efforts**, we will finalize our analysis of the data from the RCT we carried out in Uganda with the Burlo Garofolo Institute for Maternal and Child Health (Trieste), whose objective was to assess the quality, cost and equity of services for children with severe acute malnutrition. In Tanzania we will launch regionally-based research on the role played by community health workers in the integrated management of acute and chronic malnutrition, and do one study on access to nutritional services and another on early childhood stimulation interventions by families and the community. In partnership with Amsterdam's Royal Tropical Institute, we will continue to explore the factors that facilitate or impede the exclusive breastfeeding of infants in Sierra Leone.

In the area of **chronic diseases** we will focus our operational research on Mozambique, studying the epidemiology of key diseases like diabetes and hypertension and the complications associated with the former (e.g., diabetic retinopathy, nephropathy and foot), and investigating the co-occurrence of diabetes and infectious diseases such as tuberculosis in the search for an effective way to treat both simultaneously. Finally, we will conduct further research in Ethiopia, Tanzania and Mozambique on the screening and treatment of cervical cancer.

CUAMM will also press on with its commitment to **help encourage a culture of evaluation in the global health field**. One example is our organization, in partnership with the Tuscany Region's Global Health Center, of the third annual conference on this topic, where we will shine a spotlight on the delicate role played by hospitals in primary health care.

Developing sound and effective global health programs, implementing innovative solutions to reach even the most destitute, **generating findings** that can help positively shape international health policies – this is Doctors with Africa CUAMM's approach to field research, a path we will continue to pursue with the **support and partnership of international research centers and universities**.

Visit http://www.mediciconlafrica.org/en/fieldresearch/ to keep abreast of all of CUAMM's research, both ongoing and published.

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Maternal and child health

Cost-effectiveness of an ambulance-based referral system for emergency obstetrical and neonatal care in rural Ethiopia

PAPER

Authors
Accorsi S., Somigliana E., Solomon H., Ademe T., Woldegebriel J., Almaz B., Zemedu M., Manenti F., Tibebe A., Farese P., Seifu A., Menozzi S., Putoto G.

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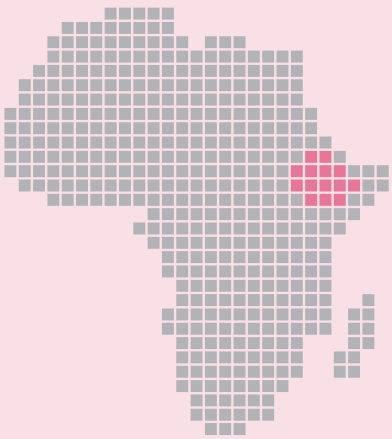
Maternal and child health

Focus country
Ethiopia



Abstract

The study's scope was to assess the cost-effectiveness of a referral system based on the use of ambulances for obstetric emergencies and neonatal care in remote, rural settings of sub-Saharan Africa. The study was conducted in the Oromiya Region of Ethiopia, evaluating the effectiveness and actual cost of all obstetric cases transferred to the hospital by ambulance. Pre and post-referral costs included those required to run the ambulance service and the additional costs necessary for the assistance in the hospital.

A total of 111 ambulance referrals were recorded. The ambulance was undoubtedly effective for 9 women and 4 newborns, corresponding to 336 years saved. The total cost was $ 8,299 and the cost per year of life saved was $ 24.7, far below the benchmarks of $ 150 and $ 30 that define attractive and very attractive interventions.

Analysis of the numbers of effective transfers, ambulance costs, and actual implementation of referral system and the results achieved confirmed that it is an effective, highly cost-effective resource for limited-resource countries.

Accorsi et al. BMC Pregnancy and Childbirth (2017) 17:220
DOI 10.1186/s12884-017-1403-8

BMC Pregnancy and Childbirth

RESEARCH ARTICLE Open Access

Cost-effectiveness of an ambulance-based referral system for emergency obstetrical and neonatal care in rural Ethiopia

Sandro Accorsi[1], Edgardo Somigliana[2,7*], Hagos Solomon[1], Tsegaye Ademe[3], Jofrey Woldegebriel[4], Biadgo Almaz[4], Mohammed Zemedu[3], Fabio Manenti[5], Akalu Tibebe[1], Pasquale Farese[1], Aberra Seifu[6], Serena Menozzi[3] and Giovanni Putoto[5]

Abstract

Background: To estimate the cost-effectiveness of an ambulance-based referral system an dedicated to emergency obstetrics and neonatal care (EmONC) in remote sub-Saharan settings.

Methods: In this prospective study performed in Oromiya Region (Ethiopia), all obstetrical cases referred to the hospital with the ambulance were consecutively evaluated during a three-months period. The health professionals who managed the referred cases were requested to identify those that could be considered as undoubtedly effective. Pre and post-referral costs included those required to run the ambulance service and the additional costs necessary for the assistance in the hospital. Local life expectancy tables were used to calculate the number of year saved.

Results: A total of 111 ambulance referrals were recorded. The ambulance was undoubtedly effective for 9 women and 4 newborns, corresponding to 336 years saved. The total cost of the intervention was 8299 US dollars. The cost per year life saved was 24.7 US dollars which is below the benchmarks of 150 and 30 US dollars that define attractive and very attractive interventions. Sensitivity analyses on the rate of effective referrals, on the costs of the ambulance and on the discount rate confirmed the robustness of the result.

Conclusions: An ambulance-based referral system for EmONC in remote sub-Saharan areas appears highly cost-effective.

Keywords: Ambulance, EmONC, Remote setting, Cost-effectiveness

Background

Maternal and neonatal mortality remain an unsolved health priority in low income countries and sub-Saharan Africa in particular [1]. Most maternal deaths are actually preventable and occur during labour, delivery and the first day postpartum. Skilled attendance at birth is the most important intervention to reduce maternal and neonatal mortality since complications leading to these deaths are unpredictable but can be successfully treated if diagnosed early and properly managed [2–4]. Therefore, the strategy has shifted in the last decade from the risk approach, involving identification of high risk pregnancies which can develop complications, to provision of skilled care during delivery and Emergency Obstetric and Neonatal Care (EmONC) when a complication occurs. An integrated and comprehensive health program is recommended to address the three delays hampering access to safe motherhood services: (i) seeking appropriate medical care for an obstetric emergency; (ii) reaching an appropriate EmONC facility; and (iii) receiving adequate care when the facility is reached [5]. However, efforts to improve access to EmONC mainly focused on addressing harmful traditional beliefs and practices, poor infrastructure and inadequate care at health facilities, while overcoming transport barriers is a

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relatively neglected area [1]. Albeit scanty, evidence from the few available studies emerging from disparate locations is however highly promising [6–10]. For example, in a rural area of Burundi, the integration of ambulance network with EmONC referral systems was estimated to reduce maternal mortality by 74% [8].

Overall, the performance of ambulance services for EmONC and their cost-effectiveness remain largely unevaluated in sub-Saharan settings and further evidence is warranted prior to definitely recommend its systematic implementation. To add information on this issue, we thus designed a prospective observational study in the rural area of Oromiya Region (Ethiopia) aimed at estimating the cost-effectiveness of an ambulance-based referral system specifically dedicated to EmONC.

Methods

Setting

Ethiopia counts around 90 million inhabitants, with over 80% of the population living in rural areas and remains one of Africa's poorest countries [11, 12]. The percentage of deliveries attended by skilled health personnel and the maternal mortality ratio are estimated at 14% and 676 per 100,000 live births, respectively [13, 14]. The annual Gross Domestic Product (GDP) is 550 US dollars per capita, while the health expenditure per capita is 21 US dollars [15].

Southwest Shoa Zone (Oromiya Region) has 12 districts with a total population of 1,079,814 people. The percentage of institutional deliveries was estimated at 48%. The study was conducted in four of these districts (with a total population of 397,573): Wolisso Urban (50,657), Wolisso Rural (178,633), Goro (55,195) and Wonchi (113,088). The expected deliveries per year was 13,518 and the expected number of caesarean sections was 176 (local rate of 2.7%) [10]. In the four districts, there are one hospital, 18 Health Centres and 90 Health Posts. The referral facility is the St. Luke Hospital located in Wolisso town, capital of the Southwest Shoa Zone; it is a private, non-profit hospital belonging to the Ethiopian Catholic Bishop Conference.

The area is supported by a public health programme partly financed by the Italian Development Cooperation and locally coordinated by the Italian Non-Governmental Organization (NGO) *Doctors with Africa – CUAMM*. General support (personnel, rehabilitations and constructions, training, supervisions, equipments and drug supply) are given to the 21 Health posts, 8 Health Centers and the hospital that actually provides free maternal and child services.

Free ambulance services are provided to transport labouring mothers from village to nearby Health Centers and, if needed, to St. Luke Hospital. Referral directly from the Health Centers could also be done. The main vision of the intervention was to direct uncomplicated deliveries to the Health Centres and complicated cases to the hospital [10, 16]. The ambulance service was ensured with a single vehicle for 24 h a day and managed by two drivers. The drivers did not receive specific training for health assistance. However, they were instructed to inquire about the severity of the situation with the healthcare professionals of the hospital or the Health Centers. No healthcare professionals accompanied the driver (even if in some particularly critical cases, personnel of the hospital or the Health Centers could do it). The ambulance was equipped with a single couch but could carry up to three other seated persons if needed. The service was dedicated to pregnant women but, in selected cases, other urgent cases could be referred (but the potential benefits of these referrals were not included in the present analysis).

The call for the ambulance service was usually made by the pregnant woman or her family member through cell phone to the ambulance drivers' cell phone or to a fixed phone located at the Hospital. The ambulance was generally located in the hospital. The distances between the hospital and the Health Centers varied between 2.5 and 47 Kilometres. All connecting roads in the area were rough. Only one ambulance was bought and no replacing car was available. In case of breakdown or car maintenance, the service was temporarily suspended.

Design

The study prospectively examined the ambulance callouts and transfers to St. Luke Hospital of women at risk of or with obstetric complication from 7th of January 2015 to 15th of April 2015 (with a one-week interruption for ambulance maintenance). Ethical approval was obtained from the Southwest Shoa Zonal Health Department. Only verbal informed consent to participate was obtained because the majority of treated women were illiterate.

The study design is reported in details in a previous publication of our group [7]. Briefly, all obstetrical cases referred to the hospital by ambulance were evaluated and managed by two health professionals with specific skills on EmONC. In particular, they were requested to independently judge the effectiveness of referral by classifying cases into three categories: *not effective*, *possibly effective* and *undoubtedly effective*. Initial location and distance from the hospital (and thus the relevance of the potential delay in referral with other means) was also taken into consideration in the evaluation. In particular, referrals were considered u*ndoubtedly effective* when they were thought to save the maternal and/or the neonatal life and when the use of other means to refer would have not. Judgments were given separately for the mother and the newborn and had to be given within

24–48 h of the event. The effectiveness categories were predefined but the definition was not stringent, allowing the adaptation of the decision to the specific clinical conditions and distance from the hospital. When the two health professionals disagreed on the effectiveness judgment, a third health professional was involved to make a final decision.

Cost-effectiveness analyses

The analysis was carried out from the perspective of the District Health provider. The ultimate aim of the paper was to provide a tool to help health authorities operating in remote setting make rational choices. Even if, in the particular setting of the present study, important financial support came from external stakeholders and the hospital was private, the analysis was done assuming that, in other contexts, all costs would have to be supported by the District Health provider. Moreover, we excluded the additional costs that are initially required for starting the service (training, supervision, advertisement, health education and advocacy) because we aimed at evaluating the cost-effectiveness of the system in everyday clinical practice, not in the starting phase.

Pre and post-referral costs falling on the hospital with regards to the ambulance referrals were estimated as previously reported in details [7]. Specifically, we included costs associated with the referral system, i.e. all the costs required for running the ambulance service as well as those required to assist the woman once she reached the hospital. The main vision was that women, if not referred with the ambulance, would have not received assistance in the hospital at all. We thus included only costs that were different from those related to the assistance in the Health Centers (i.e. caesarean section, uterine evacuation, second-line uterotonic agents, fluids and parental antibiotics). Personnel costs in the hospital were excluded since 24-h assistance was already available prior to the implementation of the project with no additional need to increase the number of duty personnel after the implementation of the ambulance service. Moreover, financial support given for the improvement of the hospital and the Health Centres were excluded since these were not intended to specifically support the ambulance service. Costs of the specific medical services given to the referred women were estimated based on average cost of each medical procedure set at St. Luke Hospital. For example, the mean cost for caesarean section was estimated at 65 US dollars.

The benefits were estimated on the number of years saved based on the local life-expectancy tables [17]. Prevention of disabilities was not included in the model. A 3% discount of the life years gained was used [18]. The main analysis focused on "undoubtedly effective" referrals but we performed a secondary analysis including also cases classified as "possibly effective". Sensitivity analyses were carried out for the costs of the ambulance, for the proportion of undoubtedly effective cases and increasing the discount of the life years gained to 6%. The intervention was deemed acceptable if the costs per each year saved was below the GDP per person per year in the country (550 US dollars), attractive if <150 US dollars and very attractive if <30 US dollars [19].

Results

A total of 111 ambulance referrals to St. Luke Hospital were recorded during the study period. Six (5%) were from the village via Health Center to the hospital while the remaining 105 (95%) were referred from the Health Center to the hospital. All 18 Health Centers referred at least one woman. The highest number of cases (n = 30) came from Chitu, a Health Center located at 9 km from the hospital. Most women were aged 20–34 years (n = 81, 73%). Forty-six women (41%) were nulliparous while 24 (22%) had four or more previous deliveries. At the hospital level, 41 (37%) mothers were diagnosed with one or more pregnancy related complications. One maternal death and nine stillborns were recorded.

The referrals were considered undoubtedly and possibly effective for the mother and/or the newborn in 9 (8%) and 27 (24%) cases, respectively (total of 36 cases, corresponding to 32%). The ambulance was undoubtedly effective for 9 women and 4 newborns. It was possibly effective for an additional 22 women and 23 newborns. Details are shown in Table 1. The main diagnoses of the remaining 75 non-effective referrals were as follows: normal labour with vaginal delivery (n = 52), obstructed labour with vaginal delivery (n = 11), spontaneous abortion with minimal bleeding (n = 10), abdominal trauma without consequences (n = 1) and death at arrival (n = 1).

The extrapolated cost of the ambulance referral system for the three months period, based on the cost of one entire year (2014) is displayed on Table 2. In the three months period, the total cost of the ambulance was 6587 US dollars and the additional cost incurred to the hospital for the provision of effective referral services was 1712 US dollars which gives a total cost of 8299 US dollars. Considering only undoubtedly effective referrals, the total years saved was estimated at 336. The cost per year life saved was thus 24.7 US dollars which is below the three benchmarks (550, 150 and 30 US dollars) and fulfils the criterion to be defined as very attractive (< 30 US dollars).

Sensitivity analyses were firstly carried out for the costs of the ambulance referral system and the rate of undoubtedly effective referral (Fig. 1). The intervention remains attractive (< 150 US dollars per year saved) up to a rate of undoubtedly effective cases of 1.3% and up

Table 1 Clinical findings of the cases judged as undoubtedly or possibly effective referrals

Clinical condition	Number of women	Number of newborns
Undoubtedly effective		
Incomplete abortion (immediate blood transfusion)	2	0
Uterine rupture, foetus alive	1	1
Impending uterine rupture, foetus alive	2	2
Uterine rupture, foetus dead	2	0
Eclampsia, foetus dead	1	0
Postpartum haemorrhage, foetal distress	1	1
Total	9	4
Possibly effective		
Preeclampsia, fetus dead	1	0
Instrumental delivery	3	3
Obstructed labour, immediate caesarean section	4	5[a]
Obstructed labour, no caesarean section	2	3[a]
Incomplete abortion	2	0
Foetal distress	0	2
Twin delivery	0	2[a]
Premature rupture of membranes, fetus alive	0	2
Premature rupture of membranes, fetus dead	1	0
Prolonged labour	3	3
Previous caesarean section in labour	1	1
Malpresentation/Transverse lie, fetus alive	2	2
Malpresentation/Transverse lie, fetus dead	3	0
Total	22	23

[a]Twin delivery (one woman corresponds to two newborns)

Table 2 Costs of the ambulance

Expenses	Costs per unit	Extrapolated costs per year	Costs for the study period (3 months)
Car (Toyota Land Cruiser)[a]	44,635	11,159	2790
Car insurance per year	591	591	148
Referral system			
Mobile phones[b]	125	31	8
SIM cards[b]	14	4	1
Air-time	180	180	45
Fuel	4653	4653	1163
Car maintenance[c]			
Service	928	928	232
Damages Repair	2588	2588	647
Tyre Repair – substitution	2375	2375	594
Drivers gross salaries (n = 2)	3759	3759	940
Drivers' uniform cloth	75	75	19
Total	59,923	26,343	6587

Costs are expressed in US dollars, with an exchange rate of 1 USD = 20 Ethiopian Birr
[a]The ambulance is considered to serve for 4 years
[b]Mobile phones and Sim cards were provided for the drivers. The mobile apparatus is estimated to serve for 4 years
[c]In order to temper possible variations of the costs of maintenance, it was calculated as 25% (3 out of 12 months) of the total expenses recorded over the last year of use

to a three-months cost of the ambulance of 50,400 US dollars. Increasing the discount of the life years gained from 3% to 6% lead to a cost per year life saved of 40.5 US dollars, thus above the threshold of very attractive interventions (30 US dollars) but below the threshold for attractive interventions (150 US dollars). Finally, all the analyses were repeated considering together the possibly and undoubtedly effective referrals (n = 36). As expected, the intervention resulted more effective. The total years saved was 1526 and the cost per year saved was 5.4 US dollars.

Discussion

This study showed that implementing an effective ambulance referral system to ensure access to EmONC services in a rural setting is highly cost-effective, with a cost per year saved of 24.7 US dollars. This cost is below the 30 US dollars benchmark for the definition of a very attractive intervention and far below the 150 US dollars benchmark for the definition of an attractive intervention [19, 20]. The sensitivity analyses carried on the rate of undoubtedly effective cases, the ambulance costs and the discount rate emphasized the robustness of this conclusion. Moreover, it is worth noting that our results are in line with those observed in a previous similar study carried out in a remote area in Uganda. The cost per year saved in that study was even lower, being 15.8 US dollars [7]. Finally, it has also to be pointed out that our results corroborate the conclusions of other recent studies from different and heterogeneous settings that univocally showed the clinical benefits of an ambulance referral service for EmONC [7–10].

Noteworthy, in our setting, communication and ambulance services were delivered in the context of a comprehensive multi-pronged strategy to address the three delays in seeking appropriate medical care for an obstetric emergency, reaching an appropriate EmONC facility, and receiving adequate care when the facility is reached. We cannot exclude that the attractive economical profile of the ambulance service may be less favourable if the intervention is not concomitantly sustained by a comprehensive approach. Of relevance here is that effectiveness of a referral also depends on timeliness of decision for referral, pre-referral care, en-route stabilizing care

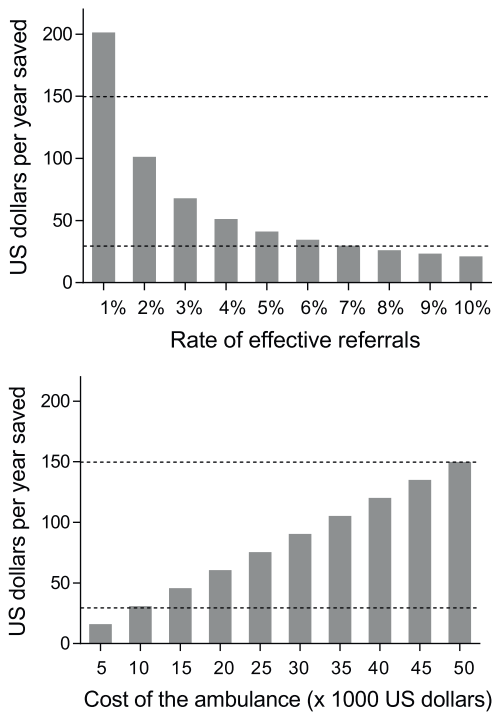

Fig. 1 Sensitivity analyses according to the proportion of undoutedly effective referrals (upper panel) and the cost of the ambulance (lower panel). In the two panels, the two dotted lines represent the benchmarks to define attractive interventions (150 US dollars, upper line) and very attractive interventions (30 US dollars, lower line). The costs of the ambulance refer to a three months period of use

(which was not provided in our setting), time taken to arrange referral vehicle, time taken to reach higher facility and promptness with which the case was attended at the higher facility. Regarding comprehensiveness of our intervention, it has also to be underlined that the local framework for supporting maternal and neonatal health was pro-poor oriented. Explicit consideration of how the poor interact with the system and how barriers to access EmONC facility can be overcome was given and, in order to address geographical and financial barriers to access to EmONC services, both ambulance and obstetrical care services were provided free of charge. It is also worth noting that the focus on neonatal and maternal health helps to target those in poverty: in fact not only are death rates higher among the poor compared with the rich, but also the highest poor-rich mortality ratio is observed for complications of pregnancy and delivery [21].

From an economic perspective, it is also worthwhile noting that the ambulance service by itself did not significantly impact on the activity of the hospital. During the three months duration of the study, only 111 ambulance referrals were recorded (8–9 referrals per week). Indirectly, this confirms the previously reported low rate of abuse of the ambulance service [10] and concomitantly excludes a relevant increase in the clinical burden to the hospital. Indeed, the implementation of the service did not lead to an increase in the number of duty personnel. This point is important because, in our study, we decided a priori to include among the costs for the hospital only the material costs needed to provide the assistance, thus assuming that the general burden to the hospital was unremarkable.

Some strengths and limitations of the study should be considered. As for the strengths, all cases were reviewed by health professionals with specific skills on EmONC, thus reducing the risk of misclassifications, while, being a prospective study, erroneous recording of the data was unlikely. Furthermore, important conservative assumptions were made in cost-effectiveness analyses. Concerning costs, an estimated ambulance's useful life of four years was assumed, as in Uganda [7], while longer useful life was used in other studies carried out in other similar rural areas [22, 23]. Concerning effectiveness, we cannot exclude some misclassification. For instance, some women with obstructive labour may have uterus rupture if not promptly operated: by excluding all women with obstructive labour from the group of undoubtedly effective referrals, we thus presumably under-estimated the effectiveness of the whole program. Furthermore, we exclusively focussed on survival and did not consider quality of life and disability that may also be of relevance. A delayed caesarean section may indeed also impact on quality of life: vesico-vaginal fistulae and child disabilities are overwhelming complications of a delayed caesarean section [24]. Finally, in remote rural, prevention of maternal death may have profound benefits for the entire households [25]. This potential benefit was not included in our analysis. Finally, it is worthwhile noting that, even though the ambulance was meant for obstetrical cases, it was commonly used also for other indications such as, for example, referral of critically ill children with severe anemia who required immediate blood transfusion. The additional benefits of these referrals were herein not considered.

Considering limitations, a possible concern is the accuracy of the classification. In fact, the judgment on effectiveness remains theoretical and there is no way to assess whether referral by other means would have caused the demise of the mother or the foetus This criticism is valid for both clinical and logistics aspects. Regarding the latter, even if initial location and distance from the hospital was considered in the classification of the cases and a personalized judgment was given, this

evaluation was subjective. Another debatable point may be the decision to apply the national life expectancy-tables without adjusting for region and pathologies. It may indeed be argued that life expectancy may be lower in the study area and that the application of these tables to all the clinical conditions (such as for instance prematurity or caesarean section) may lead to an overestimate of the benefits. Unfortunately, specific life expectancy-tables for specific areas are not available. Regarding the impact of the indication on life expectancy, it has to be underlined that women and their newborns were discharged only if well and that referrals dying before discharging were considered ineffective. Finally, since the recruitment period was limited to the Winter-Spring seasons, definitive inferences to the whole year cannot be done. All connecting roads in the area were rough and referrals may be more complicated in the rainy season (June to August). The situation of the roads in the area is mostly acceptable even during the rainy season which may explain why we failed to document a significantly lower referral rate during the rainy season in a previous study in the same setting [10].

In the future, the cost-effectiveness profile of the ambulance-based referral system may be improved by ensuring the proper management of uncomplicated cases at Health Center level and addressing inappropriate referrals by training health personnel, improving drug availability and strengthening supervision at peripheral units. An accompanying healthcare professional in the ambulance would be costly, but would improve assistance and would represent a further important step forward. Occasionally, and for the most critical cases, a midwife or a nurse of the hospital usually accompanied the patient. Integration of different means of transport adapted to the local terrain might also increase effectiveness, depending of what is required in terms of distance, geographic terrain, road infrastructure, and weather conditions provided that they do not contrast with local cultural beliefs [6, 26]. Furthermore, taking into consideration that some ambulance costs are mainly fixed and do not significantly increase with the number of referrals, and the rate of institutional deliveries is still low (48%), increasing the number of referrals may further enhance the cost effectiveness profile of the intervention.

Conclusions

Communication and an ambulance-based referral system for EmONC in remote rural areas appear highly cost-effective. However, the mere implementation of this single intervention may be insufficient if not included in the context of a comprehensive multi-pronged strategy aimed at ensuring continuity of care and at strengthening referral.

Abbreviations

EmONC: Emergency Obstetric and Neonatal Care; GDP: Gross Domestic Product; US: United States

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Availability of data and materials

The dataset is available from the corresponding author at request.

Authors' contributions

SA, FM and GP conceived and designed the study. ES and FM performed the analyses and wrote the first draft of the manuscript. All the remaining authors (HS, TA JW, BA, MZ, AT, PF, AS and SM) participated to data collection and interpretation. All authors critically revised the first draft of the manuscript and approved the final version. All authors participated sufficiently in the work to take responsibility for appropriate portions of the content and all agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethics approval and consent to participate

Ethical approval was obtained from the Southwest Shoa Zonal Health Department.

Consent for publication

Only verbal informed consent to participate was obtained because the majority of treated women were illiterate. This method of consent was approved by the Ethical Committee.

Competing interests

The authors declare that they have no competing interests.

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A new use for an old tool: maternity waiting homes to improve equity in rural childbirth care. Results from a cross-sectional hospital and community survey in Tanzania

PAPER

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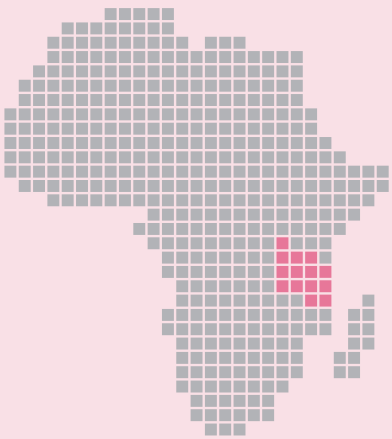
Topic
Maternal and child health

Focus country
Tanzania



Abstract

In sub-Saharan Africa poor-quality childbirth services primarily affect poor women. Health facilities that have the ability to manage obstetric complications, including providing blood transfusions and Cesarean sections, offer higher-quality services.

This study investigated whether maternity waiting homes (MWHs) might be an effective tool for drawing poor women to facilities offering higher-quality obstetric services. It was carried out in the Iringa Rural District in Tanzania's southern uplands, an area served by just one hospital with the capacity to manage every sort of delivery-related complication. Interviews were done with 1,072 women who had given birth in the hospital, 31.3% of whom had stayed at the MWH prior to delivery.

Our multivariate analysis showed that poorer women were more likely to use the MWH than better-off ones. A second significant factor in terms of use of the MWH was the distance from women's homes to the hospital: the further away their homes were, the more likely women were to make use of the MWH.

Solving Africa's maternal and child mortality equity gap calls for urgent measures. One of these should be to encourage poor women in rural areas to make use of MWHs in order to draw them to health facilities that offer higher-quality childbirth services.

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A new use for an old tool: maternity waiting homes to improve equity in rural childbirth care. Results from a cross-sectional hospital and community survey in Tanzania

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Abstract

Limited quality of childbirth care in sub-Saharan Africa primarily affects the poor. Greater quality is available in facilities providing advanced management of childbirth complications. We aimed to determine whether Maternity Waiting Homes (MWHs) may be a tool to improve access of lower socio-economic women to such facilities. Secondary analysis of a cross-sectional hospital survey from Iringa District, Tanzania was carried out. Women who delivered between October 2011 and May 2012 in the only District facility providing comprehensive Emergency Obstetric Care were interviewed. Their socio-economic profile was obtained by comparison with District representative data. Multivariable logistic regression was used to compare women who had stayed in the MWH before delivery with those who had accessed the hospital directly. Out of 1072 study participants, 31.3% had accessed the MWH. In multivariable analysis, age, education, marital status and obstetric factors were not significantly associated with MWH stay. Adjusted odds ratios for MWH stay increased progressively with distance from the hospital (women living 6–25 km, OR 4.38; 26–50 km, OR 4.90; >50 km, OR 5.12). In adjusted analysis, poorer women were more likely to access the MWH before hospital delivery compared with the wealthiest quintile (OR 1.38). Policy makers should consider MWH as a tool to mitigate inequity in rural childbirth care.

Keywords: Maternal health, newborn health, maternity waiting homes, equity, obstetrics, Tanzania, universal health coverage, childbirth

Key Messages

- The rural poor in sub-Saharan Africa bear the burden of childbirth-related complications and deaths. Where facility delivery coverage is low, home delivery is common among women from lower socio-economic groups; available evidence indicates that as coverage increases they tend to access childbirth care in primary care or first-line facilities, able to provide lower quality. Solutions are needed to address the equity gap in outcomes.
- Through multivariate analysis of hospital survey data in a high facility delivery context, we found that the only district Maternity Waiting Home (MWH) was preferentially accessed by poorer women.
- Promoting MWHs near hospitals is a mitigation strategy that can reduce inequity, by improving poorer women's access to facilities able to provide advanced management of childbirth complications.

Introduction

Tackling maternal and perinatal mortality in sub-Saharan Africa (SSA) has proven challenging. In 2015 alone, 201 000 maternal deaths, 1 027 000 newborn deaths (UNICEF 2016) and 1 060 000 (Blencowe *et al.* 2016) stillbirths were estimated in the region. Wide socio-economic disparities exist within countries, with greater mortality among the poorest generally attributed to lower access to care (Lawn *et al.* 2009).

Care at delivery is crucial as complications and deaths are concentrated around this time. Efforts in rural SSA in the past have focused on demand promotion and higher facility densities to improve access to institutional delivery (Dettrick *et al.* 2013). Coverage itself is insufficient to reduce mortality, and the focus has recently been shifted to quality improvement. In SSA, childbirth assistance is provided both in primary care and in higher level facilities. The relevance of the primary health care system varies, with some countries assisting half of institutional deliveries at this level (Campbell *et al.* 2016; Kruk *et al.* 2016). Advanced management of complications is generally only available from the hospital level. Campbell and colleagues have recently provided a framework for improvement of this complex service, which the skilled birth attendance indicator was unable to describe fully (Campbell *et al.* 2016). Recent evidence indicates that greater quality is available in facilities with higher delivery volumes, offering more functions of obstetric care (Kruk *et al.* 2016).

The United Republic of Tanzania, with a population of 53 470 000 (WHO 2016), in 2015 was among ten countries worldwide with the highest absolute numbers of neonatal, maternal deaths and stillbirths (Lawn *et al.* 2016), in spite of a well-developed primary health care network and delivery care available at all levels of the health system. High access to institutional deliveries has been documented in different areas of the country (Kruk *et al.* 2015, Straneo *et al.* 2016; TDHS-MIS 2016), making it an ideal context to study steps following coverage in low-income countries. Evidence from Tanzania highlighted an equity gap when institutional delivery coverage is achieved. Poorest women are more likely to access delivery care in the primary health care system where lower quality is available, and are under-represented where comprehensive emergency obstetric care (C-EmOC) is provided (Straneo *et al.* 2014). Though thresholds on optimal delivery volumes in primary care are a matter of debate (Kruk *et al.* 2016; Straneo *et al.* 2017), compelling evidence on the impact of limited quality in the peripheral component of the health system comes from a population survey in Tanzania, where direct maternal mortality reduced with proximity to a hospital, but not to any facility (Hanson *et al.* 2015). Quality of front-line delivery care in Tanzania has been found to be weak in different studies (Hanson *et al.* 2013; Kruk *et al.* 2016; Mkoka *et al.* 2014; Penfold *et al.* 2013). Users' perceptions on quality of front-line facilities are indicated by women's bypassing of facilities (Kantè *et al.* 2016). Coverage brings forward challenges, among which insufficient staffing and caseloads too low for skills retention, arduous to overcome without a complex health system reorganization (Fogliati *et al.* 2015).

How can access of the poorest women to facilities providing advanced management of childbirth complications be improved? Maternity Waiting Homes (MWHs) have been advocated for several decades to overcome distance barriers to obstetric care and reduce maternal and perinatal mortality (WHO 1996; Lee *et al.* 2009; van Lonkhuijzen *et al.* 2012). They have been extensively used in rural areas of limited resources countries, though there are knowledge gaps on their impact on outcomes, partly following difficulties comparing utilization in different contexts (van Lonkhuijzen *et al.* 2012). Very limited data exist on how mothers from different socio-economic groups utilize MWHs.

As part of an effort to address inequity in maternal and perinatal outcomes, we set out to answer the question of whether MWHs may be a strategy to improve poorer women's access to facilities providing advanced management of obstetric complications. The study was conducted in Iringa District, Tanzania, a high facility delivery coverage setting (87.7% in 2009) (Straneo *et al.* 2016). Specifically, MWH utilization among women who had delivered in the only District C-EmOC facility was assessed, to determine whether socio-economic status is a determinant.

Methods

Study setting

The study was carried out in Iringa District, a mostly rural district in the Tanzanian Southern Highlands, with an habitable surface of 9857 km^2. The estimated population of 254 023 was served by 73 health facilities in 2012, including one District-designated diocesan hospital, 6 health centres and 66 dispensaries. C-EmOC services were available only in the Hospital, equipped with a 45 bed Maternity Ward. In 2012, 7645 institutional deliveries were recorded in the District, with 2140 (28.0%) in the C-EmOC facility, and 5505 (72.0%) in primary care facilities. In 2011–12, the only MWH in the district was adjacent to the hospital. It offered basic accommodation with toilets and cooking facilities for pregnant women, and required payment of a small daily fee. Women admitted to the MWH were self-referred or referred by a health worker from a peripheral facility.

Maternity ward hospital survey

This study was based on secondary analysis of a cross-sectional survey of women who delivered in the only C-EmOC facility in Iringa District (Tosamaganga District-designated Hospital) between October 2011 and May 2012. Women were interviewed to collect data on access and quality of services ('hospital survey') (Straneo *et al.* 2014), as part of a development intervention aiming to strengthen maternal and newborn services. A baseline population socio-economic profile was obtained from a district-representative household survey ('community survey') described elsewhere (Straneo *et al.* 2016). Data collected included socio-demographic characteristics of women discharged and pregnancy outcomes. A pre-test validated, structured questionnaire was administered by ward staff at discharge. Where relevant (e.g. type of stillborn, birth weight, time of newborn death), data were extracted from the women's files. Neonatal and perinatal mortality definitions followed WHO guidelines (WHO 2006). Obstetric risk factor was defined according to national guidelines (Jahn *et al.* 1998; MoHSw 2008), and includes primigravidae, gravida >4, previous cesarean section and poor obstetric history.

Women were asked about village of residence. Euclidean distances to C-EmOC were remotely estimated by using a geographical information system and reference points at village level, like health facility or village centre. Intervals applied were ≤5, 6–25, 26–50, >50 km, in accordance with similar studies (Høj *et al.* 2002; Wild et al. 2012).

Characteristics of the population of women who had stayed in the MWH and of those who had accessed the maternity ward directly were examined. Variables examined were age, tribe, parity, education, marital status, sex of household head, distance of residence from the hospital, obstetric risk, socio-economic strata (SES).

Sample size for the primary study was calculated to detect a 30% difference among the socio-economic groups accessing the C-EmOC facility compared with the baseline community SES groups, with a significance level of 5 and 90% power.

Socio-economic stratification

Socio-economic stratification of the district population was obtained from a District-representative cross-sectional survey conducted in 2009. It was based on durable household goods or housing characteristics (thatched roof, non-mud floor, radio, mobile phone, bicycle). Five SES were obtained using principal component analysis, labelled 1–5 from lowest to highest. The socio-economic profile of women with a hospital delivery was obtained by applying the cut-offs of socio-economic quintiles from the District population (Straneo *et al.* 2014). SES quintiles were collapsed into two categories (1–4 and 5) in multivariable analysis, to assess differential access of poorer women compared with the wealthiest.

Data analysis

Data entry and cleaning was done using Epidata version 3.1. Data were analysed using STATA version 9.

Characteristics of women who stayed at MWH and of those who directly accessed the hospital were summarized using proportions and 95% CI. Factors associated with staying at MHW were assessed by multivariable logistic regression. Crude and adjusted odds ratios with 95% CI were estimated and *P*-values calculated with the Wald test. Pregnancy outcomes were examined for MWH users and non-users in bivariate analysis. Proportions and 95% CI were calculated for each group and chi-squared test was applied to estimate *P*-values. Multivariable analysis on fetal/neonatal outcomes could not be performed due to small counts in some sub-groups. All $P < 0.05$ values (two-sided) were considered statistically significant.

Results

In the study period, 1405 women were discharged after delivery from the Maternity Ward, including six who died during admission. From comparison with the ward register, 99% of women discharged were interviewed.

Characteristics of women utilizing MWH

After excluding women living outside the District ($n = 333$), records from 1072 women were analysed. Information on MWH stay was available for 1046 women (97.6%). We found 335 women (31.3%) had stayed at the MWH. Baseline characteristics of women with MWH stay and of those with direct hospital access are summarized in Table 1. There were no relevant differences between the two groups regarding age, tribe (data not shown), parity, marital status, sex of household head, obstetric risk factors and type of delivery.

In bivariate analysis, years of education, distance to hospital and SES were significantly associated with MWH stay. Women who had stayed in the MWH were more likely to be less educated (crude OR 0.53, 95% CI 0.34–0.82 for women with ≥8 years' education compared with baseline 7 years), more likely to live distant from the hospital with crude OR of MWH stay increasing with distance (women living 6–25 km, OR 4.74, 95% CI 3.01–7.46; living 26–50 km, OR 5.20, 95% CI, 3.10–8.74; living >50 km, OR 5.58, 95% CI, 2.89–10.78), and more likely to belong to the lowest four socio-economic groups (quintiles 1–4 compared with the wealthiest quintile, crude OR 1.52, 95% CI 1.16–1.99).

The final model for multivariable logistic analysis included age, distance to hospital, education, marital status, household head sex, SES and presence of obstetric risk factors. The variable parity could not be fitted into the regression model because of collinearity with variable age, and type of delivery was excluded as posterior to MWH stay. Adjusted OR, with 95% CI and *P*-values are depicted in Table 2. After adjusting, factors significantly associated to MWH stay were distance from hospital (women living 6–25 km, OR 4.38, 95% CI 2.75–7.00; living 26–50 km, OR 4.90, 95% CI, 2.87–8.37; living >50 km, OR 5.12, 95% CI, 2.61–10.02) and socio-economic status, with poorer women (quintiles 1–4) more likely to access the MWH than those from the highest quintile (adjusted OR 1.38, 95% CI 1.02–1.88).

Outcomes

Data on delivery outcome were available for all 1046 deliveries. In total, 1077 babies were delivered, with 1015 singletons and 62 twins. Approximately one third (348, 32.3%) were from mothers in the MWH group, and 67.7% (729) from women with no MWH stay. Median hospital stay was 1 day. Characteristics of the two groups are shown in Table 3.

There were non-significant differences in proportions of twins among the two groups. There were no differences in the proportion of babies born alive in the two groups, though there were significant differences in birthweight distribution, with more babies weighing ≤2500 g in the group with direct hospital access (5.6 vs 1.4%).

There were 25 neonatal deaths among 1044 babies born alive. Facility early neonatal mortality for the population was 24/1044, corresponding to 23.0/1000 live births. At bivariate level, we found significant differences in neonatal survival, with greater survival in the MWH group, compared with the group that had accessed the hospital directly. Very early and early neonatal mortality were lower in the MWH group, while perinatal mortality was not different between the two groups (Table 3).

Six maternal deaths were recorded during the study period, with data on MWH stay missing for one. One of the women who died had stayed in the MWH (intra-hospital mortality 1/334; 0.3%, 95% CI 0.0–1.7), and four had accessed the hospital directly (intra-hospital mortality 4/710; 0.6%, 95% CI 0.2–1.4): *P*-value was non-significant ($P = 0.566$).

Discussion

Three main findings arise from this study. First, among women with a hospital delivery, analysis of determinants indicates poorer women are more likely to access the MWH prior to delivery compared with those from the wealthiest quintile. Second, distance from a hospital makes MWH utilization more likely, with highest OR for women living >50 km from the facility. The third regards outcomes: neonatal survival and very early neonatal survival were greater among MWH women compared with those with direct hospital access.

The first finding is the most important, and strives to answer the research question. There is very limited published data on how women from socio-economic groups access MWH. One study found greater maize production in bivariate analysis among MWH utilizers in Zambia compared with non-utilizers (Van Lonkhuijzen *et al.* 2003). More recently, a study from Malawi (Singh *et al.* 2017) found in bivariate analysis that poorest women were more likely to have accessed MWHs. In the present study, after adjusting for

Table 1. Baseline characteristics of women who delivered at District hospital and stayed at MWH compared with women who did not stay at MWH. Iringa Rural District, Tanzania (2011–2012) ($n = 1072$)

Variable	Stayed at MWH ($n = 335$)			Not stayed at MWH ($n = 711$)		
	n	%	(95% CI)	*n*	%	(95% CI)
Age (years)						
≤19	63	18.9	(14.6–23.1)	110	15.5	(12.8–18.2)
20–39	263	78.7	(74.3–83.2)	583	82.1	(79.3–84.9)
≥40	8	2.4	(0.7–4.0)	17	2.4	(1.3–3.5)
Parity						
1	129	38.5	(33.3–43.7)	294	41.4	(37.8–45.0)
2–4	139	41.5	(36.2–46.8)	290	40.9	(37.2–44.5)
≥5	67	20.0	(15.7–24.3)	126	17.8	(14.9–20.6)
Education (years)						
0–6	33	9.9	(6.7–13.1)	61	8.6	(6.6–10.7)
7	273	81.7	(77.6–85.9)	540	76.5	(73.4–79.6)
≥8	28	8.4	(5.4–11.4)	105	14.9	(12.2–17.5)
Marital status						
Married/living together	283	85.0	(81.1–88.8)	575	81.3	(78.5–84.2)
Single	50	15.0	(11.2–18.9)	132	18.7	(15.8–21.5)
Sex of household head						
Male	307	93.9	(91.3–96.5)	645	91.9	(89.9–93.9)
Female	20	6.1	(3.5–8.7)	57	8.1	(6.1–10.1)
Distance from hospital (km)						
0–5 km	25	8.3	(5.2–11.5)	201	30.9	(27.3–34.4)
6–25 km	184	61.3	(55.8–66.9)	312	47.9	(44.1–51.8)
26–50 km	66	22.0	(17.3–26.7)	102	15.7	(12.9–18.5)
>50	25	8.3	(5.2–11.5)	36	5.5	(3.8–7.3)
Obstetric risk factors[a]						
Present	217	64.8	(59.6–69.9)	447	63.0	(59.4–66.5)
Absent	118	35.2	(30.1–40.6)	263	37.0	(33.5–40.7)
Type of delivery						
Vaginal	231	69.0	(64.0–73.9)	489	68.8	(65.4–72.2)
Cesarean section	104	31.0	(26.1–36.0)	222	31.2	(27.8–34.6)
SES						
Very low	28	8.5	(5.4–11.5)	36	5.1	(3.5–6.8)
Low	43	13.0	(9.4–16.6)	76	10.8	(8.5–13.1)
Medium	59	17.8	(13.7–22.0)	115	16.4	(13.7–19.2)
High	87	26.3	(21.5–31.1)	163	23.3	(20.1–26.4)
Very high	114	34.4	(29.3–39.6)	311	44.4	(40.7–48.1)

[a]Obstetric risk factors: primipara, grand multipara, previous cesarean section, poor obstetric history.

potential confounders, poorer women were more represented in the MWH. It is likely that even in rural SSA the wealthiest women have the economic means for emergency transport to hospital once labour starts. For poorer women, the MWH may be a means to access higher level obstetric care without incurring in costs for private transport during labour. There is at present insufficient evidence on optimal organization of MWHs (van Lonkhuijzen *et al.* 2012, Lori *et al.* 2016), and no clear demonstration of impact on neonatal (Buser and Lori 2016), maternal outcomes, and stillbirths, which ongoing randomized trials may contribute to address (National Institutes of Health Undated). Notwithstanding the uncertainties, the double burden of poor outcomes among the poor and limited quality of services they access, calls for urgent policy measures. Promoting MWHs near hospitals is a mitigation strategy that can address inequity. As obstetric services with advanced management of complications are rolled out in rural areas, such as non-hospital C-EmOC units (Nyamtema *et al.* 2016), establishment of MWHs in their proximity should be considered to facilitate poorer women's access.

In addition, it is worth noting that, though relatively there is preferential MWH uptake by lower SES groups, in absolute terms the poorest are under-represented in the hospital population compared with that of origin (only 8.5% of women from the lowest socio-economic quintile) (Straneo *et al.* 2014).

Distance has been shown in several studies to be a determinant for MWH uptake, thus their availability has been advocated to overcome geographical barriers to facility delivery (WHO 1996; van Lonkhuijzen *et al.* 2012). This study adds that distance remains a significant factor even in settings with high coverage (Straneo *et al.* 2016; TDHS 2015–16).

The third finding relates to outcomes. In this analysis, overall neonatal deaths, very early and early neonatal deaths were lower in MWH women, compared with the direct hospital access group. The finding must be interpreted with caution. Mothers with premature labour are likely to access the hospital directly. Prematurity is likely to explain at least part of the greater mortality among the group with direct hospital access. We did not find an association of obstetric risk factors' presence and MWH uptake. This contrasts with findings from other studies (van Lonkhuijzen *et al.* 2003, 2012) carried out in low coverage contexts. Overall, over 60% of women reported an obstetric risk factor both in MWH and non-MWH women. Risk factors in addition to those reported could have been

Table 2. Factors associated with staying at MWH

Variable	OR crude	(95% CI)	*P*-value*	OR adjusted**	(95% CI)	*P*-value*
Age (years)						
≤19	1.27	(0.90–1.79)	0.172	1.36	(0.89–2.09)	0.152
20–39	1			1		
≥0	1.04	(0.44–2.45)	0.923	1.24	(0.49–3.16)	0.655
Education (years)						
0–6	1.07	(0.68–1.67)	0.767	0.90	(0.54–1.51)	0.694
7	1			1		
≥8	0.53	(0.34–0.82)	0.005	0.72	(0.43–1.21)	0.214
Sex of household head						
Female	1			1		
Male	1.36	(0.80–2.30)	0.257	0.89	(0.43–1.82)	0.743
Marital status						
Married/living together	1.30	(0.91–1.85)	0.149	1.64	(0.95–2.83)	0.077
Single	1			1		
Distance from hospital (km)						
0–5 km	1			1		
6–25 km	4.74	(3.01–7.46)	<0.001	4.38	(2.75–7.00)	<0.001
26–50 km	5.20	(3.10–8.74)	<0.001	4.90	(2.87–8.37)	<0.001
>50	5.58	(2.89–10.78)	<0.001	5.12	(2.61–10.02)	<0.001
Obstetric risk factors						
Present	1.08	(0.83–1.42)	0.569	1.13	(0.82–1.57)	0.450
Absent	1			1		
SES						
Poorer (lower 4 quintiles)	1.52	(1.16–1.99)	0.003	1.38	(1.02–1.88)	0.037
Wealthiest (quintile 5)	1			1		

*Wald test.
**Adjusted for all variables.

Table 3. Outcomes babies (1072 women enrolled, available data on MWH stay 1046)

Variable	Mother stayed at MWH ($n = 335$)			Mother did not stay at MWH ($n = 711$)			*P*-value*
	n	%	(95% CI)	*n*	%	(95% CI)	
Total babies delivered (alive and dead)	348	32.3	(29.5–35.2)	729	67.7	(64.8–70.5)	
Singleton[a]	322	92.5	(89.2–95.1)	693	95.1	(93.2–96.5)	0.095
Twins[a]	26	7.5	(4.9–10.8)	36	4.9	(3.5–6.8)	0.095
Birth weight							
<2.5 kg	5	1.4	(0.5–3.3)	41	5.6	(4.1–7.6)	0.001
≥2.5 kg	343	98.6	(96.7–99.5)	688	94.4	(92.4–95.9)	0.001
Born dead[a]	12	3.4	(1.8–5.9)	21	2.9	(1.8–4.4)	0.613
MSB	9	2.6	(1.2–4.9)	9	1.2	(0.6–2.3)	0.106
FSB	3	0.9	(0.2–2.5)	12	1.6	(0.9–2.9)	0.305
Born alive[a]	336	96.6	(94.1–98.2)	708	97.1	(95.6–98.2)	0.613
Neonatal deaths[b]	3	0.9	(0.2–2.6)	22	3.1	(2.0–4.7)	0.029
very early (≤24 h)	2	0.6	(0.1–2.1)	11	1.6	(0.8–2.8)	0.192
early (0–6 days)	3	0.9	(0.2–2.6)	21	3.0	(1.8–4.5)	0.037
late (7–27 days)	0			1	0.1	(0.0–0.8)	0.491
Perinatal deaths[c]	14	4.0	(2.2–6.7)	41	5.6	(4.1–7.6)	0.266
Alive at discharge[a]	333	95.7	(93.0–97.6)	686	94.1	(92.1–95.7)	0.280

[a]Denominator total babies delivered.
[b]denominator babies born alive.
[c]Perinatal death: early neonatal deaths and still births > 1000 g; denominator born deaths weight > 1000 g and live births.
*Chi-squared test.

present leading to misclassification, thus the finding needs to be evaluated further.

This study has several strengths. One is its very high response rate (>95%), thus it offers a complete picture, with the few missing data unlikely to affect results. Second, it derives the hospital population's socio-economic profile from comparison with that of the district population. It allows to compare the women with the population of origin, rather than with more general regional or national data. Third, multivariable analysis was used to adjust for confounding where applicable.

Limitations of the study should also be considered. Regarding the study question on factors associated with MWH, one limitation is it was a secondary analysis of survey data. Sample size and power were calculated for the primary study indicators (Straneo *et al.* 2016). In spite

of this, a significant difference in socio-economic groups' use of the MWH was detected. Second, the two populations were not time-matched, with hospital data collected 24–31 months after the community survey. Third, this was a facility study, thus the population examined was not representative of the general population. In relation to outcomes, the study was not designed to assess differences in outcomes between MWH users and non-users. Short median follow-up did not allow to identify all neonatal deaths, therefore it is likely only data on stillbirths and very early neonatal deaths are accurate, while early neonatal deaths are likely to be underestimated. Further studies are needed to assess MWH effect on outcomes.

In published literature, this is the first study that has explored a relation between MWH utilization and socio-economic status controlling for confounders, in high institutional delivery coverage. This is particularly important in limited resources contexts with expanding rural health systems, where contrasts between coverage and quality of care become evident (Hanson *et al.* 2015; Straneo *et al.* 2017). Further studies are required to validate this result, and to address questions that arise from it. Solutions to improve poorest MWH access should be sought, as, in absolute terms; they were still under-represented. Development of communities' shared models of MWH, adapted to local contexts, may favour women's uptake (Sialubanje *et al.* 2015; Lori *et al.* 2016).

Conclusion

In a rural high facility delivery context, poorer women, compared with the wealthiest, were more likely to access a MWH before hospital delivery.

Promoting MWHs near hospitals can contribute to mitigate inequity in childbirth-related outcomes in SSA, by improving poorest women's access to facilities able to provide advanced management of delivery complications.

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Ethical clearance

The National Institute for Medical Research, United Republic of Tanzania, provided ethical clearance for the hospital and the community household surveys. All participants in both surveys provided informed, signed consent. Data were entered anonymously for confidentiality.

Conflict of interest statement. None declared.

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Effects of demand-side incentives in improving the utilisation of delivery services in Oyam District in northern Uganda: a quasi-experimental study

PAPER

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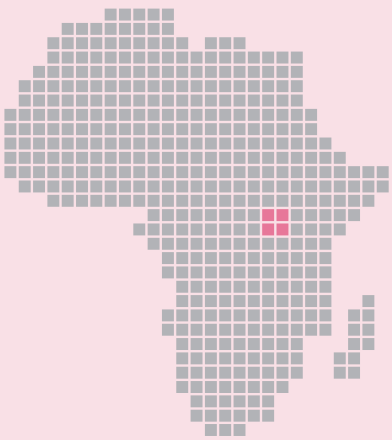

Abstract

The pace of development in northern Uganda's rural district of Oyam, which is home to approximately 400,000 people, has generally been slow. Doctors with Africa CUAMM's "Mothers and Children First" program has experimented there with two types of incentives to help pregnant women overcome geographic and financial barriers to their use of maternal health services: providing mothers-to-be with transport vouchers that enable them to travel by motorcycle to a health facility offering such services, and new mothers with "baby kits" containing various items useful for the care of newborns.

Our 12-month study (January through December 2014) assessed the impact and financial cost of providing these incentives and investigated their impact on women's use of prenatal care, deliveries assisted by skilled attendants and postnatal care. We used a "difference in differences" technique to conduct our research, looking at areas that were similar in terms of population and the availability of services, but only some of which were targets of our intervention.

We found significant increases in the number of prenatal care visits and assisted deliveries in the health facilities in which the two incentives were introduced. The percentage of women who went to such a facility to give birth jumped from 31% to 53% with the introduction of the baby kits, and from 13% to 53% with that of the transport vouchers, whose provision also led to a major increase – from 8% to 47% – in the percentage of women taking advantage of all four antenatal care visits. The cost of an institutional delivery came to US$ 9.40 for each transport voucher used and US$ 10.50 for each baby kit, while the incremental cost per unit increment in institutional deliveries was US $15.90 with the transport vouchers and US$ 30.60 with the baby kits.

Therefore both types of incentive, but especially the transport vouchers, proved effective in increasing the community's use of maternal and neonatal care services by significantly reducing demand-side barriers.

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RESEARCH ARTICLE Open Access

Effects of demand-side incentives in improving the utilisation of delivery services in Oyam District in northern Uganda: a quasi-experimental study

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Abstract

Background: We evaluated the effects and financial costs of two interventions with respect to utilisation of institutional deliveries and other maternal health services in Oyam District in Uganda.

Methods: We conducted a quasi-experimental study involving intervention and comparable/control sub-counties in Oyam District for 12 months (January–December 2014). Participants were women receiving antenatal care, delivery and postnatal care services. We evaluated two interventions: the provision of (1) transport vouchers to women receiving antenatal care and delivering at two health centres (level II) in Acaba sub-county, and (2) baby kits to women who delivered at Ngai Health Centre (level III) in Ngai sub-county. The study outcomes included service coverage of institutional deliveries, four antenatal care visits, postnatal care, and the percentage of women 'bypassing' maternal health services inside their resident sub-counties. We calculated the effect of each intervention on study outcomes using the difference in differences analysis. We calculated the cost per institutional delivery and the cost per unit increment in institutional deliveries for each intervention.

Results: Overall, transport vouchers had greater effects on all four outcomes, whereas baby kits mainly influenced institutional deliveries. The absolute increase in institutional deliveries attributable to vouchers was 42.9%; the equivalent for baby kits was 30.0%. Additionally, transport vouchers increased the coverage of four antenatal care visits and postnatal care service coverage by 60.0% and 49.2%, respectively. 'Bypassing' was mainly related to transport vouchers and ranged from 7.2% for postnatal care to 11.9% for deliveries. The financial cost of institutional delivery was US$9.4 per transport voucher provided, and US$10.5 per baby kit. The incremental cost per unit increment in institutional deliveries in the transport-voucher system was US$15.9; the equivalent for the baby kit was US$30.6.

Conclusion: The transport voucher scheme effectively increased utilisation of maternal health services whereas the baby-kit scheme was only effective in increasing institutional deliveries. The transport vouchers were less costly than the baby kits in the promotion of institutional deliveries. Such incentives can be sustainable if the Ministry of Health integrates them in the health system.

Keywords: Baby kit, Demand-side, Incentives, Maternal and newborn health, Oyam District, Transport vouchers, Uganda

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Background

Maternal mortality remains a major public-health problem in sub-Saharan Africa (SSA) and in many resource-limited settings. Globally, SSA accounted for 179, 000 (62%) of all estimated 289,000 maternal deaths in 2013. In that year, the maternal mortality ratio (MMR) in low-income countries was 14 times higher than in high-income countries, with SSA having the highest MMR at 510, compared to the global average of 210 per 100,000 live births. The estimated lifetime risk of maternal mortality in high-income countries was 1 in 3400 in comparison to 1 in 52 in low-income countries [1–5].

Maternal mortality has enormous negative effects on child survival, family dynamics, and household economies, as well as national development [6–8]. Consequently, several global, regional, and national initiatives have been employed to reduce maternal mortality and its negative effects, with varying degrees of success. These initiatives include strengthening health systems, implementing safe motherhood strategies, and developing maternal and newborn health networks, which are part of the United Nations Millennium Development Goals (MDGs) and the UN Secretary General's Strategy, 'Every woman every child', among other programmes [9–11]. Reviews, progress reports, and evaluation studies on such initiatives consistently show better outcomes in middle and high-income countries than in low-income countries [12–14], especially SSA. The key reasons often cited for these disparities include weak health systems, low government health expenditures that often translate to catastrophic health expenditures for households, inequities, lack of policies that support the delivery of evidence-based interventions, and lack of access to skilled birth attendants [15, 16].

Uganda is one of the several SSA countries that did not achieve the fifth MDG target by September 2015 [15, 17]. The MMR and institutional delivery rates stood at 435 per 100,000 live births and 52.7%, respectively [18, 19]. In addition to the reasons cited above, many barriers to accessing healthcare exist in Uganda. These include poor geographical access due to distance and transport issues, lack of decision-making power among women, shortage of professional health workers, poor attitudes of some health workers, and preference for traditional birth attendants [2, 4, 5].

Oyam District has one of the highest MMRs (500/100,000 live births) in Uganda [20]. The district is located in a rural post-conflict region in the northern part of the country and had a population of 388, 011 at the time of this study. Over 50% of the population live below the poverty line (US$1.25), more than 70% of the health facilities are health centre IIs, and less than 40% of the population live within 5 km of a health facility. Eighty-nine percent of the pregnant women receive antenatal care (ANC) at least once, but only 48% make four ANC visits (previous recommendation), and 42% use institutional delivery services. The overall rate of caesarean sections is 2.1%, well below the minimum 5% recommended by the WHO [20–24]. This situation has prompted several non-governmental organisations (NGOs) and implementing partners to support healthcare delivery services in the district. If this move is sustained, it could promote institutional deliveries and improve birth outcomes, in line with evidence from literature [25].

The presence of skilled attendants at birth is considered the single most important factor in preventing maternal deaths [26–29], particularly in resource-limited settings. To that end, several innovative approaches that target both demand and supply-side barriers are being implemented. These include incentive-based interventions using strategies, such as conditional cash transfers, clean birth kits and transport voucher schemes. Although most of the studies of such interventions have been conducted in Asia [30–32] and Latin America [33] rather than Africa [34–36], the results have been positive [34, 37] in all the settings.

Few studies have assessed the effects of demand -side incentives, such as a transport voucher scheme, on the proportion of institutional deliveries in Uganda. Nonetheless, there are promising results from one of the preliminary studies [34]. The Ministry of Health (MoH) launched the *Maama* kit initiative in Uganda in 2003 to promote clean and safe deliveries [38]. Under that initiative, *Maama* kits were distributed to pregnant women in mostly rural districts during antenatal visits or community outreach visits [38, 39]. We hypothesised that encouraging pregnant women to deliver at health facilities and providing them with a kit that reduces the cost of newborn care could increase the demand for institutional deliveries. We call this a "baby kit", contrary to the *Maama* Kit.

We evaluated the effects of providing transport vouchers and baby kits on changes in the number of institutional deliveries, four ANC visits, and postnatal care (PNC) visit. We also measured the proportion of women 'bypassing' maternal health services inside their residential sub-counties, in favour of services outside, with respect to four ANC visits, institutional deliveries, and PNC services. As a 'side objective', we hypothesised that given the inadequate number and disproportionate distribution of health facilities in the district, this study could help, to some extent, document the extent of 'bypassing' in the study's sub-counties before and during the interventions. We also examined the financial costs of the two interventions in the promotion of institutional deliveries, to scale up to other sub-counties in Oyam District.

Methods

Study design and population

This quasi-experimental study evaluated the effects of the two interventions separately: the provision of transport vouchers and baby kits on the utilisation of maternal health services.

The study population consisted of women attending antenatal, delivery and postnatal services at health facilities in the study's sub-counties.

Setting

Doctors with Africa CUAMM, an Italian NGO, and hereafter, referred to as CUAMM, implemented the interventions in Oyam District in northern Uganda, from January to December 2014. CUAMM is the main international NGO supporting maternal and newborn healthcare delivery services in Oyam District. This organisation and its operations have been described in previous publications [23, 24, 40, 41]. The papers provide maps of the district and details of the administrative divisions, such as the health sub-districts (HSD), sub-counties, parishes, and villages. Moreover, these papers describe the district's health system, including the distribution of health facilities and their functional relationships within the district's health system. Notably, Aber Hospital, a private not-for-profit (PNFP) facility is the only hospital in the district, the single facility capable of providing all emergency obstetric and neonatal care (EmONC) services, and it serves as referral hospital for the district [23]. Table 1 summarises the basic components and services provided at the various levels of the district's health system.

According to the Uganda National Health Policy [42], there should be a HC III in every sub-county and a HC II in every parish. However, Oyam District has only 6 HC IIIs for the 12 sub-counties, 22 HC IIs for the 63 parishes, a HC IV at Anyeke, and 1 PNFP hospital, for a total of 30 health facilities (Oyam District Health Report 2015, unpublished). Although it is desirable to provide maternity services, mainly at the HC III level and above in the Ugandan health system [43–45], an inadequate number of HC IIIs and their geographical inaccessibility make this provision untenable in Oyam. This situation compelled the district's local government to upgrade and mandate some HC IIs to provide basic maternity services, in line with existing central government provisions [46, 47].

Furthermore, HCs are distributed unevenly, such that some sub-counties and parishes have two or more health facilities, whereas others have none. This disproportionate distribution of HCs in the sub-counties, coupled with the perceptions of poor quality of care leads to 'bypassing' the HCs, a phenomenon whereby residents of poorly served sub-counties seek health services from health facilities in neighbouring sub-counties [48, 49].

Following the presidential election campaign in 2001, Uganda officially abolished user fees in all public-health facilities [50], but that did not lead to zero costs. Patients still pay for transport and sometimes also for medications and commodities at the health facilities because of frequent shortages.

In 2012, CUAMM launched a 5-year programme to improve access to and use of maternal and neonatal health services in the entire district. The programme adopted a mix of demand and supply-side strategies aimed at strengthening the district's health system and improving the availability, quality, and use of maternal and newborn healthcare services, particularly, skilled attendants at birth. The programme was integrated into the district's health system, where services

Table 1 Basic components and services at the various levels of the Oyam District Health System

Level	Location	Population	Services provided
[a]Health Centre I (community and Village Health Teams)	Village	1000	Community-based prevention and health-promotion services
[b]Health Centre II	Parish	5000	Prevention, health promotion, and outpatient curative services, outreach
Health Centre III	Sub-County	20,000	Prevention and health-promotion, outpatient curative services, outreach, Maternity, in-patient curative services, and laboratory services
Health Centre IV	County	100,000	Emergency surgery, blood transfusion, and all services provided at HC III level
General or District Hospital (Aber Hospital = PNFP, 178 beds)	District	500,000	Consultations, in-service training, other general services, and research support to community-based healthcare programmes. In addition to services offered at the HC IV level

Sources: Health Sector Strategic Plan 2000/01–2004/05, Ministry of Health, Uganda; Health Sector Strategic Plan II 2005/06–2009/10, Ministry of Health, Uganda; Institute for Health Metrics and Evaluation (IHME). Health Service Provision in Uganda: Assessing Facility Capacity, Costs of Care, and Patient Perspectives. Seattle, WA: IHME, 2014

HC, Health Centre. [a]A HC I is the interface between the formal health system and the community. There are no physical structures, except for a network of Village Health Teams (VHT). The VHTs are non-professional health workers trained to perform several functions. They include health education, disease prevention and health promotion through community sensitisation and mobilisation for various public-health interventions. They are usually residents of the communities and serve as 'bridges' between the health facilities and their communities. [b]Some HC IIs were upgraded and mandated to provide basic maternity services

are usually free of charge. The key components of that programme were:

- Budget support to the district's health office;
- Quarterly supplies of equipment and drugs and reproductive health commodities to all health facilities in the district;
- Recruitment of additional qualified human resources for health, mainly nurses and midwives;
- Training of healthcare workers providing maternal and newborn health services in emergency obstetric and neonatal care, and the provision of incentive packages;
- Reduced and flat hospital admission fees for maternal and newborn services at Aber Hospital;
- Free-of-charge caesarean sections at Anyeke HC IV and Aber Hospital;
- Free ambulance referral services linking the lower-level health facilities to Anyeke HC IV and Aber Hospital;
- Strengthening of monitoring and evaluation through regular joint support supervisions involving the district's health authorities and CUAMM staff members;
- Other measures entailed revitalisation of VHTs to sensitise and mobilise the communities to access and utilise health services; and
- Retention initiatives, such as performance-based allowances for key staff members who provide comprehensive EmONC services at Aber Hospital and Anyeke HC IV.

The two incentive schemes were implemented within the framework of the programme described above.

Intervention and control sub-counties and health facilities

In selecting the intervention and control sub-counties, we considered institutional delivery service coverage, 'bypassing', the logistical feasibility of implementing the interventions, and the similarity of the health facilities. As the main aim of the interventions was to increase institutional deliveries, the sub-counties with the lowest service coverages were purposively selected. To minimise 'bypassing', the control and intervention sub-counties were chosen in such a way that they were separated by a buffer zone. The intervention sub-counties were located in the same HSD to make it logistically feasible to implement the study, given the limited resources available. We also ensured that the control and intervention facilities were fairly similar regarding the levels of care in the health system, infrastructure, services provided, and staffing (Table 1).

Based on the above factors, Alao HC II and Atipe HC II in Acaba sub-county were selected for the transport-voucher intervention. Amwa HC II (Myene sub-county) was selected as a control facility for this intervention. Ngai HC III (Ngai sub-county) was selected for the baby-kit intervention, with Agulurude HC III (Loro sub-county) serving as its control. Each of Acaba and Myene sub-counties has two HC IIs but no HC III. Ngai sub-county has only one HC III, while Loro sub-county has one HC III and two HC IIs.

Interventions

Transport vouchers

The transport-voucher intervention was implemented in Acaba sub-county. The vouchers were given to pregnant women while attending ANC at Alao HC II and Atipe HC II during the intervention period. Some pregnant women in the study's catchment area learned about the intervention at the time of delivery. To prevent them from feeling being 'left out', these women received vouchers to use for PNC services. The voucher allowed women to use any locally available means of transport (motorbike or bicycle) to travel to the health centres for any pregnancy or labour-related condition or emergency, including delivery. The voucher scheme was intended to address geographical inaccessibility. After transport being provided to women, the driver redeemed the voucher at a fixed amount of 10,000 Ugandan Shillings (4 US dollars), at the health facility.

Baby kit

To our knowledge, at the time of this study, only Anyeke HC IV in the Oyam District was receiving intermittent supplies of the Ugandan MoH *Maama* kits. That health centre was not included in the study. There are notable differences and minor similarities between the MoH *Maama* kit and the Baby kit that we provided, regarding objectives, contents, and distribution strategies. As shown in the background section, the MoH *Maama* kit initiative was meant primarily to promote clean and safe deliveries. The Maama kit contained a plastic sheet, sterile gloves, razor blades, a cord ligature, a tube of Tetracycline ointment, cotton, sanitary pads and a piece of soap. The kit was offered to pregnant women during antenatal and community outreach visits, which makes the distribution strategy more extensive, compared to our approach.

On the other hand, the baby kits were intended to encourage the use of health facility delivery services by reducing costs related to newborn care. Each baby kit consisted of a plastic basin, a bar of soap, a polythene bag, 1/2 kg of sugar, and a piece of cotton cloth for wrapping the baby. The baby-kit intervention was implemented at Ngai HC III, the only health facility in Ngai sub-county. All pregnant women who delivered at that health centre received baby kits before being discharged.

The project staff visited the intervention facilities monthly to monitor progress, collect the receipts for the vouchers and baby kits, replenish stocks and ensure accountability. Local radio messages and several stakeholder meetings were used to sensitise and mobilise the target communities for the interventions. In addition, the VHTs, community resource persons, and health facilities worked together to raise awareness about the availability of the incentives and how women could access them.

Study outcomes and cost metrics

The study outcomes included the service coverage of institutional deliveries, four ANC visits, a minimum of one PNC visit, and the proportion of women 'bypassing' local health facilities. Institutional delivery was defined as childbirth in a health facility. ANC was defined as the receipt of pregnancy care from skilled providers, while PNC was defined as care at a health facility after childbirth regardless of the place of delivery. Data on these outcomes were extracted from the ANC, delivery, and PNC registers using a standard form designed specifically for this study's data collection procedures. The form captured monthly summary data on the numbers of ANC visits, institutional deliveries, PNC visits, and referrals all disaggregated by health facility catchment areas. Baseline and endline data were collected throughout 2013 and 2014, respectively. Data on the number of outpatient visits at each participating health facility during these reference periods were also collected.

We calculated costs from the perspective of CUAMM, as the funder of and partner with the district in implementing the interventions. Thus, we did not consider the costs incurred by the users. Data on costs were obtained from the project's accounting and administrative records for the period January to December 2014. The costs included the values of direct inputs for both intervention arms. This consisted of the cost of each of the items in a baby kit, multiplied by the number of kits distributed, and the total cost of the transport vouchers distributed. Additionally, the costs included labour costs, training costs, sensitisation costs, and administrative support services, notably, the cost of transport for distributing the items and the printing services needed for transport vouchers and receipt books for baby kits. We calculated labour costs by multiplying the number of days in a week spent by drivers and social workers involved in handling vouchers and baby kits by their respective daily net salaries and then annualised the resulting amount. We conducted one joint project start-up training for two staffs from each intervention health facility. Consequently, we allocated training costs in proportion to the number of staff trained for each intervention. We also shared administrative support services costs between the two intervention arms based on the ratio of the institutional deliveries in 2014. Research costs were not included. The costs were handled in Ugandan Shillings (UGX), but for this analysis, we expressed them in US dollars (1 US$ = 2598 UGX as of June 2014) [51]. Details about the cost items are shown in Additional file 1.

Data analysis

Analysis of outcomes

We calculated the service coverage of the four ANC visits, institutional deliveries and PNC as the number of pregnant women who utilised the facility for each of these services in a 12-month period, divided by the annual number of deliveries expected in the area. We performed these calculations separately for baseline and endline data. We estimated the expected number of deliveries by multiplying the crude birth rate for each year by the health facility's catchment population for the respective year based on official government data. Based on World Bank statistics, we used a crude birth rate (per 1000 population) of 43.5 for 2013 and 43.00 for 2014 [52]. We included women from the study area who had been transferred to other catchment areas for further care in the calculation. For each outcome, we calculated the 'bypass' percentage as the proportion of all users from outside the catchment areas of the study's health facilities. We did not consider women from the study's catchment areas who might have utilised services in health centres that were not participating in the study.

We performed difference in differences (DID) analyses to estimate the effect of the interventions on each of the outcomes [53]. We calculated the DID estimate of the intervention using the equation: $(Y_{I2}-Y_{I1})-(Y_{c2}-Y_{c1})$, whereby Y_{I2} is the endline value of a given outcome indicator in the intervention group, Y_{I1} is the baseline value of this indicator in the intervention group, Y_{c2} is the endline value of the indicator in the control group, and Y_{c1} is the baseline value of the indicator in the control group. The DID estimate is thus, the difference in changes over time in the outcomes between the intervention and control groups. Except for the baby-kit and transport-voucher schemes, the health system strengthening programme mentioned above was implemented equally in the control and intervention areas of study. Therefore, any differences in the outcomes between the control and intervention groups can be attributed to the interventions.

Analysis of financial costs

The analysis separately compared the two interventions: the transport-voucher system and provision of baby-kit as described in the Methods, to no intervention (the respective control arms). We used institutional deliveries

as the main outcome of interest for the cost analysis, and performed a descriptive analysis of the costs for each intervention. Thereafter, we divided the number of institutional deliveries in 2014 in each intervention area by the cost of each intervention to obtain the cost per delivery. We also calculated the incremental cost of each intervention per delivery. To obtain the incremental number of deliveries, we used the formula for the DID analysis presented above, and based the calculations on absolute numbers instead of percentages. We then calculated the incremental cost per delivery by dividing the incremental number of institutional deliveries in each intervention area by the incremental cost of each intervention. All analyses were performed using Microsoft Excel 2010.

Results

Service utilisation

The distribution of women who delivered in the intervention and control facilities before, and during the interventions is presented in Table 2. More than 70% of the women who utilised ANC services and had institutional deliveries across the intervention and control facilities, were from the catchment areas of the respective health facilities. We observed similar results concerning PNC, except that the figure was just below 70% at the control health facility for the transport-voucher intervention. The number of clients attending the four ANC visits increased across all the study health facilities after the start of the interventions. In the transport-voucher intervention, the number of institutional deliveries increased at both the intervention and control facilities, although the former showed a greater increase. For the baby kit, the number of deliveries decreased at the control health facility but increased at the intervention facility. The number of postnatal visits rose sharply at all the study health facilities, except the control health facility for the transport-voucher intervention. The trends in the number of ANC visits, institutional deliveries, and PNC visits are presented in Figs. 1 and 2.

Effect of the interventions on service utilisation

According to the DID analysis, 30.0% of the expected deliveries that occurred in the catchment area of the baby-kit intervention was associated with the offer of a baby kit (Table 3). This intervention had a negligible effect on the four ANC visits and PNC. On the other hand, the transport vouchers had strong positive effects on the utilisation of all three maternal health services (Table 4). The service coverage of the four ANC visits, institutional deliveries, and PNC in the intervention catchment areas, attributable to the transport vouchers were 60.0%, 42.9%, and 49.2%, respectively.

'Bypassing'

The proportion of women receiving maternal health services at the intervention health facilities, who were not from the facilities' catchment areas ('bypassers'), reduced

Table 2 Maternal health services and outpatients' department users before and during the interventions, Oyam District, 2013–2014

Indicator	Baby kits n (%)				Transport vouchers n (%)			
	Control (Agulurude HC III)		Intervention (Ngai HC III)		Control (Amwa HC II)		Intervention (Atipe + Alao HC IIs)	
	2013	2014	2013	2014	2013	2014	2013	2014
Catchment population	21,832	29,375	24,959	33,582	8649	11,637	25,878	26,235
No. of expected deliveries	950	1263	1086	1444	376	500	1126	1128
Four ANC visits								
n (%) from catchment area	284 (77.0)	525 (72.6)	235 (78.3)	519 (90.4)	152 (70.7)	220 (75.6)	125 (92.6)	738 (89.5)
n (%) bypassing	85 (23.0)	198 (27.4)	65 (21.7)	55 (9.6)	63 (29.3)	71 (24.4)	10 (7.4)	87 (10.5)
Total four ANC visits	369	723	300	574	215	291	135	825
Institutional delivery								
n (%) from catchment area	675 (79.4)	646 (72.2)	407 (80.4)	734 (87.6)	130 (77.8)	249 (81.4)	224 (98.2)	811 (89.9)
n (%) bypassing	175 (20.6)	249 (27.8)	99 (19.6)	104 (12.4)	37 (22.2)	57 (18.6)	4 (1.8)	91 (10.1)
Total deliveries	850	895	506	838	167	306	228	902
PNC visits								
n (%) from catchment area	61 (83.6)	307 (74.7)	29 (100)	348 (94.3)	33 (68.8)	43 (69.4)	7 (100)	520 (93.4)
n (%) bypassing	12 (16.4)	104 (25.3)	0 (0)	21 (5.7)	15 (31.2)	19 (30.6)	0 (0)	37 (6.6)
Total PNC	73	411	29	369	48	62	7	557
Total OPD attendance[a]	20,751	18,607	20,809	17,976	6834	6203	17,169	14,483

OPD Outpatients' department, *ANC* Antenatal care, *PNC* Postnatal care. [a]OPD attendance is largely driven by malaria in the district. In 2014, there was a district-wide distribution of insecticide-treated bed nets and indoors residual spraying for malaria control, which explain the drop from the 2013 figures

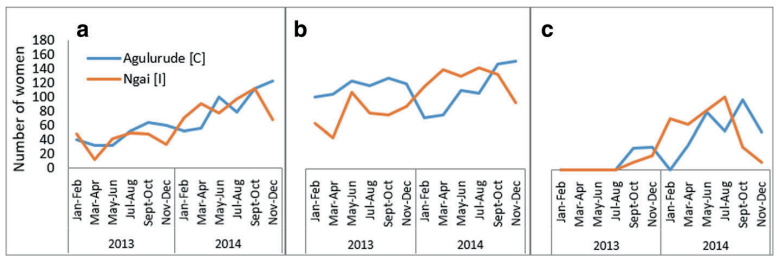

Fig. 1 Utilisation of antenatal care (**a**), institutional delivery care (**b**), and postnatal care (**c**) services at baseline and during the baby-kit intervention. The blue line represents the control health centre and the orange line represents the intervention health centre

at the health centre that distributed the baby kit, but increased at those that distributed the transport vouchers (Table 5).

Referrals from lower level health facilities to Anyeke HC IV and Aber hospital

The analysis showed that the interventions increased the proportion of pregnancy and labour-related referrals (i.e. women transferred from study health centres to the district's referral facilities for further management) by 36.8% (Additional file 2).

Financial costs of the interventions

Table 6 shows the descriptive analysis of the cost of each intervention per unit institutional delivery, and the incremental cost of each intervention per unit institutional delivery. Direct costs accounted for 57.6% and 65.4% of the total cost in the baby kit and transport voucher arms, respectively. The number of institutional deliveries attributable to the transport vouchers and baby kits were 535 and 287, respectively. The total cost of implementing the transport-voucher system was US$8478.3; whereas it costed the project US$8774.4 to provide baby kits. Hence, the cost per unit institutional delivery was US$10.5 and US$ 9.4 in the baby kit and voucher arms, respectively. The incremental cost per unit increment in the institutional delivery due to the transport-voucher system was US$15.9; the cost for the baby kit was US$30.6.

Discussion

We found that the baby-kit and the transport-voucher schemes markedly increased the service coverage of institutional deliveries at the intervention facilities over the relatively short study period. The DID analysis indicated that 30.0% of the deliveries at Ngai HC III during the intervention period were attributable to the provision of the baby kit. Ngai HC III is the only HC in Ngai sub-county. This element, combined with the HC's proximity for the women living in the Ngai sub-county and with the baby- kit intervention, could indeed build up to a motivational effect for mothers to deliver at the facility.

The transport vouchers had a greater effect (42.9%) on the coverage of institutional deliveries when we compared the two interventions. This is a surprising finding, given that the transport vouchers were implemented at HC IIs, which have less technical capacity to conduct deliveries and that are considered to offer health services of poorer quality. Nonetheless, we believe that a combination of health system strengthening efforts with the introduction of transport vouchers may have led to

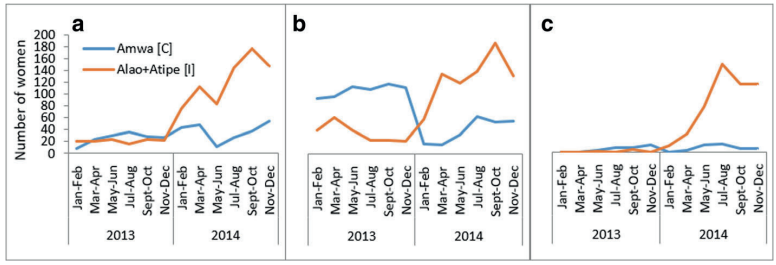

Fig. 2 Utilisation of antenatal care (**a**), institutional delivery care (**b**) and postnatal care (**c**) services at baseline and during the transport-voucher intervention. The blue line represents the control health centre and the orange line represents the intervention health centres

Table 3 Effect of baby kit on the utilisation of maternal health services, Oyam District, 2013–2014

Outcome	Control (Agulurude HC III) % coverage			Intervention (Ngai HC III) % coverage			DID %
	2013	2014	Difference	2013	2014	Difference	
ANC 4	38.9	57.2	18.3	27.6	39.7	12.1	−6.2
Delivery	89.5	70.9	−18.6	46.6	58.0	11.4	30.0
PNC	7.7	32.5	24.8	2.7	25.6	22.9	−2.0

ANC Antenatal care, *PNC* Postnatal care, *DID* Difference in differences (analysis). Service coverage was calculated using the information in Table 2. For instance, institutional delivery coverage in 2013 in the control group was obtained by dividing the total number of institutional deliveries in 2013 by the expected number of deliveries in the reference area in 2013
i.e. 850/950*100 = 89.5%

positive synergies in terms of facilitating institutional deliveries.

Similarly, the service coverage of four ANC visits and at least one PNC visit increased during the interventions, with the transport vouchers demonstrating greater effect. Essentially, these outcomes are repetitive health-seeking activities that require improved access to promote utilisation. Our findings, therefore, suggest improved access to, and use of these services over time. The trends in ANC, delivery, and PNC services use by the mothers were pronounced between the transport-voucher facilities compared to their control facility than between the baby-kit and its control facility (figs. 1 and 2). Indeed, ample published literature demonstrates that the vouchers improved service utilisation and health outcomes among the target populations [54]. The demand-side financing intervention using vouchers has been associated with increased use of ANC, institutional deliveries, PNC, and reduced inequities in institutional deliveries in Pakistan [55, 56]. A study in Kenya found that some of the women who purchased vouchers meant to cover direct healthcare costs (service vouchers), did not use them because of high transport costs to the health facilities [57].

Table 4 Effect of transport vouchers on the utilisation of maternal health services, Oyam District, 2013–2014

Outcome	Control (Amwa HC II) % coverage			Intervention (Atipe HC II + Alao HC II) % coverage			DID %
	2013	2014	Difference	2013	2014	Difference	
ANC 4	57.1	58.2	1.1	12.0	73.1	61.1	60.0
Delivery	44.4	61.2	16.8	20.3	80.0	59.7	42.9
PNC	12.8	12.4	−0.4	0.6	49.4	48.8	49.2

ANC Antenatal care, *PNC* Postnatal care, *DID* Difference in differences (analysis). Service coverage was calculated using the information in Table 2. For instance, PNC coverage in 2013 in the control group was obtained by dividing the total number of women who received PNC in 2013 by the expected number of deliveries in the reference area in 2013
i.e. 48/376*100 = 12.8%

We also found that the level of 'bypassing' increased considerably during the study period, and it was transport-voucher-related, mainly. Although several factors may explain this finding, the unequal distribution of health facilities and the low quality of services provided by many of the facilities in the district, remain key in promoting "bypassing." A previous study conducted in the district, and others performed elsewhere demonstrate that distance, perceived quality of care, and affordability are principal determinants of utilisation of delivery services, among others [17, 24, 58]. Hence, it is highly likely that the transport vouchers removed major barriers, particularly, distance and transport costs and encouraged pregnant women to use the facilities of their choice for maternal health services. Indeed, the DID analysis showed that the transport vouchers promoted 'bypassing' which in turn moderately improved service coverage in the transport voucher areas.

As illustrated above, the baby kits and factors such as proximity and a relatively higher quality of services may have attracted women from Ngai sub-county and some nearby villages to deliver at Ngai HC III, where the baby kits were implemented. Logically, the above scenario could encourage 'bypassing' from neighbouring communities to some extent. Notwithstanding, for women living in distant communities, the baby kits and the perceived quality of services did not appear to have had any effects on the barriers posed by long distances and the costs of transport to the centre, when compared with the effects of the transport vouchers.

Approximately 37% of the increase in pregnancy and labour-related referrals to a higher level of care was attributable to the interventions. The referrals were predominantly to Anyeke HC IV and Aber Hospital. As shown earlier, the overall facility utilisation increased with the interventions; thus, the increase in referrals might reflect the increase in the proportion of women with complications or at risk of developing complications. Considering that over 70% of the health facilities in the district are HC IIs without adequate capacities to manage complications related to pregnancy and labour, the increase in referrals is consistent with expectation. A recent study reported that although Anyeke HC IV plays a vital role in managing obstetric emergencies, only Aber Hospital has the capacity to perform all comprehensive and basic EmONC functions within the district's health system [23]. This calls for an effective referral system that ensures a reliable and timely transfer of patients from lower level health facilities to referral centres. We believe that by strengthening the referral system through effective and free ambulance services, and free caesarean sections at Anyeke HC IV and Aber Hospital, the incentive schemes may have indirectly promoted women's access to and use of skilled attendants during deliveries in the district [9, 27].

Table 5 Maternal health services and 'bypassing' analysis, Oyam District, 2013–2014

Outcome	Control			Intervention			DID (%)
	2013	2014	Difference	2013	2014	Difference	
Baby kits intervention							
Four ANC visits bypass	23.0	27.4	4.4	21.7	9.6	−12.1	−16.5
Delivery bypass	20.6	27.8	7.2	19.6	12.4	−7.2	−14.4
PNC bypass	16.4	25.3	8.9	0.0	5.7	5.7	−3.2
Transport vouchers							
Four ANC visits bypass	29.3	24.4	−4.9	7.4	10.5	3.1	8.0
Delivery bypass	22.2	18.6	−3.5	1.8	10.1	8.3	11.8
PNC bypass	31.3	30.6	−0.6	0.0	6.6	6.6	7.2

ANC Antenatal care, *PNC* Postnatal care, *DID* Difference in differences (analysis). The percentages of women 'bypassing' are from Table 2

Of note, our interventions also resulted in unintended but largely positive effects that were predominantly associated with the transport-voucher system. From our experience, the transport-voucher system was a new concept in the district, as such it triggered excitement, and encouraged participation with the potential for some people to make small economic gains. As an illustration, some VHTs and family members or friends who owned bicycles and or motorbikes, used their knowledge of the context to sensitise households and community members about the intervention while advertising themselves as transporters.

Studies report that male involvement in maternal and newborn health services is low in Uganda [59–61]. Nevertheless, as news of the transport-voucher intervention spread through communities, some husbands and partners began to transport their spouses to the health facilities to redeem the transport vouchers. Based on the accounts of midwives and nurses responsible for the study facilities, many of the transporters were either husbands or partners of the pregnant women, who used the facilities during the intervention period. While at the health facilities, the health workers engaged most men in discussions about maternal, newborn, and reproductive health issues. Consequently, the transport vouchers seemed to have generated interest in some segments of the communities in the district, and indirectly promoted male involvement in maternal and newborn health services, to some extent. Pariyo et al. [62] reported some of these unintended effects. That study also elaborated on the potential risks and the need to enforce traffic regulations and safety precautions when using local transport mechanisms (e.g. bicycles and motorbikes) to promote maternal and newborn health services in rural settings.

Financial costs of the interventions

The cost analysis revealed that it cost US$15.9 and US$30.6 for every additional institutional delivery attributable to the transport-voucher and baby-kit schemes, respectively. Our results imply that providing transport vouchers is less costly than baby kits in facilitating institutional deliveries. The baby kit probably has less scope for usage (reducing costs related to newborn care while encouraging facility deliveries) than the transport-

Table 6 Analysis of costs and incremental unit costs associated with the interventions, Oyam District, 2013–2014

	Baby kits			Transport vouchers		
No. of deliveries	838			902		
No. of deliveries attributable to intervention (DID estimate)	287			535		
COSTS	UGX	US$	% of cost	UGX	US$	% cost
Direct costs	13,119,500	5049.85	57.6	14,404,000	5544.26	65.4
Sensitisation costs	3,804,713	1464.48	16.7	4,095,287	1576.32	18.6
Training costs	183,333	70.57	0.8	366,667	141.13	1.7
Labour costs	5,139,168	1978.12	22.5	2,569,584	989.06	11.7
Shared administrative support services	549,034	211.33	2.4	590,966	227.47	2.7
Total costs	22,795,748	8774.35	100.0	22,026,504	8478.25	100.0
Cost of intervention per delivery	27,203	10.47		24,420	9.40	
Incremental cost of intervention per delivery	79,427.69	30.57		41,171.03	15.85	

UGX Ugandan Shillings, *US* United States Dollar

voucher scheme, which facilitates the use of the institutional delivery system by addressing major barriers (distance and transport costs), to accessing facility-based services. Since health services are predominantly facility-based, and majority of the district's population live beyond 5 km of a health facility, the transport-voucher scheme translated into having a wider impact on the study's outcomes.

The two incentive schemes were implemented simultaneously to improve access to and use of maternal and newborn healthcare services in the district. The resultant effects were notable and indicated which intervention to prioritise in the event of budgetary constraints.

As of yet, there are few publications on the cost-analysis of transport vouchers and hardly any research literature on baby kits, which makes this study a significant contribution to the literature. Moreover, regardless of the lack of comparable literature, in a setting where more than half of the population lives below the poverty level [20], our interventions may not be affordable or sustainable without substantially more public-health funding from the government and development or implementing partners.

Study limitations

We acknowledge several limitations to our study that we think might be related to the setting and methodological challenges posed by implementing a study within a larger programme. The control and intervention groups were not randomly selected, which could lead to possible biases. As described in the Methods, the intervention facilities were purposively selected based on their poor performance to improve the maternal and newborn health services in the affected sub-counties. Nonetheless, their controls were comparable. Furthermore, the use of aggregated health-facility data did not allow the use of statistical analyses to adjust for confounders and to account for uncertainty in our estimates by calculating 95% confidence intervals. We are, however, confident that the DID analysis enabled us to demonstrate the effects of the interventions on the study outcomes, given the limitations.

We think that some deliveries that could be attributed to the interventions, particularly the transport vouchers, may have occurred at health facilities outside our study catchment areas. As such, those deliveries were not included in the analysis according to our study design. This means that we might not have captured the full effects of the interventions regarding institutional deliveries.

Likewise, the cost analysis did not capture the effects of the interventions on other services, such as changes in the uptake of ANC and PNC services. Consequently, the analysis probably underestimated the full effects of each intervention.

The district-wide measures to strengthen the health system were congruent with the need for a stronger health system to implement the interventions and achieve the study outcomes [63, 64]. Notwithstanding, some of the measures might have resulted in synergies that are desirable; yet, they might also confound some of the effects of the interventions, especially the effects on referrals and 'bypassing'.

The overlap of the catchment areas of the health facilities or the boundaries of the study's sub-counties could have led to over or underestimation of the calculated percentage of 'bypassing'. Although we made efforts to minimise this phenomenon, the quest for better quality of care and affordable services might have been a distraction from some of those efforts. Considering these methodological challenges, we urge caution in interpreting our findings. Additionally, we think that a qualitative study on these interventions could complement our findings.

We also recognise that this study was conducted in a rural post-conflict district in northern Uganda, where the context might not permit generalisation of our findings to other settings. Despite the limitations, we firmly believe that our findings remain valid as well as relevant.

Conclusions

Implementation of a transport voucher scheme in Oyam District effectively increased the utilisation of ANC, institutional childbirth, and PNC services whereas the baby-kit scheme increased utilisation of institutional delivery. Both interventions had a positive effect on referrals. 'Bypassing' increased and it was essentially transport voucher-related.

The transport-voucher system was less costly than providing baby kits in facilitating institutional deliveries. The finding that the provision of transport vouchers was less costly and had a wider influence, including unintended but largely positive effects suggests that in the event of budgetary constraints, the preference would be to use the transport-voucher system. We believe these incentives can be sustainable if the Ministry of Health budgets for and integrates them in the health system, especially in underserved areas.

Additional files

Additional file 1: Details of cost items analysed. This table shows the different cost items analysed for the transport voucher and baby-kit schemes. (DOCX 14 kb)

Additional file 2: Number of pregnancy and labour-related referrals. This table shows the number of women referred from the intervention and control health facilities to the hospital or the Health Centre IV. (DOCX 14 kb)

Abbreviations
ANC: Antenatal care; DID: Difference in differences; EmONC: Emergency obstetric and neonatal care; HC: Health centre; HSD: Health sub-district; MDGs: Millennium development goals; MMR: Maternal mortality ratio; NGO: Non-governmental organisation; OPD: Out patients' department; PNC: Postnatal care; PNFP: Private not-for-profit; SSA: Sub-Saharan Africa; VHT: Village health team

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Availability of data and materials
All data generated or analysed during this study are included in this published article.

Authors' contributions
CW conceived and designed the study, analysed the data, wrote the methods and results sections of the draft manuscript, and participated in the interpretation of the findings and revision of the manuscript. WM amended the study design, contributed to the implementation of the study and data collection, participated in the data analysis, drafted the manuscript, and participated in the interpretation of the findings and revision of the manuscript. MN contributed to the implementation of the study, data collection, initial data analysis, interpretation of the findings, and revision of the manuscript. ED and RKM implemented the study, supervised the data collection, contributed to the interpretation of findings and revision of the manuscript. CA contributed to the implementation of the study, provided data from the district health office, and participated in the editing of the manuscript and interpretation of findings. PL, GP, and BC contributed to the interpretation of the findings and revision of the manuscript. All authors read and approved the final version of the manuscript.

Ethics approval and consent to participate
The Lacor Hospital Institutional Research and Ethical Review Committee approved the study, and it was registered with the Uganda National Council for Science and Technology (Ref. #: SS 3542). Written participant consent was not a requirement of the Ethical Review Committee; hence the study was approved without written participant consent. In addition, we obtained permission from the district authorities to conduct the study. The analysis was based on routinely collected health-facility data that were aggregated by month, and hence, did not contain any personal identifiers.

Consent for publication
Not applicable.

Competing interests
We have no competing interests to declare.

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Minimum obstetric volume in low-income countries

PAPER

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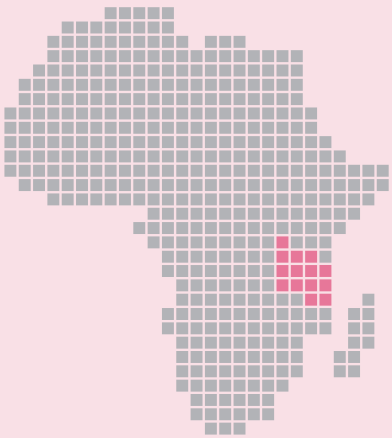

Abstract

In sub-Saharan Africa, primary health care facilities are essential for providing safe childbirth. However, the delivery volume in health facilities must be studied as an indicator of the effectiveness of primary care. Evidence indicates improved neonatal survival and fewer complications in facilities with higher delivery volumes.

In Tanzania there is an apparent paradox in an "excess" of delivery sites as 51.8% of rural institutional deliveries in Tanzania take place in primary health-care facilities. This excellent coverage risks being an obstacle to service quality: the volume of annual deliveries is too low, which prevents the few available workers to develop experience.

A possible solution may be centralizing the health system's organization, reducing the number of rural delivery sites while maintaining accessibility to mothers in remote areas. This solution could help increase service quality, but any change should undergo evaluation and trials before being implemented.

Correspondence

effectively removes accountability for the primary actors in the SDGs. Governments will need to lead the charge toward SDG achievement by ensuring universal access for their populations to reproductive health care, family planning, preventive care and treatment, as well as ensuring gender equity, education, and economic opportunity[5]. Only national, subnational, or individual level targets will ensure accountability for these actions to make certain that no one is left behind.

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See Online for appendix

Minimum obstetric volume in low-income countries

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Quality, respectful childbirth care is advocated both for mothers and their babies' health and as a fundamental right.[1] Childbirth care organisation varies widely across countries in sub-Saharan Africa,[1] with no superior organisation pattern in low-income countries.

We believe a piece of the puzzle is missing. The effect of delivery volumes on outcomes has been studied only in high-income settings. Evidence indicates improved neonatal survival and fewer complications in facilities with higher delivery volumes.[2] Although uncertainties on thresholds and balance between caseload and distance remain, delivery care has been progressively centralised in these contexts. What is best in low-income countries where childbirth assistance is part of primary care? Tanzania is paradigmatic as it has been at the forefront in rolling out primary health care. 51·8% of rural institutional deliveries in Tanzania take place in primary health-care facilities.[3] There is a knowledge gap on optimal delivery volumes in first-line facilities for patient safety, skills retention, and economies of scale, which is crucial, as this health-system component primarily serves the marginalised, rural poor.[4]

Reducing the number of rural delivery sites might be feasible without compromising geographical accessibility,[5] but stronger evidence is needed to support such a policy shift. As distance has an effect on maternal survival due to access barriers,[6] any policy change must be evidence-based. A balance between adequate volumes to ensure quality and walking distance to facilities will contribute to grant a human right to those who need it most.

We declare no competing interests.

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Progress and challenges to introduce midwifery education in Nepal

Marjorie Koblinsky and colleagues must be commended as they remind us that optimisation of the health workforce remains an important strategy to reach quality maternity care "for every woman, everywhere" (Nov 5, p 2307).[1]

Nepal—a country where four women die each day of pregnancy-related causes[2] (appendix)—has no professional midwives.[3] In 2014, only 55·6% of women were attended by skilled birth attendants (SBAs) at birth, with wide inequalities between the poorest (25·5%) and wealthiest (93·3%) quintiles.[4] These SBAs are only given two months' training on core maternal and newborn skills.

To date, around 7000 auxiliary nurse-midwives, nurses, and doctors are trained to be SBAs through an in-service education curriculum introduced in 2007 (for a current projected population of 28·4 million). More importantly, a plan is in place to finally initiate a 3-year Bachelor of Midwifery programme in three universities with the support of the Ministry of Health and a number of development partners, including the UN Population Fund, WHO, and Deutsche Gesellschaft fuer internationale Zusammenarbeit. A curriculum meeting the global standards of competencies was developed by the universities and submitted to the Nepal Nursing Council for endorsement.

Barriers to utilisation of antenatal care services in South Sudan: a qualitative study in Rumbek North County

PAPER

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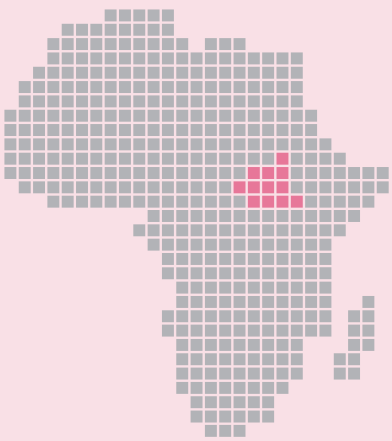

Abstract

Access to adequate antenatal care (ANC) is critical to ensure good maternal health and to prevent maternal and neonatal morbidity and mortality. South Sudan has one of the world's poorest health indicators due to a fragile health system and a combination of socio-cultural, economic, and political factors that prevent access to care.

This qualitative study was conducted to identify barriers to the utilization of ANC services in Rumbek North County in South Sudan. Data were collected through 14 focus group discussions with 169 women and 45 men and 12 key informant interviews with community leaders, staff working in health facilities, and the staff of the County Health Department.

This study identified a myriad of factors deeply entrenched in the society, which impede women from utilizing ANC services. These included long distance to health facilities, lack of means of transportation to them, floods and poor roads, and demand for payment for health care at some health facilities; the negative influence of husbands who were reluctant to allow their wives to attend ANC, low perceived risk of pregnancy-related complications, and distrust of the quality of care and the efficacy of medical treatment.

These barriers should be considered in the new service planning implemented in the county to tangibly improve care and access to safe childbirth.

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Barriers to utilisation of antenatal care services in South Sudan: a qualitative study in Rumbek North County

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Abstract

Background: Access to adequate antenatal care (ANC) is critical in ensuring a good maternal health and in preventing maternal and neonatal morbidity and mortality. South Sudan has one of the world's poorest health indicators due to a fragile health system and a combination of socio-cultural, economic, and political factors. This study was conducted to identify barriers to utilisation of ANC services in Rumbek North County.

Methods: Using a qualitative design, data were collected through 14 focus group discussions with 169 women and 45 men and 12 key informant interviews with community leaders, staff working in health facilities, and the staff of the County Health Department. Data were analysed using inductive content analysis.

Results: The perceived barriers to ANC utilisation were categorised as follows: 1) Issues related to access to health facilities and lack of resources. These included long distance to health facilities, lack of means of transportation to the health facilities, floods and poor roads, and demand for payment for health care at some health facilities; 2) The influence of the socio-cultural context and conflict including heavy burden of domestic chores, the negative influence of husbands who were reluctant to allow their wives to attend ANC, and insecurity; 3) Perceptions about pregnancy including misperceptions about the benefits of ANC and low perceived risk of pregnancy-related complications; and 4) Perceptions about the quality of care and the efficacy of medical treatment.

Conclusions: This study identified a myriad of factors deeply entrenched in the society, which prevent women from utilising ANC services. It also elicits broad aspects of interconnectedness among the barriers. To ensure effectiveness, strategies to improve utilisation of ANC in the study area and in similar contexts need to take into account the barriers identified by this study.

Keywords: Maternal health, Reproductive health, Pregnancy, Fragile states, Post-conflict settings

Plain English summary

This study was conducted to identify the reasons why pregnant women in Rumbek North do not attend clinics for health check-ups and care during pregnancy. Data were collected through 14 group discussions with women and men separately and 12 one-on-one interviews with community leaders, staff working in health facilities, and the staff of the Rumbek North County Health Department. The reasons why pregnant women were not attending clinics included long distance to health facilities, lack of transport means, flooding and poor roads, demand for payment at health facilities, heavy burden of domestic work among women, the negative influence of husbands who were reluctant to allow their wives to attend ANC over such concerns as the safety of the woman and of the children left at home, insecurity, feelings about the benefit of care during pregnancy and of the danger of health problems during pregnancy, and the views about the quality of care and

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the benefit of medical treatment. In order to succeed, strategies to improve utilisation of clinics for care during pregnancy in Rumbek North should address the issues identified in this study.

Background

Maternal health remains one of the unmet challenges on the global development agenda [1]. Access to adequate antenatal care (ANC) is critical in ensuring a good maternal health and in preventing neonatal morbidity and mortality [2]. The World Health Organization (WHO) currently recommends a minimum of eight ANC visits instead of the previously recommended minimum four visits [3]. South Sudan, the world's youngest nation, is plagued by a myriad of challenges including a fragile health system, which has been aggravated by decades of armed conflict, resulting in a poor health status of the population. According to the 2010 Sudan Household Survey (SHHS), only 40.3% of pregnant women received any ANC by a skilled provider [4]. The determinants of ANC services utilisation in the country are still poorly understood. So far, only one published study, based on data from the 2010 SHHS, has attempted to explore the factors associated with non-use of ANC [5]. More information is needed for evidence-based planning of ANC service delivery in this context.

The Government of South Sudan has launched various policies and strategies to address the health system challenges faced by the new nation. The Health Sector Development Plan (HSDP) 2012–2016 aimed to "contribute to the reduction of maternal and infant mortality and improve the overall health status and quality of life of the South Sudanese population" [6]. One of the objectives of the HSDP was to increase the utilisation and quality of health services with an emphasis on maternal and child health. To operationalise the HSDP, the government defined a Basic Package of Health and Nutrition Services (BPHNS), which contains a set of interventions aimed to reduce morbidity and mortality in South Sudan [7]. These interventions are grouped into four categories. The first one is "Integrated Reproductive Health Care", which includes essential obstetric care as one of its components. The BPHNS further lists the services to be provided at each level of the health system together with the required human and material resources. Although South Sudan has subsequently released a number of health policy documents, the BPHNS remains the basic framework for health service provision in the country. Despite the government's efforts, the health system in South Sudan is still faced with many problems such as lack of human resources, poor infrastructure, shortage of drugs and supplies, and weak management [8]. To mitigate some of these challenges, the government works with non-governmental organisations, based on the "contracting out" model [9], to provide primary health services in the country [6]. From 2013, the Ministry of Health (MoH) in Rumbek North County started to partner with Doctors with Africa CUAMM (hereafter CUAMM) to implement a comprehensive primary health care project. The project began by re-activating health facilities which had been closed or were partially functioning due to lack of staff, equipment, and supplies. The reactivation involved infrastructural renovations; staff recruitment, on-the-job training and supervision; and provision of equipment, drugs and supplies.

Routine data collected by the MoH in the county showed that, in 2014, 54.8% of pregnant women received any ANC, 11.3% attended four or more ANC visits and 1.7% delivered in a health facility. To design a strategy to improve maternal health services delivery in the county, we conducted a study to understand the barriers to utilisation maternal health services (ANC and childbirth). The findings on the barriers to utilisation of childbirth services have been reported elsewhere [10]. In this paper, we report the findings of a qualitative study designed to elicit the barriers to utilisation of ANC services.

Methods

This study is reported per the consolidated criteria for reporting qualitative research (COREQ) [11]. The detailed methodology (including the COREQ checklist) has been described elsewhere [10]; below is a summary.

Study area

This study was conducted in Rumbek North County, which in 2015 had a population of 59,740 inhabitants [12], and was divided into six *payams* (sub-county units): Alor, Malueth, Mayen, Madol, Maper and Wunrieng. The county's population is semi-nomadic and pastoralism is the main economic activity. In 2015, the county had one Primary Health Care Centre (PHCC) located in Maper, and seven Primary Health Care Units (PHCUs). Each one of the PHCUs was run by one community health worker (CHW), one traditional birth attendant (TBA), and one drug dispenser. The PHCC had three expatriate professional health workers: a nurse, a midwife, and a clinical officer. In South Sudan, PHCUs and PHCCs are, respectively, the lowest- and second lowest-level health facilities of the health system. These health facilities are mandated to provide ANC services [7]. Each PHCU is supposed to be staffed by two CHWs and a community midwife while a PHCC is supposed to have one clinical officer, three professional nurses, two midwives, three CHWs, and lower cadre staff [7]. At the time of this study, a complete package of ANC services, apart from laboratory tests, was being provided daily at the PHCC and at four PHCUs and

through scheduled outreaches at the rest of the PHCUs. In South Sudan, the ANC package at PHCUs and PHCCs includes identification of pregnant women and rising awareness on early initiation and compliance with ANC, provision of services for prevention of mother to child transmission of HIV, prevention and treatment of sexually transmitted infections, nutrition counselling and micronutrient supplementation, malaria prevention interventions, identification and referral of women at high risk, and monthly outreach clinics [7].

Design, sampling, and participants

This qualitative study collected data through focus group discussions (FGDs) in eight randomly selected villages and through key informant interviews (KIIs). Villages in the county were stratified by *payam* and randomly selected as follows: two villages from each of Malueth and Mayen *payams* (the most populous) and one from each of Madol, Alor, Maper and Wunrieng. In each village, one FGD was conducted with women aged 18 years and above who had delivered in the preceding 12 months and were usual residents in the county. Additionally, in a random sub-sample of half of the villages, husbands of women who delivered in the preceding 12 months were recruited to participate in men's FGDs. Two extra FGDs with women were conducted in one cattle camp. In each selected village, CHWs invited 12 eligible participants to take part in the FGDs and all those who turned up were included. KIIs were conducted with a purposive sample of CHWs in the PHCC and PHCUs, community leaders, and staff of the County Health Department (CHD). The choice of the number and type of participants to be enrolled in this study depended on the extent to which they could contribute to providing relevant information in response to the research questions [13].

Data collection

FGDs and KIIs were conducted in March 2015 utilising open-ended pretested question guides. Each FGD was conducted by two Dinka-speaking facilitators who were previously unknown to participants. The facilitators were of the same gender as participants, had at least high school-level education, and were conversant with the local language and culture. One data collector facilitated the sessions while the other one managed audio recordings and took field notes. The data collectors were trained for 1 day and were supervised by one of the co-authors (CW) who is experienced in qualitative research. The FGDs were held in local church structures and under tree shades. KIIs took place at venues that were convenient to participants.

A total of 14 FGDs with 45 men (4 FGDs), 127 women in the villages (8 FGDs), and 42 women in cattle camps (2 FGDs) were conducted. The characteristics of FGD participants have been described previously [10]. In brief, the women FGD participants had a median age of 25 years. A majority had no education (96.7%); were married (92.6%); and had attended at least one ANC visit during their most recent pregnancy (67.5%). The median age of male FGD participants was 35 years and 71% of them had no formal education. Twelve KIIs were conducted with the following individuals: 3 community leaders, 3 PHCU staff, 4 PHCC staff, and 2 CHD staff. Women's FGDs had a median of 16 participants while men's FGDs had a median of 9 participants. There were no drop-outs during FGDs. All KIIs were conducted by one of the co-authors (CW) either directly in English (for CHWs and CHD staff) or through a translator (for community leaders). Both KIIs and FGDs were audio recorded. Each FGD session lasted for about one hour whilst each KII lasted for about 20 min. No repeat interviews were conducted.

Data analysis

Audio recordings in Dinka language were transcribed and translated into English by bilingual (Dinka and English) speakers while audio recordings of KIIs conducted in English were transcribed by CW. The transcripts were not returned to participants for review because of logistical constraints. The transcripts were then analysed using the inductive content analysis approach [14]. The analytic framework was adapted from a large systematic review [15]. Although the original framework is about barriers to childbirth service use, the themes were modified to apply to ANC use. Coding was done using NVivo 10 (QSR International, Melbourne, Australia). Information from KIIs was used to triangulate findings from FGDs. The data for each theme and subtheme were then pieced together to provide an overview of the content relating to that specific theme (charting). The four broad themes were: 1) access and resource availability, 2) influence of the sociocultural context and insecurity, 3) Perceptions of pregnancy, and 4) perceptions of the quality of care. Quotes were selected to represent a typical response or to illustrate a deviant opinion.

Results

Table 1 summarises the findings of the study. The perceived barriers to utilisation of ANC services in the county are described in detail below. FGD participants often used the word "hospital" to refer to any type of health facility.

A. Access and resource availability

Transportation/access

Transportation/access issues included long distance to health facilities, flooding and poor roads, and lack of transportation means. Long

Table 1 Barriers to utilisation of antenatal care in Rumbek North County, South Sudan

Barrier	Main findings
a. Access and resource availability	
1. Transportation/access	
1.1 Proximity of health facility	Long distance to heath facilities aggravated by sparsely distributed population settlements. A semi-nomadic lifestyle which increased the distance to health facilities. Some nearby PHCUs not providing ANC.
1.2 Transport means availability	Lack of commercial or private means of transportation.
1.3 Flooding and poor roads	Floods and mud during the wet season, inability to swim, parts of roads being washed away, inaccessibility of health facilities for delivery of drugs and supplies, bumpy roads which predisposed women to excessive shaking if travelling by car or motorbike.
2. Costs	Pregnant women being asked to pay money at some health facilities. Having been asked to pay for ANC in the past affecting current ANC service use. Transportation costs to health facilities.
b. Influence of sociocultural context and conflict	
1. Domestic chores of women	Lack of time to attend ANC due to the heavy burden of domestic work. Lack of someone to leave behind with children if a woman decides to visit a heath facility. Inability to arrive at the health facility on time due to domestic chores.
2. Influence of husbands/male partners	Men unwilling to pay for costs associated with visiting a health facility, men restricting their partners from attending ANC, lack of emotional support and encouragement from men, lack of interest in maternal health by men. Men perceive ANC attendance to be unnecessary because foremothers never used to attend ANC.
3. Insecurity	Frequent attacks by neighbouring tribes/clans. Constant fear of being attacked at any time by neighbouring tribe/clans. Women cannot leave children at home alone to attend ANC because of the insecurity. Husbands cannot allow their wives to attend ANC because of insecurity. Displacement after attacks exacerbated geographic inaccessibility.
c. Perceptions of pregnancy	
1. Perceived benefit	ANC perceived to be a new concept in the community, unfamiliarity with ANC and its significance, lack of prior contact with the formal heath system.
2. Perceived risk	Low-risk perception due to no prior pregnancy-related complications and trivialization of health problems during pregnancy. ANC attendance not viewed as a routine exercise but linked to pregnancy complications.
d. Perceived quality of care and efficacy of medical treatment	Dissatisfaction with ANC if medical treatment was not provided during the visit. Attendance of ANC influenced by whether the woman's symptoms were relieved by treatment received during previous ANC visit.

distance to health facilities was occasioned by the sparseness of the population settlements, nomadism in search for water and pasture, and the lack of enough facilities providing ANC in the county.

"Another reason why women don't attend ANC is the long distance from villages to health facilities. Some villages and payams have no health facilities and women are discouraged from visiting faraway health facilities." (Male FGD participant, Maper centre)

"Most of the ladies stay in cattle camps and are used to migrating every season to other areas. In the dry season, they have to go to a far place where there is water and during the rainy season, they move to a place where there are no mosquitoes because this place has a lot of mosquitoes if there is water." (KII, CHD staff)

Long distance and lack of means of transportation to health facilities aggravated the effect of the other barriers on ANC attendance (mentioned below). Women felt that if a health facility was near, they would attend ANC and return home quickly without having to worry about insecurity. Additionally, their husbands would be less likely to restrict them from attending ANC.

"It is mainly a matter of distance. If you bring a hospital near, our problems will be solved. We will not be worried about our children, husbands, and cattle." (Female FGD participant, Chatom village)

"Most of the time, we don't have transportation means to the hospital in Maper or Rumbek." (Female FGD participant, Wundhiot village)

Flooding during wet seasons prevented women from accessing health facilities as highlighted below:

"During the wet season, the land becomes flooded and the water can reach the shoulder level. If you are pregnant, you cannot swim in such a place, because your heart will get tired and your thighs will be exhausted." (Female FGD participant, Chatom Village)

Additionally, flooding prevented delivery of drugs and supplies to health facilities rendering them functionless. Floods washed away parts of the main road connecting Maper centre and Rumbek town causing serious logistical challenges.

"I did not go to the hospital because I was in the village and the land was flooded with water and there were no drugs that are usually given to pregnant women at the health facility." (Female FGD participant, Meen village)

There were also concerns about the excessive shaking that occurs when travelling by a motor vehicle on the rutted roads in the county.

"I did not go to the hospital in the past month because the roads were very bad. You can neither walk on foot nor use the car because they say that pregnant women are not supposed to get in the car if there is too much shaking due to bad roads." (Female FGD participant, Meen Village)

Costs
Both male and female FGD participants mentioned that women were discouraged from attending ANC because of being asked by health facility staff to pay money. It was unclear whether these payments were official or under-the-table payments. Participants, however, noted that this practice was not present at all health facilities, and was being encountered mainly at health facilities located in neighbouring counties.

"Some health facilities ask pregnant women to pay fees. This can discourage women from attending antenatal care because they don't have money." (Male FGD participant, Maper centre)

"I tried going to the health facility and I was told by the man I found there to bring money." (Female FGD participant, Madhol village).

The experience of having been asked to pay for ANC or for treatment during pregnancy was negatively affecting the current use of ANC services.

"In the past when people were being asked to pay money, we did not use to go to the hospital because we did not have money to carry with us. We did not even have one pound to buy soap, leave alone money to pay at the hospital. If a pregnant woman is asked to pay money every day she goes to the hospital, but she is very poor and cannot afford to pay, do you think she will go again?" (Female FGD participant, Maper centre)

Some women who had been asked to pay for services returned home and spread this message to their friends and relatives; discouraging more women from attending ANC.

"My sister went to the hospital and when she came back she told me that I should never go there if I did not have money." (Female FGD participant, Madhol village)

B. Influence of the sociocultural context and insecurity
Domestic chores of women
Women in Rumbek North bear a heavy burden of domestic chores. They were responsible for taking care of children, taking care of the house, and producing and preparing food for the family. Domestic chores increased substantially during planting, weeding and harvesting seasons when women were required to work on their farms besides attending to their families. A list of the duties of women and men in Rumbek North is presented in Additional file 1. Long distance to health facilities and insecurity worsened the problem of domestic chores. There was also the problem of lack of someone to take care of children at home if a woman wished to attend ANC.

"Sometimes we are preoccupied with work at home because we are the ones who are responsible for all the work and we have no time to visit the health facility, unless if it is near. The other reason is that there is nobody to leave our children at home with." (Female FGD participant, Achiek village)

Because of domestic chores, some women could not arrive at health facilities during the regular time of service delivery and there were concerns about being turned away for arriving too late at health facilities.

"Children cannot spend the whole day without eating. So you spend time cooking in the morning until the hospital visiting time is over. If you go to the hospital late, doctors will say that the time for registration is over. Therefore, women who work in the morning may not go to the hospital because

they can only arrive there late every day." (Female FGD participant, Maper centre)

Influence of male partners

Partners of pregnant women had a great influence on utilisation of ANC and other maternal health services in Rumbek North. Because men controlled the resources of the family, they were often unwilling to pay for the costs associated with health facility visits. Both male and female FGD participants mentioned that men were restricting their wives from attending ANC based on three main factors: 1) long distance to health facilities: men did not want their wives to travel to faraway health facilities leaving their homes and children unattended, 2) men did not want their wives to travel to health facilities because of insecurity, and 3) some men did not see the necessity of their wives attending ANC because their mothers never used to do so.

"Our husbands do not know the benefits of the hospital. They keep us at home saying that 'our mothers never used to go to the hospital and were giving birth to many children like me… Did I die? No, I am still alive. Why should you frequent the hospital?'" (Female FGD participant, Maper centre)

"Some women do not go to the hospital because their husbands do not allow them to." (Female FGD participant, Meen village)

Moreover, women felt that they were not getting the encouragement and support they needed during pregnancy and that men lacked interest in maternal health; leaving the burden of taking care of the pregnancy to women.

"Here if you are pregnant, men don't care. They just leave the pregnancy for you alone. They leave you for the rest of the pregnancy." (Female FGD participant, Madhol village)

Some men encouraged their wives to attend ANC. However, this was primarily driven by the need to have their wives get tested for any disease that would affect the foetus or just to check the status of the foetus. There was little concern about the health of the mother.

"Visiting the clinic during pregnancy is useful because it helps the pregnant woman and her husband to know the gender of the baby, the time of delivery and to determine whether she is carrying twins." (Male FGD participant, Meen village)

"Attending the hospital is for checking the foetus inside the woman's womb; that is to find out if the foetus is free from diseases or not. If the foetus has a disease, the hospital provides treatment." (Male FGD participant, Ror bar village)

Insecurity

Rumbek North is in a state of chronic insecurity and the inhabitants live in fear of being attacked at any time by the neighbouring communities. Although the county is known for frequent inter-clan feuds, the prevailing political and security situation in South Sudan had exacerbated the problem. Insecurity was widely cited as the reason behind poor ANC utilisation.

"The fighting is really affecting us; for example, now we have heard that people from the neighbouring clan have attacked Madhol village. Do you think that if a pregnant woman had planned to come today she will come? She will not come because of fighting. Many people are attacking our village every day and for that reason, we cannot go to a distant hospital…." (Female FGD participant, Maper centre)

C. Perceptions of pregnancy

Perceived benefit

ANC was perceived in the county to be a new concept. The population had lived for a long time without formal health care services and some women had never visited a health facility. Consequently, some women were not familiar with ANC and its significance.

"The reason why others don't go to the hospital is that the doctors have just come recently. Our villages have been in the forest all along. For example, Maper never had a hospital in the past. So many people don't know the goodness of the hospital and that is why they do not use it." (Female FGD participant, Chatom village)

"I have never gone to the hospital ever since I was born and so I don't know much about the hospital." (Female FGD participant, Madhol village)

Additionally, in the case of problems during pregnancy, some women turned to traditional remedies because they did not know about the medical treatment in health facilities.

"I don't know the importance of the hospital. During my previous pregnancy, whenever I had any kind of illness, I went to the traditional healer." (Female FGD participant, Chatom village)

The health facility staff felt that efforts to raise awareness, though still limited, were resulting in an increase in the number of women attending ANC.

"Last year they were not attending but this year they are. This is because previously, they were unaware of the benefits of the health facility. We have tried to create awareness in the villages and they are listening and starting to understand. A few women came, received good care and went back to inform their colleagues to come." (KII, CHW, Maper PHCC)

Perceived risk

The risk of serious pregnancy-related complications was perceived to be low. Some women without any prior pregnancy related complication did not see the added value of ANC attendance in the context of the formidable barriers to service access. Similarly, those with a health concern did not perceive the problem to be a major threat to the pregnancy.

"Some of us who did not experience any problem during the first pregnancy don't see the need of going to the hospital. We reason that the present pregnancy will be like the first one." (Female FGD participant, Ror bar village)

On the other hand, women with prior pregnancy-related complications were more likely to attend ANC because of their higher risk perception.

"For my first pregnancy, my child died because of the sickness I was having during pregnancy. From there, I said to myself that for my second pregnancy, I would not want my baby to die again. I went to the hospital for check-up and treatment, came back home and delivered safely to a life child." (Female FGD participant, Wundhiot village)

Attending ANC was often associated with medical treatment. As seen above, FGD participants seldom viewed ANC as a preventive service. On one hand this promoted ANC attendance for women with health problems but on the other hand, it was a potential reason to avoid service use for women who did not feel any discomfort.

"I visited the clinic when I was pregnant because I was very sick. While there, I was injected with medicine and then I felt well." (Female FGD participant, Maper centre)

Some male participants had a positive perception toward ANC especially the medical care received at health facilities—which they felt sometimes benefited them too.

"We think that it is good for a pregnant woman to visit the health facility because sometimes she may be having fever and body pain and this will require her and the husband to visit a health facility for treatment. Accompanying a woman may encourage her to attend the clinic. Both of you will be tested together. You may be suffering from a sexually transmitted disease and this will require the doctor to treat both of you." (Male FGD participant, Maper centre)

D. Perceived low quality of care and poor efficacy of medical treatment

Because ANC was perceived be a curative service, some women felt unsatisfied if treatment was not provided during ANC while others were unsatisfied with the quality of treatment provided if it did not include an injection or if the treatment did not relieve the symptoms experienced. These issues seemed to affect decisions on future ANC attendance.

"What we want is medicine. Even if you go to the hospital, you will not be given medicine. I have gone to the hospital twice but nothing has happened. Now I have decided to go to Marial lou hospital because this medicine of Maper hospital is not helping." (Female FGD participant, Nhomleng cattle camp)

"Some pregnant women prefer to be injected. If you give them a tablet, they don't accept because they think that only injectable drugs can help them." (KII, CHW, Meen PHCU)

Discussion

In general, the barriers to utilisation of ANC services identified in the present study have also been reported in other studies [16]. Some of them, such as transportation problems and insecurity, affect both service provision and utilisation; aggravating the problem of poor access to maternal health services. In this setting, geographical barriers and insecurity made it difficult and dangerous for women to travel to health facilities thereby negatively influencing the decision to attend ANC.

Although maternal health services were officially free-of-charge in Rumbek North, women were discouraged from utilising ANC services because health workers at some health facilities were demanding for payment. One study in South Sudan has reported that "under-the-table" payments were hindering institutional childbirth

in the country [17]. Any out-of-pocket payment requested, either official or illegal, has a considerable negative impact and dramatically hinders the delivery of ANC in this setting. An investigation into the reasons behind these possible "under-the-table" payments is warranted.

The present study identified two key sociocultural barriers to ANC utilisation: women's domestic chores and the influence of male partners/husbands. Both of these issues are reflective of the women's empowerment situation in this community. Women were overwhelmed with domestic chores and had little or no time to attend ANC. Surprisingly, the issue of women's domestic chores did not emerge in men's FGDs. Husbands were perceived to be unsupportive or restrictive of their wives attending ANC. Although some men were supportive of ANC attendance, this had a lot to do with the health of the foetus rather than that of the mother. We have previously reported that husbands were restricting their wives from utilising childbirth services in this setting [10]. This restriction also applied to ANC, although to a lesser degree.

Tradition and culture had a formidable influence on institutional childbirth in this setting [10] but seemed to have a relatively weaker influence on ANC attendance. This is probably because ANC was perceived to be important in confirming the wellness of the baby, and for the treatment of health problems. The relationship between the health of the woman and the health of the baby seemed to be poorly understood. Pregnancy was perceived to be a normal life event that did not require visiting a health worker unless if there was a complication. Thus most participants related ANC to the treatment of illnesses during pregnancy as has been documented elsewhere [16]. This perception that ANC was a curative rather than a preventive health service might result into sporadic utilisation driven by the perceived severity of health problems during pregnancy. This same perception determined the criteria women applied to judge the quality of care received. Because most women attended ANC at PHCUs and these health facilities stocked only non-injectable drugs in line with the government guidelines, the medical treatment received was perceived to be inadequate and a waste of time. As has been reported elsewhere [16, 18], perceptions of medical interventions during previous ANC shaped the attitude towards the future use of ANC.

Lack of correct and sufficient information about the importance of maternal health care and poor understanding of the risks aggravates the socio-cultural barriers mentioned above. Most women in Rumbek North, especially those in cattle camps, had no prior experience of ANC and were unsure about its utility. The community was also generally poorly informed about maternal health care. Campaigns to raise awareness not only among women but also in the entire community may be essential to overcome, in a reasonable timeframe, the effects of the lack of knowledge and improve the understanding of the crucial role of ANC as has been demonstrated elsewhere [19, 20].

In low-resource settings, pregnancy is often one of the rare occasions on which women establish contact with the health system and thus it is a unique opportunity to deliver evidence-based care and interventions that could be lifesaving [21]. In 2015, the maternal mortality ratio in South Sudan was estimated by WHO to be 789 maternal deaths per 100,000 live births [22]. With this very high maternal mortality, it is crucial to identify effective and sustainable strategies to reach women and improve the delivery of care practices during pregnancy and childbirth in this country.

This is the first study to document, in detail, the barriers to ANC use in Rumbek North and one of the few in-depth inquiries into barriers to ANC service access and use in South Sudan. This is an important contribution to understanding the reasons for poor maternal health service use in the country. To ensure effectiveness, the development of any strategies to improve access to ANC needs to take into account the barriers clearly identified by this study. We used two complementary methods to collect data from diverse sources. The diversity of the respondents and the triangulation of the data ensured that the main perceptions prevalent in the community were captured. We believe the findings of this study would apply to other counties in South Sudan with similar characteristics as Rumbek North. Some of the findings may also apply to conflict-affected settings. This study, however, has some limitations. First, it is possible that some information was lost in translation and transcription. Nevertheless, this problem might have been mitigated through triangulation of data from different sources. Secondly, we limited our study to examining barriers to utilisation of any antenatal care. A further inquiry could look at barriers to late booking and to attending the recommended number of ANC visits.

Conclusions

Multiple factors and their interactions affect access to and utilisation of ANC services in Rumbek North County in South Sudan. Some of the factors, such as insecurity and poor geographical accessibility, are outside the scope of the health sector and require a multisectoral approach. Restoration of peace in South Sudan will also require the support of the international community. The health system in Rumbek North, as in other parts of the country, is still evolving, and health services planners should consider how to address the barriers identified in this study in their strategies to improve

ANC service utilisation. Creating demand for ANC service will need to be done alongside investment in the supply side, especially in human resources and in health infrastructure, to meet the potential future increase in demand. The findings of this study will inform CUAMM's strategy as the organisation works with the Rumbek North CHD and other stakeholders in ensuring that ANC services are available and accessible to the residents of the county. More studies on this subject in South Sudan are still needed to provide a comprehensive understanding of barriers to ANC to better inform strategies to address the problem.

Additional file

Additional file 1: Roles of women and men according to source of information. (DOCX 15 kb)

Abbreviations

ANC: Antenatal care; BPHNS: Basic Package of Health and Nutrition Services; CHD: County Health Department; CHW: Community health worker; COREQ: Consolidated criteria for reporting qualitative research; CUAMM: Collegio Universitario Aspiranti e Medici Missionari; FGD: Focus group discussion; HIV: Human immunodeficiency virus; HSDP: Health Sector Development Plan; KII: Key informant interview; MoH: Ministry of Health; PHCC: Primary health care centre; PHCU: Primary health care unit; SHHS: Sudan Household Survey; TBA: Traditional birth attendant; WHO: World Health Organization

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Availability of data and materials

The datasets used in the current study are available from the corresponding author on reasonable request.

Authors' contributions

CW CS GP FM conceived and designed the study. CS FM organised field work logistics. CW and FM collected data. CW analysed data. CW drafted the initial manuscript. All authors participated in interpreting the data and in critically revising the manuscript for important intellectual content. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Consent to publish de-identified data were obtained from all participants.

Ethics approval and consent to participate

This study was approved by the Ministry of Health Ethics Committee and by Rumbek North CHD. Because the participants of FGDs and community leaders were of low literacy levels, they provided verbal informed consent, which was audio recorded, after an explanation about the study. CHWs and staff of the CHD provided written consent. Permission to conduct the study in selected villages was sought from village leaders. Each participant of FGDs received a bar of soap to compensate for the time spent. No monetary incentives were provided.

Publisher's Note

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Changing the role of traditional birth attendants in Yirol West County, South Sudan

PAPER

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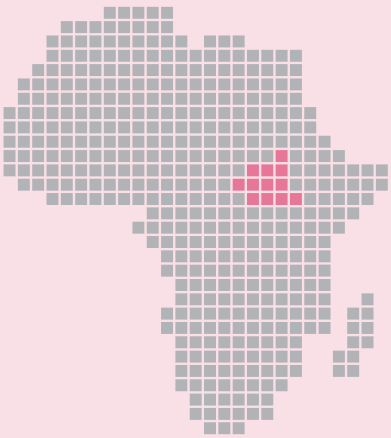

Abstract

Starting in May 2014 community-based traditional birth attendants (TBAs) working in the province of Yirol West County in South Sudan were asked to assist women in labor within health facilities rather than in their own villages, as dictated by tradition.

Our study aimed to measure the degree to which TBAs were integrated into the local health system. For the qualitative study we conducted eleven focus group discussions with TBAs, 6 focus group discussions with the community's women, and 18 key informant interviews with members of village health committees and staff from health facilities and the County Health Department.

Our data analysis revealed that while many of the TBAs began to refer the community's pregnant women to health facilities, some continued to assist their deliveries in their homes. The study highlighted various factors facilitating the integration of the TBAs into the local healthcare system, including acceptance by the community, local women and the TBAs themselves of the latter's new role; changed perceptions vis-à-vis institutional deliveries and the risks of home deliveries; the personal commitment of TBAs and their good working relationships with facility staff members; incentives offered to women giving birth in health facilities; and training of the TBAs.

However, despite encouraging developments in the integration of TBAs into the local healthcare system, various challenges remain to be overcome, including communication problems between TBAs and health care facilities, delays in identifying appropriate treatment and care for pregnant women, a lack of materials, poor or insufficient incentives for TBAs, and long distances to health facilities and associated problems of transportation.

PLOS ONE

RESEARCH ARTICLE

Changing the role of traditional birth attendants in Yirol West County, South Sudan

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Data Availability Statement: Due to ethical restrictions imposed by the Ethics Committee at the Ministry of Health, Republic of South Sudan, the data underlying this study are available upon request to qualified researchers. Queries related to data access may be submitted to Calistus Wilunda (calistuswilunda@yahoo.co.uk) or Giovanni Putoto (g.putoto@cuamm.org).

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Abstract

Effective from May 2014, community-based traditional birth attendants (TBAs) in Yirol West County, South Sudan, were directed to start referring all women in labour to health facilities for childbirth instead of assisting them in the villages. This study aimed to understand the degree of integration of TBAs in the health system, to reveal the factors influencing the integration, and to explore the perceived solutions to the challenges faced by TBAs. A qualitative study utilising 11 focus group discussions with TBAs, 6 focus group discussions with women, and 18 key informant interviews with members of village health committees, staff of health facilities, and staff of the County Health Department was conducted. Data were analysed using qualitative content analysis. The study found that many TBAs were referring women to health facilities for delivery, but some were still attending to deliveries at home. Facilitators of the adoption of the new role by TBAs were: acceptance of the new TBAs' role by the community, women and TBAs, perceptions about institutional childbirth and risks of home childbirth, personal commitment and motivation by some TBAs, a good working relationship between community-based TBAs and health facility staff, availability of incentives for women at health facilities, and training of TBAs. Challenges of integrating TBAs in the health system included, among others, communication problems between TBAs and health care facilities, delays in seeking care by women, insecurity, lack of materials and supplies for TBAs, health system constraints, insufficient incentives for TBAs, long distances to health facilities and transportation problems. This study has revealed encouraging developments in TBAs' integration in the formal health system in Yirol West. However, there is need to address the challenges faced by TBAs in assuming their new role in order to sustain the integration.

maternal health services in Yirol West County, South Sudan.

Competing interests: The authors have declared that no competing interests exist.

Introduction

The era of Millennium Development Goals witnessed a 59% increase in the deliveries assisted by skilled birth attendants (SBAs) and a 44% reduction in Maternal Mortality ratio (MMR) worldwide [1, 2]. Despite this achievement, each year, 45 million women still deliver without skilled attendance [1] and 303,000 die from complications related to pregnancy or childbirth worldwide [2]. Almost all maternal deaths (99%) occur in developing countries, with sub-Saharan Africa accounting for 66% of the deaths [2]. Thus, maternal mortality remains an agenda for global development as reflected in the Sustainable Development Goals [3].

Between the 1970s and 1990s, the international response to maternal mortality included training of traditional birth attendants (TBAs) [4] to attend to deliveries. Although TBAs working in well-structured contexts may reduce perinatal deaths, stillbirths, and neonatal deaths [5], their training failed to reduce maternal mortality [6]. Thus, the use of skilled birth attendants (SBAs) became the key strategy to reduce maternal mortality in developing countries.

Nonetheless, in settings where SBAs are scarce and barriers to service access abound, TBAs still attend to a majority of childbirths [7–9]. In such contexts, the disconnection between TBAs and the formal health system may impede access to maternal health services [10]. Given that integration of TBAs into the health system may increase skilled birth attendance [11–15], there is a renewed interest in the linkage between TBAs and SBAs; with TBAs working as promoters of institutional childbirth [16].

Maternal mortality ratio (per 100,000 births) is estimated to have increased in South Sudan from 763·8 in 1990 to 956·8 in 2013 and is projected to remain in the range of 500 to 925 by 2030 [17]. This is due to a fragile health system, which has been exacerbated by decades of conflict. The provision of health services in the country is hampered by numerous challenges including a chronic shortage of professional health workers. Since 2012, Yirol West County Health Department (CHD) has been partnering with Doctors with Africa CUAMM (hereafter CUAMM), an Italian non-governmental organisation (NGO), to strengthen the delivery of primary health care services in the county. The county, however, lacks skilled health workers, especially in peripheral health facilities. To fill the gap, the Ministry of Health recruited and trained some TBAs to work in health facilities (hereafter referred to as facility-based TBAs). Most TBAs, however, continued to work in villages unsupervised (hereafter referred to as community-based TBAs).

Effective from May 2014, in line with the national guidelines aimed at improving the quality of primary health care services, the county authorities banned TBAs from attending to home births and directed that all women in labour be referred to health facilities. The community-based TBAs' main task became referring women to health facilities for childbirth. However, the TBAs were also trained for three days on assessing pregnant women, detecting dangerous signs before; during; and after childbirth, clean delivery, and first aid in case of an obstetric emergency. Each TBA was paid a symbolic monthly incentive of US$4. Supervisory meetings between TBAs and staff working in health facilities were held monthly. To stimulate demand for institutional childbirth, women delivering in health facilities received baby kits containing a basin, a plastic cup, a bar of soap, and a baby blanket. This study aimed to 1) understand the extent of integration of community-based TBAs in the health system, 2) reveal the factors influencing this integration, and 3) explore the perceived solutions to the challenges community-based TBAs faced in adopting their new roles.

Materials and methods

Study setting

This study was conducted in Yirol West County, in the former Lakes State, South Sudan. In 2015, the county had an estimated population of 142,701 people and was divided into 7 *payams* (sub-county administrative units) namely: Abang, Anuol, Geng Geng, Aluakluak, Geer, Mapourdit and Yirol Town. The main ethnic group is Dinka (Atuot, Ciec and Jier clans) and semi-nomadic pastoralism and rudimentary crop farming are the main sources of livelihood for the inhabitants. At the time of the study, Yirol West County was served by two hospitals: Yirol County Hospital (a referral government hospital, which also serves Yirol East and Awerial counties) and St. Immaculate Hospital (a mission hospital in Mapourdit). The county was also served by 8 PHCUs and 2 primary health care centres (PHCCs). In South Sudan, the PHCU is the lowest-level health facility, which is supposed to be staffed by two community health workers (CHWs) and a community midwife while a PHCC is supposed to have one clinical officer, three professionals nurses, two midwives, three CHWs, and lower cadre staff [18]. However, none of the PHCUs and PHCCs in the county had a professional health worker; thus, childbirth services at these facilities were being provided by CHWs and facility-based TBAs. Both hospitals had SBAs. With reference to the TBAs' pre-integration period (May 2013-April 2014), the number of childbirths after integration (May 2014-April 2015) increased by 13.5% at Yirol Hospital, 26% at St. Immaculate Hospital, and 415% at PHCCs and PHCUs (S1 Table). The coverage of institutional childbirth increased from 25.9% to 36.7% (a 41.7% increase) over the same periods (S1 Table).

Design and participants

This qualitative study collected data utilising focus group discussions (FGDs) and key informant interviews (KIIs). The FGDs and KIIs were conducted with the aim of exploring the factors affecting the effective integration of TBAs into the health system and the challenges the TBAs were facing. The extent of integration of TBAs in the health system was assessed by inquiring about their current role in provision of maternal health care. Data from KIIs were also used to triangulate the information collected through FGDs.

The study participants consisted of community-based TBAs, facility-based TBAs (TBAs employed by the MoH to work in health facilities), health facility staffs (CHWs in PHCUs/PHCCs and midwives in hospitals), women who delivered in the past one year, village health committee (VHC) members, and staff of the CHD. Administratively, community-based TBAs can be divided into two groups: those who had been recognised by the CHD and efforts had been made to integrate them into the health system (community-based integrated TBAs), and those not recognised by the CHD and thus no efforts had been made to integrate them into the health system (not-integrated TBAs). In the county, there were 185 TBAs recognised by the CHD: 13 working in the hospital; 17 working in PHCUs and PHCCs; and 155 community-based integrated TBAs.

Sample selection

The number and type of participants to include in the study were guided by our judgement on the extent to which they could contribute towards providing relevant information to respond to the research questions. Thus, we determined the number of KIIs and FGDs *a priori* and used purposive sampling to select participants; ensuring that data are collected from key individuals in different geographical areas.

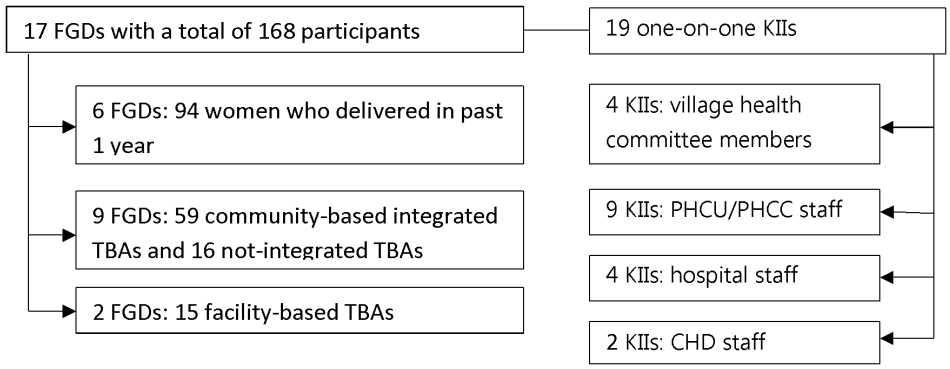

Fig 1. The number of focus group discussions, key informant interviews, and participants. FGD: focus group discussion; KII: key informant interview; PHCC: primary health care centre; PHCU Primary health care unit; TBA: traditional birth attendant.

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Data were collected in 5 out of the 7 *payams* mentioned above. Gheer *Payam* was excluded because of insecurity while Yirol *Payam* was excluded because it is close to Yirol Hospital and had a limited TBAs' activity. Not-integrated TBAs were identified with the help of VHC members, CHWs, and other TBAs. To recruit women FGD participants, one village per *payam* was randomly selected. From each village, women who delivered in the preceding 12 months were purposively selected with the help of VHC members and CHW. The time frame of 12 months was chosen to maximise recall and to ensure the responses were contemporary. A total of 17 FGDs, with an average of 12 participants per group, were conducted (Fig 1). Participants of KIIs were purposively selected amongst individuals judged to have the highest knowledge about maternal health issues in the county based on their job responsibilities, seniority, and working experience. These included: 9 CHWs from 5 PHCUs/PHCCs, 4 hospital maternity staff, 4 VHC members, and 2 CHD staffs (Fig 1). VHC members were from the villages selected for FGDs.

Data collection

Data were collected in October and November 2015. FGDs and KIIs were conducted utilising pretested open-ended question guides that allowed for flexibility in gathering information. Socio-demographic characteristics of FGD participants were collected using closed-ended questionnaires. Each FGD was conducted by two Dinka (local language) speaking facilitators who were well versed in the local language and culture. One data collector facilitated the sessions while the other one managed audio recordings and took field notes. The data collectors were trained for one day and were supervised by the principal investigator (CW) who was present at all FGDs. The FGDs were conducted in local churches, schools or under trees, as the situation demanded. Each FGD session lasted for about one hour and refreshments were served. Non-participants were not allowed near the FGD venues.

KIIs, each lasting for about 25 minutes, were conducted either in PHCUs (for CHWs and some VHC members), hospitals (for hospital staffs), at the CHD office (for CHD staff), or in villages (for some VHC members). All KIIs, except those with VHC members, were conducted directly in English. KIIs with VHC members were conducted in English with the help of a translator. All FGDs and KIIs were audio-recorded with permission from the participants.

Data analysis

Audio recordings were transcribed and read through severally to obtain an overall picture of the collected data. The transcripts were then coded by CW based on the content analysis approach [19] using NVivo 10 (QSR International, Melbourne, Australia). After reading through the transcripts, a list of themes was set up in NVivo and was updated as new themes emerged during coding. These themes formed the basis for further data synthesis and interpretation. The themes were summarised and reported under the following sub-headings: 1) New role of TBAs; 2) Facilitating factors in the adoption of the new role by TBAs; 3) Challenges faced by TBAs in adopting their new role; 4) Addressing challenges faced by the TBAs. Segments of text under each theme were then pieced together to provide an overview of the content relating to that specific theme. Quotes were selected to represent a typical response or to illustrate a deviant opinion. A checklist for the Consolidated Criteria for Reporting Qualitative Research (COREQ) [20] is presented in S2 Table.

Ethical considerations

This study was approved by the ethical committee of the Ministry of Health, Republic of South Sudan. The study was also approved locally by the Yirol West CHD. All study participants were informed about the purpose of the study and what would be expected of them. Participants were also informed of their right to exit the study at any time without any future prejudices. There were no reports of refusal to participate. Because of most participants' low literacy levels, audio recorded verbal informed consent was sought. This method of obtaining consent was approved by Ethical Committee. Each participant was paid US$4 as a travel cost reimbursement.

Results

Characteristics of FGD participants

A majority of the women who participated in the FGDs were aged 20–34 years (75.5%); had no formal education (94.7%); were currently married (93.6%); attended at least one antenatal care visit during their last pregnancy (96.8%); and did not deliver in a health facility (57.4%) as shown in Table 1.

A majority of the TBAs in the FGDs were aged 35–49 years and almost all had no formal education (Table 2). Facility-based TBAs tended to have a longer working experience than community-based TBAs. Some not-integrated TBAs (5/16) were also referring women to health facilities but all of these TBAs were attending to home deliveries. On the other hand, almost all community-based integrated TBAs were referring women to health facilities and slightly less than a third (17/59) were also attending to home deliveries. Most of the not-integrated TBAs (13/16) and some community-based integrated TBAs (13/59) had not received any training organised by the CHD or by CUAMM.

The new role of TBAs

There were mixed findings on the activities conducted by the community-based integrated TBAs. In general, it emerged across all FGDs and KIIs that most community-based integrated TBAs were referring and at times, accompanying women to health facilities for childbirth. The TBAs were doing this amidst challenges as will be described later.

Table 1. Characteristics of women who participated in focus group discussions.

Characteristic	Frequency (n = 94)	Percent
Age group		
18–19	9	9.6
20–24	24	25.5
25–29	23	24.5
30–34	24	25.5
>34	10	10.6
Missing data	4	4.3
Parity		
1–2	26	27.7
3–4	28	29.8
5–6	30	31.9
>6	10	10.6
Educational level		
None	89	94.7
Primary	5	5.3
Marital status		
Currently married	88	93.6
Never/formerly married	6	6.4
Attended ANC during last pregnancy		
Yes	91	96.8
No	3	3.2
Delivered in a health facility		
Yes	40	42.6
No	54	57.4

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'*TBAs of Panakar [a village in Abang payam] just call the hospital or the PHCU. If the ambulance is not coming, the lady is taken by the TBA up to the hospital or the PHCU.*'

(KII, VHC member, Abang Icholuoth village)

'*They (TBAs) are helping us by referring mothers in labour to the health facility.*'

(FGD, woman, Angany)

However, it was clear that others, including some community-based integrated TBAs, were still attending to births in the villages and making referrals only when there was a complication. There were some misconceptions about the new role of TBAs even among CHWs.

'*Our role is to manage labour in the villages and to refer the cases we cannot handle.*'

(FGD, community-based integrated TBAs, Aruau)

'*If they [TBAs] get a difficult delivery, they refer to the PHCU, but if it is not difficult, they assist.*'

(KII, CHW 2, Mageng PHCU)

There was a general feeling that it was difficult to completely stop community-based TBAs from conducting home deliveries.

Table 2. Characteristics of traditional birth attendants who participated in focus group discussions.

Characteristic	Facility-based TBAs (n = 15)		Community-based integrated TBAs (n = 59)		TBAs not-integrated (n = 16)	
	Frequency	%	Frequency	%	Frequency	%
Age group						
<35	2	13.3	8	13.6	5	31.2
35–49	5	33.3	30	50.8	11	68.8
>49	4	26.7	13	22.0	0	0.0
Missing data	4	26.7	8	13.6	0	0.0
Marital status						
Married	9	60.0	34	57.6	6	37.5
Formerly married	6	40.0	25	42.4	10	62.5
Education						
None	15	100	58	98.3	16	100
Primary	0	0.0	1	1.7	0	0.0
Period working as a TBA						
<10 years	4	26.7	40	67.8	9	56.2
10–19 years	6	40.0	12	20.3	7	43.8
>19 years	5	33.3	7	11.9	0	0.0
Referring women to health facilities						
Yes	—	—	58	98.3	5	31.2
No	—	—	1	1.7	11	68.8
Attending to home births						
Yes	—	—	42	71.2	16	100
No	—	—	17	28.8	0	0.0
Trained by CUAMM/CHD						
Yes	—	—	46	78.0	3	18.8
No	—	—	13	22.0	13	81.2

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'*That one [changing the role of the TBA] is not working because it is difficult to stop volunteer TBAs [community-based integrated TBAs] from assisting women to deliver at home.*'

(KII, CHW 1, Wou Wou PHCU)

'*Yes, I cannot deny that [that some TBAs are still conducting home deliveries]. They are, and it has happened several times. TBAs have been told to stop, but some haven't and we don't know their interest.*'

(KII, CHD staff 1, Yirol County)

Although some of the TBAs still perceived assisting home deliveries to be part of their role, some were doing this out of necessity, for instance in case it was too late to refer the woman to the health facility or if the health facility was too far. Some TBAs had stopped insisting on home childbirth.

'*We walk in the whole village to know the number of pregnant mothers and to tell them to go to the health facility. We assist during delivery if the mother is not able to reach the health facility.*'

(FGD, community-based integrated TBA, Anuol)

'*If they [TBAs] get a woman outside there delivering, they can help her. They also come to report it to the health facility. If she hasn't delivered at home, they can bring her here [to the health facility]. That is what I have seen them do.*'

(KII, VHC member, Mageng)

Besides referring women to health facilities for childbirth, it emerged from the FGDs and KIIs that community-based integrated TBAs were also referring women for ANC, providing health education on child and maternal nutrition, and referring women perceived to be malnourished or anaemic to health facilities. The activities of community-based integrated TBAs were being monitored through the monthly reports they were submitting to the CHD.

Facilitating factors in the adoption of new role by TBAs

Facilitating factors in the adoption of the new role by TBAs are summarised in Table 3.

Table 3. Facilitators of adoption of new role by traditional birth attendants.

Theme	Main points
Acceptance of the new role of TBAs	• Referral of women to health facilities was acceptable to the community, women, and TBAs • Women felt safer to be accompanied by TBAs to health facilities • TBAs were happy to be contributing towards improving maternal health • TBAs were motivated by a feeling of being part of the formal health system
Perceptions about the care in health facilities and the risks of childbirth at home	• Institutional childbirth was perceived to be safer than home childbirth • Women were satisfied with the care provided in health facilities • Women perceived home childbirth by TBAs to be of poorer quality • TBAs perceived to be at risk of infection through contact with body fluids during delivery • TBAs perceived home delivery to be risky to the mother and her baby • TBAs were afraid of facing consequences in case of death or morbidity of the mother and/or baby
Personal commitment and motivation among TBAs	• The spirit of serving the community and improving maternal health, with or without incentives among some TBAs
Relationship between community-based integrated TBAs and health facility staff	• A good working relationship between community-based integrated TBAs, CHWs in PHCUs and facility-based TBAs • CHWs viewed TBAs as co-workers • CHWs were involved in training TBAs • CHWs helped TBAs in completing monthly reports
The role of baby kits at health facilities	• Women delivering in health facility were rewarded with baby kits • The kits were synergistic to the work of TBAs
The role of training	• Influence of the training from CHD/CUAMM and on-job from CHW and other health workers

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Acceptance of the new role of TBAs. Generally, the community including women had accepted the new role of TBAs (i.e. the promotion of institutional childbirth). This was mainly because of a gradual realisation that institutional childbirth was safer than home childbirth.

'*They have accepted [the new role of the TBA]. If your wife gives birth in the hospital, she comes home healthy with a child. That is a good thing they have seen.*'

(KII, VHC member, Icholuoth village Abang)

'*Husbands think that the new role is good because the woman and her baby are taken care of by a doctor or somebody who is qualified.*'

(FGD, women, Aruau)

'*They (women) feel it is safer to deliver in the hospital. They are happy because TBAs are helping them to reach the health facilities.*'

(KII, staff 1, Mapourdit hospital)

Previously, women who wished to deliver in a health facility would face resistance especially from their husbands—this still persists in some cases as will be described later. Additionally, the community used to fear that any woman referred to the hospital would automatically be operated on.

'*Two years ago, husbands used to refuse to take their wives to the health facility but now after talking to them in churches and in community meetings, they accept.*'

(KII, VHC member, Pabour)

"*When we started the work, some people used to say `I don't want my wife to deliver here'. But now they are delivering in the health facility. They have calmed down and there is no fighting or complaining.*"

(KII, CHW 2, Mageng PHCU)

While travelling to the health facility, women felt safer to be accompanied by a TBA because the TBA could provide emotional support and help in case of an urgent delivery.

'*Some women are happy if there is somebody like a TBA to accompany them to the health facility.*'

(FGD, women, Aruau)

Community-based integrated TBAs had a positive attitude towards referring women to health facilities and felt that their new role was contributing towards reducing maternal morbidity and mortality.

'*We appreciate working for mothers by providing them with a good linkage to the health staffs when we refer them to deliver in the health facility.*'

(FGD, community-based integrated TBA, Anuol)

'*We like our work because it has stopped maternal deaths, which used to be common in the past.*'

(FGD, community-based integrated TBA, Aruau)

Moreover, the TBAs felt that their new role had elevated their status in the community and were proud to be part of the formal health system.

'*Our role of accompanying mothers in labour makes us feel like we are part of the government or NGO because we work together and our work is important*.'

(FGD, community-based integrated TBA, Aluak Luak)

Perceptions about the care in health facilities and the risks of childbirth at home. Adoption of the new role by TBAs had been expedited by women's perception that delivering in the health facility was safer than delivering at home. This was related to factors such as the level of hygiene in health facilities, the handling of the baby and the mother, and the availability of light in health facilities (for night time births). Women were also happy with the way they were being received and handled at health facilities following referral by TBAs.

'*TBAs working in health facilities receive us well, provide good care and are responsible for taking care of us while we are in bed. The care they [facility-based TBAs] provide is better than that provided by the village TBAs*.'

(FGD, woman, Madbar)

On the other hand, some women perceived the care provided at home with the assistance of TBAs to be of poorer quality and unhygienic. Some also had doubts about the competency of community-based TBAs in attending to them during childbirth.

'*At home, there is no light to see you if it is at night and no razor blade to cut the child's cord. But in the health facility, all these things are available*.'

(FGD, woman, Aruau)

'*In the village, blood loss is not controlled and after delivery, very little blood remains in your body*.'

(FGD, woman, Pabour)

TBAs also felt that delivering in health facilities was better than delivering at home. They viewed health facility staffs to be more knowledgeable in handling labour and labour-related complications. They also felt that health facilities had the required infrastructure, equipment, supplies, and drugs for childbirth.

'*We prefer that women deliver in health facilities because of the heavy bleeding that might come during or after delivery*.'

(FGD, community-based integrated TBA, Panakar)

Moreover, TBAs had realised that assisting women to deliver at home was not only risky to the mother and her baby but also to them (TBAs). They perceived to be at risk of infection through contact with blood during childbirth. It was unclear whether this perception existed prior to TBAs changing their roles.

'*Infection is a big worry to us because blood may splash on your body while handling a baby*.'

(FGD, community-based integrated TBA, Mageng)

'*It can be very frightening to the TBA if a mother in labour becomes unconscious. The baby may also be in danger because of lack of air.*'

(FGD, community-based integrated TBA, Panakar)

Additionally, increased awareness of the community about the banning of TBAs from conducting deliveries at home was making referral of women to health facilities to become a norm and TBAs assisting deliveries at home were at risk of a backlash in the case of a complication or death of the mother or baby. Thus, many TBAs had become afraid of taking the risk of conducting home deliveries and were happy to transfer this risk to health facilities.

'*Some TBAs fear to handle you because if it is outside there and something bad happens to you, she will be held responsible.*'

(FGD, woman, Madbar)

'*They attempt to assist, but if two hours elapse, they refer the mother or they call the ambulance to transport the mother to the hospital. If the TBA refuses to refer the mother, and the mother gets a problem, the community will blame the TBA and she will face problems.*'

(KII, staff 1, Yirol hospital)

Personal commitment and motivation among TBAs. Personal commitment and willingness to help the community by some TBAs were playing a key role in their effective integration in the health system. Some TBAs were highly committed to improving maternal health, with or without incentives.

'*We are all volunteers and we will still work even without being paid. We can continue working to help our community.*'

(*FGD, community-based integrated TBAs, Panakar)*

'*If we inform a TBA that there is a woman here in labour, she [the TBA] will offer herself to help. That TBA will offer herself to come and take the woman to the hospital. Even if it is travelling by foot, she will go with her. That is what I have seen. They are volunteering and they obey because these are their people.*'

(KII, VHC member, Icholuoth village, Abang)

However, this did not apply to all TBAs as will be seen later. Additionally, even self-motivated TBAs were hoping to receive a better incentive one day.

Relationship between community-based integrated TBAs and health facility staff. There was a good working relationship between community-based integrated TBAs and CHWs in health facilities. This was partly because both the TBAs and CHWs were from the same localities and knew each other even before the TBAs were instructed to stop attending to home deliveries. Regular meetings between TBAs and CHWs also played a role in fostering the good relationship. Community-based integrated TBAs respected CHWs and viewed them as a source of knowledge. CHWs were involved in training TBAs during the training organised by the CHD and on-the-job. Moreover, CHWs viewed community-based integrated TBAs as colleagues in health service delivery.

'*We have a good relationship with health professionals; it is like the relationship of a teacher and pupils. The collaboration is good.*'

(FGD, community-based integrated TBA, Agany)

'*When there is work in the facility, we call them and sit together and do that work. . . We work together as one group. . ..*'

(KII, CHW 1, Wou Wou PHCU)

Being illiterate, TBAs relied on CHWs in completing monthly data reporting forms submitted to the CHD; further strengthening the working relationship.

'*We have a good relationship in connection with monthly reports; those data we collect in the villages on the number of pregnant women and the number of deliveries in the villages.*'

(FGD, community-based integrated TBA, Aluak luak)

Community-based integrated TBAs also had a good working relationship with facility-based TBAs. This working relationship seemed to be important in ensuring a seamless adoption of the new role by community-based integrated TBAs.

'*We have a good relationship [with facility based TBAs] because we are bound together by work as health providers. All of us face similar challenges even though we have different abilities and skills.*'

(FGD, community-based integrated TBA, Aruau)

The role of baby kits at health facilities. The message on the distribution of baby kits to women who deliver in a health facility had spread widely in the community and women were more likely to agree to be referred to health facilities because they knew they would receive this incentive. This incentive was thus synergistic to the work of TBAs.

'*It is very good to deliver in the health facility because some items such as medicine, soap, basin and other things are given to you and your child.*'

(FGD, woman, Agany)

'*Women don't deliver at home because when they come here, they get a lot of things such as soap, basin, and clothes for the child, and the child is vaccinated.*'

(KII, VHC member, Pabour)

The role of training. The training (s) that community-based integrated TBAs had received at the start of their integration in the health system seemed to have contributed to the adoption of their new role.

'*We are happy with the training conducted to improve our work in service delivery to our people, to improve the health of mothers.*'

(FGD, community-based integrated TBA, Mageng)

However, not all community-based integrated TBAs had been trained (Table 2).

Table 4. Challenges faced by traditional birth attendants in adopting their new role.

Theme	Main points
Problems in communicating with health facilities	• TBAs lacked mobile phones, money to buy airtime, and means to charge their phones • Lack or poor mobile phone network • Some TBAs lacked the contact phone numbers of health facilities
Distance to health facilities and transportation problems	• Some villages were located in remote villages which hampered referral. • TBAs lacked means of transportation and walked to collect data, mobilise communities, and accompany women to health facilities. • Ambulance and motorcycles could not access many parts of the county because of poor roads • Motorcycles were not preferred by women in labour
Insecurity	• TBAs could not escort women to health facilities due to conflicts and fear of wild animals • Insecurity affected ambulance and motorcycles movement
Delays in seeking care by women	• TBAs attended to home deliveries because women sought help when at an advanced stage of labour
Lack of materials and supplies for TBAs	• TBAs lacked basic supplies such as torches, raincoats, gumboots and bags • TBAs lacked basic supplies to assist women in case of urgent childbirth
Health system constraints	• Lack of qualified staff in PHCUs and PHCCs • Infrastructural limitations to handle deliveries at PHCUs and PHCCs
Insufficient monetary incentive/loss of income and other incentives	• The monthly incentive of 12 South Sudanese Pounds received by TBAs considered to be too low and did not match the workload and cost of living • TBAs were no longer getting the incentives they used to get when assisting home births. • The community considered TBAs to be employed and thus was not obliged to give any anything extra to them
Insufficient/lack of training	• TBAs not been trained/insufficiently trained. • Some TBAs had not understood the rationale for referring women to health facilities
Lack of a common understanding among health staff about the new role of TBAs	• Some CHWs thought that the role of community-based integrated TBAs was to attend to deliveries at home and to refer only complicated cases. This can be misleading information to TBAs

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Challenges faced by TBAs in adopting their new role

The challenges faced by TBAs in adopting their new role are summarised in Table 4.

Problems in communicating with health facilities. TBAs had difficulties in communicating with health facilities whenever they had a woman in labour in need of being transported to a health facility. This was due to many factors including lack of mobile phones and/or means to charge their phones, lack of money to make phone calls, and poor mobile phone network. Additionally, some TBAs did not have the health facility contact phone number. This forced some of them to assist women to deliver at home even if that was not the intention. The

problems of communication became more serious at night when movement was restricted by insecurity and lack of lighting.

'*Poor mobile phone network is a great challenge. Sometimes we are connected to health facilities but on other occasions, even if one of us has a phone and calls the health facility, the call does not go through and this discourages the relatives of the woman*.'

(FGD, not-integrated TBA, Pabour, Madbar)

'*The challenge is that when a TBA finds a pregnant mother in labour deep in the village at night, communication with the health facility is difficult*.'

(FGD, community-based integrated TBA, Aluak luak)

Distance to health facilities and transportation problems. The problem of long distance to health facilities and lack of transportation means was more serious in remote villages not easily accessible by road. Long distance to health facilities meant that there was no time to refer women at an advanced stage in labour or with obstetric emergencies.

'*Because if it is a faraway village and the woman is about to deliver, there will be no time for her to come. Maybe the lady will deliver there and she will bring only the report*.'

(KII, CHW 1, Mageng PHCU)

Due to poor roads and lack of reliable transportation means, walking was the most common means of getting to health facilities. This posed a great challenge to the work of TBAs in accompanying women in labour to health facilities, collecting data on the number of pregnant women in their localities, and in mobilising communities. Often, TBAs had to walk for long distances to do all these. The available means of transportation (motorcycles at PHCUs and PHCCs and ambulances at the hospitals) could not access many parts of the county because of poor roads. The ambulance at Yirol Hospital was also over-stretched and sometimes delayed to respond to emergency calls from villages. Communication problems, long distances to health facilities and sparsely populated villages exacerbated the transportation problems. Although most PHCUs and PHCCs had motorcycles to pick women in labour from villages, this means of transportation was not preferred by women due to bumpy roads, the fear of accidents, and insecurity. Transportation was harder during the rainy seasons.

'*If there is a woman who wants to deliver in the village, volunteer TBAs [community-based integrated TBAs] send a child or someone on a bicycle to come and inform the TBA in the health facility. There is no transport. That's why the number of deliveries is small because there is no transport to reach far places. There is another village with no road to go there and some people don't even have phones to call*.'

(KII, VHC member, Pabour)

Insecurity. The prevailing state of insecurity in Yirol West County affected the work of TBAs. TBAs were afraid to escort women to health facilities especially at night because they feared inter-tribal fighting, rape, and abduction.

'*There is fear of insecurity due to tribal conflicts, cattle raiding, and the culture of revenge where women are killed even at water points and when collecting firewood*.'

(FGD, community-based integrated TBA, Mageng)

'*Conflicts don't allow us to move at night because they rape women of any age; whether young or old.*'

(FGD, community-based integrated TBA, Anuol)

There was also fear of attacks from wild animals especially when moving at night without a light source.

'*We fear wild animals when moving at night without a torch to light the way to the home of the woman in labour.*'

(FGD, community-based integrated TBA, Anuol)

The insecurity situation also affected the movement of the ambulance and motorcycles used to transport women to health facilities during emergencies.

Delays in seeking care. In some instances, TBAs attended to home deliveries because women waited for too long before seeking help and only contacted the TBA when referral was not an option.

'*. . ..sometimes the mother does not feel ready to come and deliver at the hospital for reasons well known to her. However, she will just call the TBA at the last moment, when the baby is coming out and of course she [the TBA] can't call [the ambulance] because it would be too late, so she has to remain there and help the mother.*'

(KII, staff 2, Yirol Hospital)

Lack of materials and supplies. TBAs lacked basic items such as torches for use at night, raincoats and gumboots for use during the rainy season, and bags to carry their paraphernalia. Some TBAs without any intention of assisting women to deliver at home found themselves doing so because of various barriers including those faced by women in accessing health care (S1 File). For instance, because of long distance, a woman would deliver on the way to the health facility and a TBA would be called into action. TBAs lacked basic supplies to assist women in such situations.

'*The challenge is a lack of materials such as torches, gumboots, and rain coats.*'

(FGD, community-based integrated TBA, Agany)

'*We have the challenge of lack of materials such as torches, gloves, razor blades, cotton wool, cord clamps, soap, bags, raincoats, gumboots and containers for carrying water.*'

(FGD, community-based integrated TBA, Aruau)

Health system constraints. Although it was the intention of the CHD to have all women deliver in health facilities, in reality the health system in Yirol West was still weak and could not handle all childbirths. Qualified midwives were available only at the two hospitals, and PHCUs/PHCCs were staffed with CHWs and TBAs who had only basic training and skills to attend to childbirth.

"The number of qualified midwives is not adequate, so for the time being, we cannot eliminate them [the TBAs]. And we cannot say: 'no, you can't do this' unless the hospital is equipped and has adequate personnel. Also, the peripheral health facilities have no qualified

personnel. They have only this community health workers who are trying their best but are not equipped for deliveries, they are very active in referring."

(KII, Staff 2, Yirol hospital)

There were also infrastructural limitations at lower level health facilities because they lacked maternity units, sufficient beds, and space to accommodate women in labour, during delivery, and in the postpartum period. Consequently, PHCUs and PHCCs were sometimes struggling to cope with the number of women accessing them (referred by TBAs or not). Some TBAs were aware of this limitation and seemed to be getting discouraged from referring women.

'*Now, the only problem in my unit is that when the mother delivers, there is no place for her to stay for some minutes or for one hour. When a mother delivers, she is send home because we do not have any place for her to stay. The place is very small.*'

(KII, CHW 1, Panakar PHCU)

'*Many health facilities don't have enough beds to accommodate the women in labour whom we refer.*'

(FGD, community-based integrated TBA, Panakar)

Moreover, some women were refusing to be referred to health facilities because they knew about the problem of limited infrastructure.

'*When labour approaches, some women refuse to deliver in health facilities because there are no beds. There is only one examination coach and there is no bed where mothers can stay for more than 24 hours after delivery.*'

(FGD, facility-based TBA, Yirol West)

Insufficient monetary incentive/loss of income and other incentives. Whereas some community-based integrated TBAs had a high degree of personal commitment and self-motivation and were willing to continue working even without a monetary incentive, it emerged in most KIIs and FGDs that the monthly incentive of 12 South Sudanese Pounds (US$4) that the community-based integrated TBAs were receiving was too low to meet the most basic of needs. It was perceived that TBAs were not being compensated fairly for the work they were doing. The nature of their work meant that they could be called upon at any time to accompany women to health facilities. They often spent long hours with women in labour at the expense of working or looking for food for their families. TBAs wondered why the mothers they referred to health facilities were getting a better incentive (baby kits) and their colleagues employed in health facilities were being paid a monthly salary but they were getting almost nothing for their work.

'*It [the incentive] helps a bit but high prices have affected us and you cannot get anything with 12 South Sudanese Pounds. This little amount of money should be increased. . ..*'

(FGD, community-based integrated TBA, Aruau)

'*. . .they are complaining about salary; there is no work without salary. They are saying that they are in a newly independent country but they have no salary even though they are working. That is why they are not working well because they need a salary. They receive only a motivation, and the motivation is little, just 12 pounds per month.*'

(KII, CHW 1, Mageng PHCU)

Before the TBAs were banned from attending to home deliveries, they would receive mainly non-monetary incentives from the women they assist. But with the change of their role, the TBAs were no longer getting these incentives. Additionally, the community was aware that TBAs were receiving an incentive for referring women and was unwilling to give anything more to TBAs. The community considered TBAs to be employees of CUAMM.

'*Because of the 12 South Sudanese Pounds, we are no longer being given alcohol, calabash and cups because the community says that we are being paid by the NGO.*'

(FGD, community-based integrated TBA, Anuol)

'*Nowadays nothing is given to us because the community has heard that we are being paid 12 South Sudanese Pounds.*"

(FGD, community-based integrated TBA, Aruau)

Insufficient/lack of training. Key informants opined that some TBAs were still attending to home births either because they had not been trained in the new role or the training received was insufficient. Thus, some TBAs had not understood the rationale for referring women to health facilities. Some TBAs had also not heard about the ban on home births. However, this problem seemed to be applicable mainly to not-integrated TBAs.

'*Some TBAs have not been told not to help women to deliver at home and they have not been trained.*'

(KII, staff 2, Mapourdit hospital)

'*It is the way of understanding. Volunteer TBAs [community-based integrated TBAs] understand that all women should be referred to the health facility. But some TBAs who do not understand the MoH directive conduct delivery at home.*'

(KII, CHW 1, Wou Wou PHCU)

Lack of a common understanding of the new role of TBAs. It seemed like some formal health care workers were not clear about the new role of TBAs. They thought that the role of community-based integrated TBAs was to attend to childbirth at home and to refer women only if there was a complication. Such health workers are unlikely to support TBAs to stop attending to childbirths at home or they may convey the wrong message to TBAs.

'*If it is normal [uncomplicated delivery], they can do it there in the community. If there is a difficulty, they can call us and then we can go and pick the woman from the community and bring her to the health facility.*'

(KII, CHW 1, Wou Wou PHCU)

Addressing the challenges faced by the TBAs

Table 5 presents a summary of the suggested solutions to the challenges faced by the TBAs in adopting their new role.

Provision of a salary. This was the most frequently mentioned solution to keeping TBAs integrated into the health system. This solution emerged at all FGDs and KIIs. Almost all participants opined that the monthly monetary incentive being given to TBAs should be increased

Table 5. Addressing the challenges faced by traditional birth attendants in adopting their new role.

Theme	Main points
Provision of a salary	• The current TBAs' monthly incentive should be increased
Training and supervision	• Regular training/refresher training • Supervising TBAs to ensure that they are performing their role and to identify and address their challenges
Addressing transport and communication problems	• Providing TBAs with bicycles
Improving the health facility infrastructure	• Constructing more health facilities • Allocating more space for maternity at the existing PHCUs and PHCCs and providing more maternity beds
Providing supplies and equipment to TBAs	• Providing basic supplies such as raincoats, gumboots, torches, soap, umbrellas and bags • Providing clean delivery kits to TBAs for use in attending to urgent deliveries • Providing uniforms to TBAs

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to a reasonable amount to match the cost of living and the magnitude of work performed by TBAs.

'*We need our small incentive to be increased to an amount that can sustain and protect us from the increasing prices of goods on the market.*'

(FGD, community-based integrated TBA, Aluak luak)

'*I would like you to give TBAs a salary because they are obeying your work. If you go to the house of a TBA at night and tell her that there is a lady here, she will obey and go. That one needs them to have a salary.*'

(KII, VHC member, Icholuoth village Abang)

It was also suggested that TBAs should be given non-monetary incentives instead of a salary.

'*Instead of money they could be given soap or sugar, this can motivate.*'

(KII, CHW, Anuol PHCC)

Training and supervision. Training was perhaps the second most frequently mentioned solution to the challenges faced by the TBAs. The training the TBAs had received was perceived to be inadequate. Moreover, some TBAs had not been trained. Respondents felt that if TBAs were well trained, they would know how to communicate better with women and their husbands in explaining to them the reasons for referral. They would also be able to safely attend to a delivery in case it was not possible to refer the woman to a health facility. It was also noted that the trainings or refresher trainings should be conducted regularly to ensure continuous learning.

'*Training can be the first priority because many TBAs lack skills.*'

(FGD, community-based integrated TBA, Mageng)

There was also a need for more supervision of TBAs to ensure they were performing their new role and to identify and promptly address their challenges. It was also mentioned that

health care workers should continuously communicate with TBAs to encourage them to refer women to health facilities.

'*They need to be supervised more frequently so that we can know if they are performing, and if they are not performing we can re-organize and bring them here*.'

(KII, staff 2, Yirol hospital)

'*We should talk to them and understand why they don't refer women to the health facilities*.'

(KII, CHW 2, Wou Wou PHCU)

Addressing transport and communication problems. Participants felt that transport problems could be solved by providing TBAs with bicycles for mobilising and referring women.

'*If the government or CUAMM partners have no salaries for TBAs, they should support TBAs by providing them with bicycles to enable them to work. If it is a far away village, such as Lual, maybe they can come with the bicycle to bring the report. If a woman in labour is unable to walk, the TBA can come here with the bicycle to inform the PHCU and then we will go with the motorbike to take her*.'

(KII, CHW 1, Mageng PHCU)

There were only a few suggestions to solve the communication problems. This was because even if one had a mobile phone, there would still be challenges such as charging the mobile phones, poor mobile phone network, and buying airtime. Nevertheless, a few TBAs felt that provision of mobile phones could solve the communication problem.

Improving the health facility infrastructure. Because of the limited availability of maternity infrastructure to comfortably accommodate women referred to PHCUs and PHCCs, it was proposed that more health facilities should be constructed and more space should be allocated for maternity at the existing PHCUs and PHCCs. Construction of more health facilities was also seen as a way of tackling geographical inaccessibility and the associated transportation problems. Improvement in maternity infrastructure, for example by provision of more beds, was also suggested.

'*More health facilities should be constructed in the community to ensure that everybody is staying near a health facility for easy access*.'

(FGD, community-based integrated TBA, Wou Wou)

'*This health facility has only two beds and at night, there might be six, nine or ten women with no bed. They just put children on the floor. It is good to have a separate maternity. . .. . .*'

(KII, VHC member, Pabour)

Providing supplies and equipment to TBAs. It was suggested that community-based integrated TBAs should be given basic supplies pertinent to their new role. Such supplies included raincoats, gumboots, torches, soap, umbrellas and bags for carrying the supplies.

'*We need to be provided with materials such as torches, gumboots, raincoats, bags, umbrellas and so forth*.'

(FGD, community-based integrated TBA, Anuol)

Because the TBAs found themselves in situations where they needed to help women to deliver, it was suggested that they should also be given clean delivery kits for use while attending to such deliveries.

'*. . .. they need the materials to use out there because when the mother starts to deliver in a far place, they try to come but sometimes the clinic is far and the baby is coming out.*'

(KII, CHW 1, Panakar PHCU)

It was also suggested that the TBAs should be given a uniform or T-shirts to make them easily recognisable in the community. The uniform could also contribute towards improving the status of the TBAs in the community.

'*We can also provide them with uniforms to let them feel that they too are workers.*'

(KII CHW 1, Aruau PHCU)

Discussion

Our study found that only a bit more than one year after banning TBAs from assisting women to deliver at home in Yirol West, South Sudan, many TBAs were systematically referring women to health facilities for delivery, although some were still attending to deliveries at home, sometimes simply out of necessity. The factors facilitating the acceptance of this new "health promotional" role found in our study are similar to those of studies conducted in Somaliland [15] and Kenya [21]. These studies found that proper training of TBAs, strengthening the capacity of the health system to meet the needs of women, and providing adequate incentives to TBAs easily made the TBAs to change their role. Our findings also largely agree with those of a review of qualitative studies on lay health worker programmes to improve access to maternal and child health [22]. The review found that barriers and facilitators of program implementation were mainly related to programme acceptability, appropriateness and credibility, and health system constraints [22].

Programme recipients generally have a positive attitude towards programmes involving lay health workers [22]. Thus, it is not a surprise that the community and women in Yirol West were positive about the new role of TBAs. Although this can be linked to community mobilisation, incentives for women at health facilities, and positive outcomes (low risk of morbidity and mortality) among women who delivered in health facilities, the trust and respect communities usually have in TBAs seemed to have played a key role. In addition, TBAs are more likely to be self-motivated in helping women, which explains why for some of the TBAs, this was a facilitating factor for their integration in the health system. These reasons probably also underpin the positive attitudes of the TBAs towards their new role as found in this study.

Despite banning TBAs from attending to deliveries at home, some TBAs were nevertheless assisting women delivering at home. Sometimes this was done out of necessity, for example if it was insecure outside or if referral was not an option because the woman delayed to seek care. In line with our study, some studies have reported that women avoided going to the health facility by contacting the TBA when it is too late to refer [23, 24]. In conflict-ridden settings, insecurity can be a major barrier to service delivery and access [25]. Indeed, the existing fragile state of insecurity in South Sudan was restricting access to health facilities in the country [26]. Apart from human conflict, this study found that fear of attacks from wild animals was affecting the referral of women by TBAs. This fear forced TBAs to choose home delivery over braving a dangerous journey to the health facility at night.

Training, supervision and incentives have been reported as key strategies in changing the role of TBAs to become institutional delivery promoters [11, 15, 27]. It is thus not surprising that these issues emerged as challenges of integrating TBAs in the health system. Traditionally, in Yirol, as is in other parts of South Sudan, TBAs would receive monetary and non-monetary incentives when they assist women to deliver at home. Thus, their integration into the health system without sufficient compensation meant loss of a source of livelihood. In a study in Somaliland, TBAs were not happy after the incentives they were receiving ceased following the end of the project that was supporting them. This demonstrates the importance of ensuring a stable source of income to sustain the integration of TBAs in the health system. Although some TBAs were self-motivated and willing to continue to work even without an incentive, it is uncertain whether this is sustainable in the long term. Moreover, asking TBAs to abandon their traditional trade and source of income and expecting them to work as volunteers, sometimes over long hours and in a difficult and insecure environment, without a reasonable compensation raises ethical issues. Alternatively, WHO task-shifting recommendations have suggested interventions for maternal and newborn health that can be safely shifted to lay health workers if necessary to optimise health workers' roles. Such task-shifting strategy would expand the role of the TBAs in South Sudan and is likely to improve access to care and foster the integration of TBAs in the health system [16].

Although training of TBAs is important in integrating them in the health system as highlighted in this study, this alone may not be effective if the TBAs are not supervised [27]. In the present study, although some health facility staff were meeting with TBAs on a monthly basis, the health facility staff were unable not solve the fundamental challenges faced by TBAs. Thus, there was also need for frequent meetings between the TBAs and the CHD to promptly identify and troubleshoot the TBAs' challenges.

TBAs are ubiquitous in South Sudan and this is the first study on their integration in the health system. This study collected data from diverse sources including TBAs, CHWs, professional health workers and managers, VHC members and women. This, together with the triangulation of the data from the different sources ensured that the main issues and perceptions about changing the role of TBAs were captured. However, the study has some limitations. FGD facilitators were generally unskilled in qualitative research and required more training than could be provided given the available time and resources. Secondly, it is possible that some information was lost in translation and transcription. We minimised this by frequently providing feedback on the quality of the translation and clarifying unclear statements with help of the translators. Third, we excluded one *payam* because of insecurity. Although insecurity is likely to have a greater influence on the integration of TBAs in the excluded *payam*, the exclusion of this *payam* is unlikely to have affected our findings and conclusions. Finally, saturation of information should be the basis for determining the sample size in qualitative studies. However, for planning purposes and given the available resources, we determined *a priori* the number of KIIs and FGDs to conduct. To minimise the risk of not achieving saturation because of this approach, we decided to include a higher than the minimum number of subjects required to reach saturation. A number of studies have attempted to determine the required sample size to reach saturation in qualitative studies. For FGDs, the number ranges from 3 to 8 groups [28–30] whereas for interviews, the range is 9 to 16 [30–32]. Thus, our sample of 19 participants for KIIs and 17 FGDs was probably more than what was required to reach saturation. Although we did not formally check for saturation, we noted that the latter interviews and FGDs were yielding no more new information. Therefore, it is unlikely that our results and hence our conclusions would have changed by including more participants into the study.

Overall, the findings of this study suggest that there is a great opportunity to effectively integrate TBAs in the formal health system in Yirol West County through leveraging the factors that facilitate the adoption of new role by TBAs and by tackling the challenges they face in assuming their new role, including addressing the existing barriers to maternal health service access in the county. In addition to the recommendations made by the respondents, formal health workers need to be re-oriented on the new role of community-based integrated TBAs. This is so as to clear misconceptions and improve the supervision of the TBAs. The issuance of baby kits in health facilities should continue because it is synergistic to the work of the TBAs. To partly solve the problem of communication, the CHD should consider introducing toll-free health facility phone numbers. Similar studies in other parts of the country are warranted.

Supporting information

S1 Table. Number of institutional deliveries in Yirol West County before and after integration of traditional birth attendants in the health system. CHW, Community health Worker; PHCC, Primary health care centre; PHCU, primary health care unit; TBA, traditional birth attendant, SBA, skilled birth attendant.
(DOCX)

S2 Table. Consolidated criteria for reporting qualitative studies: 32-item checklist S1 File. Barriers faced by women in accessing institutional delivery care in Yirol West County, South Sudan.
(DOCX)

S1 File. Barriers faced by women in accessing institutional delivery care in Yirol West County, South Sudan.
(DOCX)

S2 File. Supporting information file 2.
(SAV)

S3 File. Supporting information file 3.
(SAV)

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Is a woolen cap effective in maintaining normothermia in low-birth-weight infants during kangaroo mother care? Results of a randomized controlled trial in low-resource settings

POSTER PRESENTATION

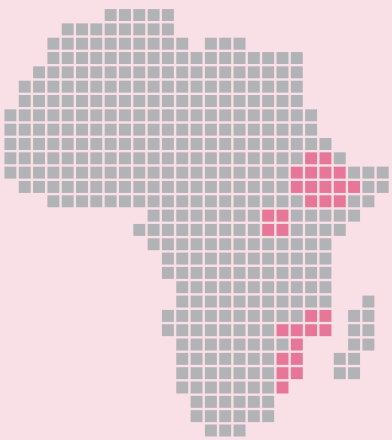
Conference
Pediatric Academic Societies | PAS 2017 Meeting

Location
San Francisco, United States

Presentation date
6th – 9th May 2017

Authors
Segafredo G., Cavallin F., Putoto G., Pizzol D., Serena T., Boscardin C., Manenti F., Varano S., Urso E., Lusiani M., Massavon W., De Vivo E., Immordino P., Wingi M.O., Trevisanuto D.

Focus country
Ethiopia, Mozambique, Uganda



Background
Kangaroo mother care (KMC) is a low-cost intervention that is recommended for temperature (T) maintenance. The World Health Organization (WHO) guidelines recommends the use of a cap during KMC.

Design and Methods
This is a multicenter, prospective, unblinded, randomized clinical trial. The study was conducted in three African hospitals: Aber Hospital in Uganda, Wolisso Hospital in Ethiopia, and Beira Hospital in Mozambique. After obtaining parental consent, 300 infants eligible to KMC with a birth weight below 2500 g were randomly assigned to KMC with (CAP) or without (NOCAP) woolen cap in a 1:1 ratio during the first week of life. Primary outcome was the time spent in the normal range T (36.5 37.5°C) during KMC. Axillary T was measured 4 times per day. Maternal and room T were also recorded. Secondary outcomes were: episodes of apnea, sepsis, mortality before discharge, in-hospital growth, age at discharge. All analyses were adjusted for cluster (hospital).

Results
Between December 2015 and September 2016, 150 infants were enrolled in the CAP and 150 in the NOCAP group: 60 at Aber, 150 at Beira and 90 at Wolisso. Median KMC room T was 27.9°C (IQR 25.4°C to 29.4°C). The recommended room T (≥ 25°C) was achieved in cases 77% of cases. At KMC admission median infant T was 36.6°C (IQR 36.1°C to 37.2°C). Mean time spent in normal T range was 55% (SD 24), with similar values in the two groups (p=0.28). However, multivariable analysis estimated a negative effect of cap on time spent with T in normal range (β -0.06; 95% C.I. -0.07 to -0.05; p=0.001; Table 2), adjusting for room T, maternal T, KMC adherence, birth weight, postnatal age and infant T at KMC admission. The cap had a positive effect on in-hospital growth (adjusted percentage of growth: 2.14; 95% C.I. 0.07 to 4.20; p=0.04), but not on the other secondary outcomes.

Conclusions
Our data suggest that the use of a woolen cap during KMC does not provide any advantage in maintaining normothermia in LBWI during first postnatal days in African low resource settings.

Saving lives at birth: the use of Birth Cushions (BCs) to increase facility deliveries in Uganda.

POSTER PRESENTATION

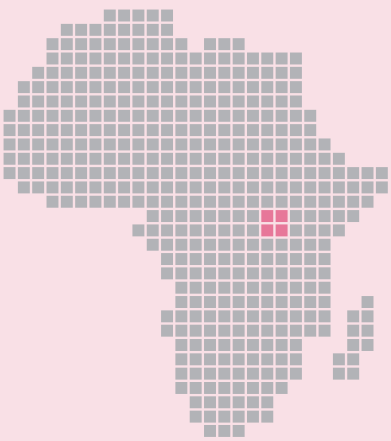
Conference
Saving Lives at Birth
DevelopmentXChange

Location
Washington D.C., United States

Presentation date
25th – 27th July 2017

Authors
Atzori A., Lochoro P.

Focus country
Uganda



Background and Aim
In Uganda, maternal mortality ratio (MMR) is at 343/100,000 live births (LB) and neonatal mortality rate (NMR) at 18.7/1,000 LB[2]. The Birth Cushions (BCs) is a low-cost and low technology innovation designed to offer a modified squatting position and to facilitate childbirth. It emulates traditional birth practices and is therefore more acceptable by women who respond by increasingly reaching heath facilities. The complete set is composed of a stool for midwife, a sitting cushion for the mother (the BC) and a baby-receiving cushion. In addition, it is observed as the use and the performance of BCs has increased the number of assisted deliveries in Health Facilities (HFs), thanks to its higher cultural acceptability.

Methods and Results
The concept was originally piloted in 2013 in only one HFs. When preference in this HFs was found to be at about 50%, BCs were further scaled to 20 facilities in 2014 and now in 81 HFs by 2016. Doctors with Africa CUAMM has distributed and successfully trialed a total of n.100 BCs in 81 HFs across the seven Districts composing Karamoja, where they have helped to increase significantly the volume of institutional deliveries (from 11,424 pre-intervention – 18% coverage – to over 25,592 – 52% coverage – in 2015).

Conclusions
While the actual contribution of BCs alone in increasing the number of assisted deliveries in HFs cannot be accurately quantified, but Doctors with Africa CUAMM will work with the Ministry of Health and District Health Authorities to carry out a validation project in 4 Districts of West Nile Region, in Uganda. BCs will prove to be an innovation with great life-saving potential particularly in low-resource settings in order to increase institutional deliveries and, in the way, contribute to reducing maternal and newborn mortality, in step with development priority of Uganda's Government.

SAVING LIVES AT BIRTH: THE USE OF A BIRTH CUSHION TO INCREASE FACILITY DELIVERIES IN UGANDA.

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BACKGROUND AND AIM

Most maternal and newborn deaths in developing country are preventable; however, the combination of barriers in access, insufficient skilled staff, socio-economic factors, traditional practices and lack of awareness often determine low utilization of safe delivery services[1].
In Uganda, maternal mortality ratio (MMR) is at 343/100,000 live births (LB) and neonatal mortality rate (NMR) at 18.7/1,000 LB[2]. Traditionally in Uganda, majority of the pregnant women deliver at home in kneel down or squatting position.
The Birth Cushions (BCs) is a low-cost and low technology innovation designed to offer a modified squatting position and to facilitate childbirth. It emulates traditional birth practices and is therefore more acceptable by women who respond by increasingly reaching heath facilities.
The complete set is composed of a stool for midwife, a sitting cushion for the mother (the BC) and a baby-receiving cushion. Doctors with Africa CUAMM first introduced BCs in partnership with UNICEF Uganda in Karamoja region in response to findings showing the low levels of institutional deliveries (27%) to be strongly determined by traditional norms[3].
In addition, it is observed as the use and the performance of BCs has increased the number of assisted deliveries in Health Facilities (HFs), thanks to its higher cultural acceptability.

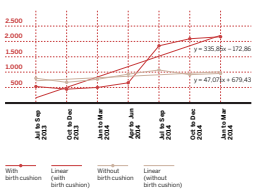
METHODS AND RESULTS

The concept was originally piloted in 2013 in only one HFs. When preference in this HFs was found to be at about 50%, BCs were further scaled to 20 facilities in 2014 and now in 81 HFs by 2016.
Doctors with Africa CUAMM has distributed and successfully trialed a total of n.100 BCs in 81 HFs across the seven Districts composing Karamoja, where they have helped to increase significantly the volume of institutional deliveries (from 11,424 pre-intervention – 18% coverage – to over 25,592 – 52% coverage – in 2015).
Despite the lack of an aggressive public BCC campaign, between 2014 and 2016, BC delivery preference has risen from 14% (n.1,100) to 29% (n.5751), and over 3,000 BC deliveries have been successfully carried out so far, without direct related complications.

CONCLUSIONS

While the actual contribution of BCs alone in increasing the number of assisted deliveries in HFs cannot be accurately quantified, the graph does show clearly higher increases in cushion facilities compared to non-cushion.
Doctors with Africa CUAMM will work with the Ministry of Health and District Health Authorities to carry out a validation project in 4 Districts of West Nile Region, in Uganda. If the result is definitely positive, CUAMM will scale up this innovation nationally.
The success of the BCs as "pull factor" compelling more women to deliver in health facility settings will be measured by the number of women delivering in health facilities over the total number of expected deliveries in the catchment area of a given facilities. BCs will prove to be an innovation with great life-saving potential particularly in low-resource settings in order to increase institutional deliveries and, in the way, contribute to reducing maternal and newborn mortality, in step with development priority of Uganda's Government.

CHANGES IN INSTITUTIONAL DELIVERIES WITH AND WITHOUT BIRTH CUSHIONS



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utilisation and quality of maternal and neonatal health care services in Karamoja region, Uganda: a health facility-based survey, in Biomed Central Reproductive

Plasmodium falciparum malaria complicated by acute acalculous cholecystitis (AAC)

POSTER PRESENTATION

Original Title
Malaria da P. Falciparum complicata da colecistite acuta alitiasica (CAA)

Conference
XIV ONSP Days Ancona 2017 – Osservatorio Nazionale Specializzandi in Pediatria *(Italian Association of Pediatric Trainees)*

Location
Ancona, Italy

Presentation date
27th – 30th September 2017

Authors
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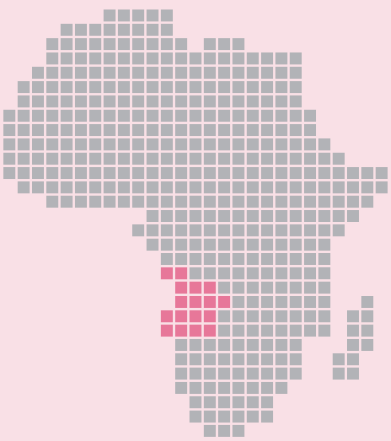
Focus country
Angola



Case Report
F., 13 years old, presented to Angola's Chiulo Hospital with a four-day history of fever and headache. A physical examination found that the patient was pale and agitated, with hepatomegaly and generalized tenderness of the abdomen. A rapid diagnostic test for *Plasmodium falciparum* produced a positive result, and treatment was begun with intravenous quinine. Despite an overall improvement in the patient's conditions, after four days she was still feverish and her abdomen was still tender on palpation, especially in the right-upper quadrant, with positive Murphy's and negative Blumberg's signs. Abdominal ultrasonography revealed a distended gallbladder containing biliary sludge and slight pericholecystic fluid. AAC was diagnosed and treatment begun with intravenous ciprofloxacin and metronidazole. Five days later the patient was discharged, having been advised to continue to take ciprofloxacin and metronidazole orally for 10 days. On her follow-up visit the patient was found to be in good overall condition, with ultrasonography revealing abdominal normalization.

Discussion
Thirty to fifty percent of cases of cholecystitis in the pediatric population are AAC. The condition can be associated with various comorbid conditions, the most common of which are systemic infections including abdominal trauma, congestive heart failure, diabetes and neoplasias. An association with malaria in the pediatric population has been described in only six cases, all of which imported from Plasmodium-endemic areas. The diagnostic gold standard for AAC is ultrasonography, which reveals thickening of the gallbladder wall (present in 100% of cases), the presence of biliary sand, a distended gallbladder and the presence of pericholecystic fluid. The prognosis is generally favorable, with resolutions of the symptoms through pharmaceutical therapy and treatment of the underlying condition; only rarely is surgery required.

Malaria da P. Falciparum complicata da colecistite acuta alitiasica (CAA)

C. Pini [1], G. Putoto [2], G.P. Pellizzer [2], F. Battisti [2]

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Case Report F, 13 anni, giunge all'ospedale di Chiulo (Angola) per febbre e cefalea da quattro giorni. All'esame obiettivo sono presenti pallore, agitazione, epatomegalia e dolorabilità addominale diffusa. Il test rapido per P. Falciparum è positivo; viene intrapresa terapia con Chinino EV. Nonostante il miglioramento delle condizioni generali, 4 giorni dopo la paziente è ancora febbrile e l'addome è dolorabile alla palpazione, soprattutto nel quadrante superiore destro con positività del segno di Murphy e negatività del Blumberg. All'ecografia dell'addome, è presente una colecisti distesa con presenza di sludge biliare e modesto versamento pericolecistico. Viene fatta diagnosi di CAA; viene iniziata la terapia con Ciprofloxacina e Metronidazolo EV. Ciqnue giorni più tardi, la paziente viene dimessa a domicilio con l'indicazione a continuare la terapia con Ciprofloxacina e Metronidazolo PO fino a completare 10 giorni di terapia. Alla visita di follow-up la ragazza è in buone condizioni generali e l'ecografia dell'addome si è normalizzata.

Commento La CAA rappresenta il 30-50% dei casi di colecistite nella popolazione pediatrica. Può associarsi a diverse condizioni morbose tra cui la più frequente è rappresentata dalle infezioni sistemiche [1]; tra le altre, traumi addominali, insufficienza cardiaca congestizia, diabete e neoplasie. L'associazione con la malaria è stata descritta, nella popolazione pediatrica, solo in sei casi, tutti di importazione [2]. Il gold standard diagnostico è l'***ecografia*** che evidenzia inspessimento della parete della colecisti (presente nel 100% dei casi), presenza di sabbia bilare, distensione della colecisti e presenza di versamento pericolecistico [3]. La prognosi è generalmente favorevole con risoluzione della sintomatologia tramite la terapia medica e il trattamento della condizione di base; solo in rari casi è necessario il ricorso alla chirurgia.

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2. *Acalculous Cholecystitis in a Pediatric Patient with Plasmodium falciparum Infection: A Case Report and Literature Review.* **Aguilera-Alonso, D. et al.** (in press), Pediatr Infect Dis J.
3. *Acute Acalculous Cholecystitis in Children: Diagnosis and Treatment.* **Imamoglu, M. et al.** 1, Jan 2002, Journal of Pediatric Surgery, Vol. 37, pp. 36-39.

“Mothers and Children First” at Tosamaganga DDH: 5 years experience of Doctors with Africa CUAMM and new perspectives

POSTER PRESENTATION

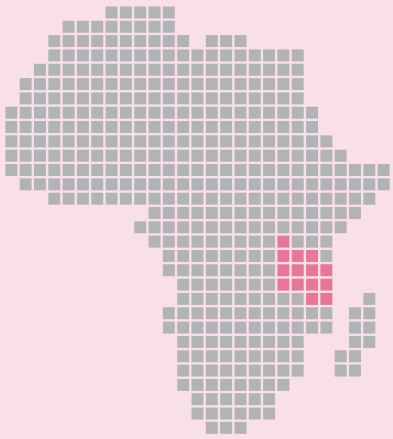
Conference
4th Tanzania Health Summit

Location
Dar es Salaam, Tanzania

Presentation date
14th – 16th November 2017

Authors
Torelli G., Azzimonti G., Maziku D., Joice A., Mkolomi R., Capuzzo M., Gambalonga R., Manenti F., Putoto G., Carraro D.

Focus country
Tanzania



Abstract

Despite significant gains in recent years, maternal and newborn death rates remain unacceptably high in Tanzania. During the last 5 years (2012-2016), in the context of the program “Mothers and Children First”, Doctors with Africa CUAMM has implemented several integrated RMNCH interventions on maternal, newborn and child health, the pivot of these actions in Iringa D.C.
Aim of the program was to contribute at the reduction of maternal and newborn mortality by addressing accessibility, equity and quality at the Council Designated District Hospital (DDH) of Tosamaganga and in 6 health centres (HC) of Iringa D.C.

From 2012 to 2016, the number of total deliveries at Tosamaganga DDH increased from 2145 (21% complicated) to 2838 (26% complicated), direct obstetric case fatality rate decreased from 2.9% to 0.27%, perinatal mortality rate from 58/1000 to 29/1000, very early neonatal mortality rate from 13/1000 to 5/1000. A nutritional unit has been also started: in 2016 the number of admission were 265 with a mortality rate of 10,3%.

At the HC level, the specific objective was to guarantee effective and quality of Basic Emergency Obstetric and Newborn care (BEmONc). In 2016, 1173 deliveries were performed in the 6 HCs and 179 were the cases referred at the hospital level; no maternal or newborn death were recorded in addition to 1 still birth. Three Maternity Waiting Homes (MWH) have been also established in these HC, mainly dedicated to women residing in remote area or at risk of complicated deliveries. From October 2014 to December 2016, 400 women were hosted and supported by CUAMM with essential tools and food.

The second five year phase of the project “Mothers and Children First” (2017-2021) has just started with new goals. In addition to the consolidated objectives of contributing at the reduction of maternal and newborn mortality and guaranteeing free care for complicated deliveries, we now also aim at ensuring nutrition support during pregnancy until 2 years of age (the 1000 days), in order to prevent and cure acute and chronic malnutrition starting from the most critical phases of child development.

Maternal health in Sierra Leone's Pujehun District: use of "met need" and "unmet obstetric need" indicators to identify inequalities in obstetric emergency care

POSTER PRESENTATION

Original Title
Salute materna in Sierra Leone, distretto di Pujehun. Utilizzo degli indicatori "met need" e "unmet obstetric need" per individuare le disuguaglianze nel trattamento delle emergenze ostetriche

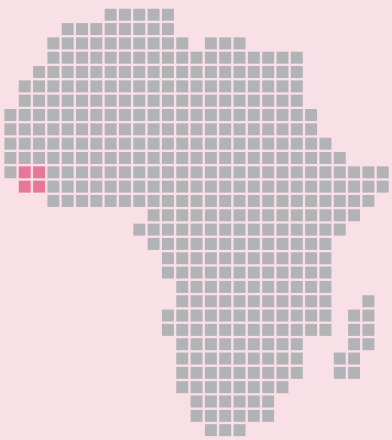
Conference
50° Congresso Nazionale SItI – Società Italiana di Igiene, Medicina Preventiva e Sanità Pubblica
(50th National Conference of the Italian Society of Hygiene, Preventive Medicine and Public Health)

Location
Turin, Italy

Presentation date
22nd – 25th November 2017

Authors
Valente N., Tognon F., Stancari L., Putoto G., Stefanati A., Gabutti G.

Focus country
Sierra Leone



Background
Maternal mortality is a major global public health issue, especially in sub-Saharan Africa. The most commonly-used indicator worldwide is the maternal mortality ratio (MMR), which in Sierra Leone is 1,360 maternal deaths per 100,000 live births. Other indicators used in developing countries include "met need" and "unmet obstetric need" (UON). "Met need" measures the number of women with MDOC who receive emergency obstetric care in health facilities compared to the number of women expected to need such care. The UON indicator is calculated as the difference between the number of women in need of emergency obstetric surgery and the number of women actually treated in health facilities providing these services.

Materials and Methods
We evaluated medical records from the maternity hospital in Pujehun, Sierra Leone, dated from 1 January 2015 to 31 December 2016. Criteria for inclusion in the study were all pregnancies with MDOCs noted in the records. The data was analyzed with STATA 14 software, using the Pearson's chi-squared test (χ^2) to compare the findings from the two years taken into consideration by the study ($p < 0,05$).

Results
Out of a total of 1,388 women, 676 cases of MDOC were recorded in 2015 and 768 in 2016 (p=0,019). "Met need" in the district was 31.4% in 2015 and 35% in 2016 (p=0,009). The number of absolute maternal indications (AMI) extracted was 253 in 2015 and 232 in 2016 (p=0,001) and major obstetric interventions (MOI) for each AMI were 193 in 2015 and 140 in 2016. The UON indicator was 11.6% in 2015 and 36.8% in 2016.

Conclusions
The "met need" indicator produces values that are too low in light of the network of services that has been set up in the Pujehun District (76% assisted deliveries by skilled birth attendants); the likely cause is probably linked to the reference percentage (15% of expected pregnancies). The UON indicator appears to provide a more accurate reflection of the work being carried out in the district, with MDOC coverage of 88% and 63% in the two years taken into consideration by the study.

SALUTE MATERNA IN SIERRA LEONE, DISTRETTO DI PUJEHUN. UTILIZZO DEGLI INDICATORI "MET NEED" E "UNMET OBSTETRIC NEED" PER INDIVIDUARE LE DISUGUAGLIANZE NEL TRATTAMENTO DELLE EMERGENZE OSTETRICHE

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INTRODUZIONE: La mortalità materna rappresenta uno dei principali problemi per la sanità pubblica internazionale, in particolare per l'Africa Sub-Sahariana, con una stima di più di 300.000 morti materne ogni anno a livello mondiale.
L'OMS sottolinea come la maggior parte dei decessi avvenga a causa di 7 complicanze direttamente collegate alla gravidanza (MDOC – Major Direct Obstetric Complications); si stima che il 15% delle gravidanze possa andare incontro ad una di queste complicanze. L'indicatore più utilizzato a livello internazionale per misurare il problema è il tasso di mortalità materna (MMR) definito come il numero di morti materne per 100.000 nati vivi. Spesso però questo dato, stimato a livello nazionale, risulta poco affidabile e difficilmente confrontabile con il numero effettivo di morti materne registrato nei diversi distretti nei paesi a basse risorse. Occorrono quindi indicatori più affidabili per identificare le mancanze e monitorare i progressi degli interventi per diminuire la mortalità materna nei paesi a basso reddito; alcuni di questi sono il Met need e Unmet Obstetric Need (UON).
Il 'Met need' stima le donne con MDOC che vengono trattate nei centri sanitari rispetto a tutte le MDOC attese. L'indicatore UON è calcolato come la differenza tra il numero di donne che necessiterebbero di chirurgia ostetrica (stimato come il 1,4% delle gravidanze attese) e il numero di donne che hanno effettivamente beneficiato dei servizi sanitari, stimando così i bisogni di salute non soddisfatti [UON=(EB * RR) – MOI per AMI]

MATERIALI E METODI: Sono state valutate le cartelle cliniche dal 1° Gennaio 2015 al 31 Dicembre 2016 dell'ospedale di Maternità di Pujehun, Sierra Leone. Criteri di inclusione nello studio sono state tutte le gravidanze con MDOC segnalate in cartella clinica. I dati sono stati analizzati utilizzando il software STATA 14, con l'utilizzo del Pearson's Chi Square ($\chi 2$) per confrontare i risultati dei due anni considerati ($p < 0,05$).

RISULTATI: Su un totale di 1.388 donne, il numero di MDOC registrate è stato 676 nel 2015 e 768 nel 2016 (p=0,019). **Considerando il numero totale delle ammissioni in ospedale nel 2015 il 52,5% e nel 2016 il 50,6% delle donne sono state ricoverate per cause legate a MDOC. La distribuzione delle diverse complicanze, secondo la classificazione dell'OMS, è descritta in tabella 1**. Il Met Need nel distretto è risultato pari a 31,4% nel 2015 e 35% nel 2016 (p=0,009). Sono state estratte le "Absolute Maternal Indication – AMI" pari a 253 nel 2015 e 232 nel 2016 (p=0,001) e i principali interventi ostetrici (MOI) per ciascuna AMI, pari a 193 nel 2015 e 140 nel 2016. L'indicatore UON è risultato pari a 11,6% nel 2015 e 36,8% nel 2016 (Tab. 2).

MDOC	2015 N (%)	2016 N (%)	p-value
N° MDOC totale	676	768	0,019
Emorragie - Preparto - Postparto	137 (20,3%) 84 (12,4%) 53 (7,8%)	163 (21,2%) 82 (10,7%) 81 (10,5%)	0,654
Parto ostruito	351 (51,9%)	415 (54%)	0,422
Sepsi postparto	31 (4,6%)	21 (2,7%)	0,060
Complicazioni da aborto	55 (8,1%)	58 (7,6%)	0,680
Severa Pre-eclampsia/eclampsia	68 (10,1%)	92 (12%)	0,246
Gravidanza ectopica	22 (3,3%)	7 (0,9%)	0,002
Rottura d'utero	12 (1,8%)	12 (1,6%)	0,752

Tab. 1: MDOC registrate negli anni 2015-2016 nell'ospedale di Pujehun

Indicatori	2015	2016	p-value
Met Need per EmOC	**31,4%**	**35%**	0,009
C/S rate	2,5%	2,5%	0,715
Direct obstetric fatality rate	0,91%	1,41%	0,389
U.O.N	11%	36%	-

Tab. 2: Calcolo degli Indicatori 2015-2016

CONCLUSIONI: La mortalità materna (in Sierra Leone pari a 1.360/100.000) nel Distretto di Pujehun porta a calcolare nei due anni considerati 189 e 193 morti materne, a fronte delle 15 e 29 morti registrate con il sistema di sorveglianza distrettuale. Oltre al MMR occorrono ulteriori indicatori che analizzino come vengono intercettate e trattate le complicanze durante la gravidanza, il parto e che possano essere in grado di misurare l'impatto degli interventi sanitari per ridurre la mortalità materna. Il Met Need risulta avere valori troppo bassi rispetto all'accesso ai servizi del Distretto; negli anni considerati, infatti, vi è stata una media del 75% di parti assistiti da personale qualificato. La causa di questa discrepanza è probabilmente da ricercare nella percentuale di riferimento (15% delle gravidanze attese), valore probabilmente sovrastimato, anche nei paesi in via di sviluppo. L'indicatore UON sembra dare un'immagine più fedele dell'operato del Distretto, con una copertura delle MDOC dell'88% e del 63% nei due anni considerati. Il calcolo di questo indicatore risulta rapido e semplice se i dati sono accessibili e raccolti adeguatamente. Limite dell'indicatore è invece la qualità del dato riguardante la diagnosi delle AMI; per via delle scarse possibilità diagnostiche, ma anche di precise indicazioni relative alle AMI stesse. Vi è la necessità, a livello locale, di aumentare la formazione per una corretta indicazione diagnostica nelle cartelle cliniche sia delle MDOC che delle AMI al fine di una migliore valutazione della casistica totale.

50° Congresso Nazionale SItI – Torino, 22-25 Novembre 2017

Congenital anomalies in developing countries: a retrospective study at Beira Central Hospital (Mozambique)

POSTER PRESENTATION

Original Title
Malformazioni congenite nei paesi in via di sviluppo: uno studio retrospettivo presso l'ospedale centrale di Beira (Mozambico)

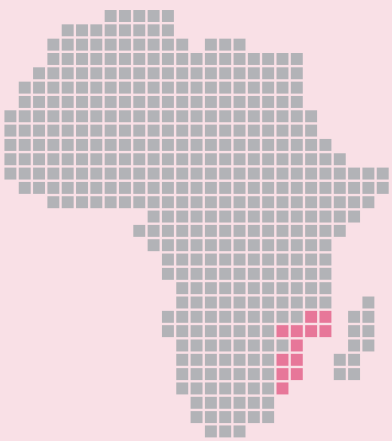
Conference
6° Congresso Nazionale AMIETIP – Accademia Medica e Infermieristica di Emergenza e Terapia Intensiva Pediatrica *(6th National Congress of the Italian Academy of Emergency Medicine and Pediatric Intensive And Critical Care)*

Location
Rimini, Italy

Presentation date
23rd – 25th November 2017

Authors
Cavaliere E., Brugnolaro V., Muhelo A., Wingi O., Alfanete M., Pizzol D., Trevisanuto D.

Focus country
Mozambique



Background
Although congenital anomalies (CAs) are one of the main causes of neonatal and infant mortality and morbidity, especially in developing countries, very little literature exists on the epidemiology of CAs in such settings. Here we present an initial descriptive study of CAs in Mozambique's Beira Central Hospital (BCH).

Methods
This retrospective study included all newborns with a certain or suspected diagnosis of CA hospitalized in BCH's neonatology unit from January 2015 to December 2016. We analyzed the following variables: gender, birth weight, gestational age, Apgar score, type and place of delivery, information about the mother of the newborn, diagnosis, comorbidities, complications, treatment and outcome.

Results
The study involved 151 newborns (58% male, 56% low birth weight). Thirty-five percent of them were delivered in BCH, 52% in health facilities and 11% at home (unattended delivery). Eighty-two percent of the deliveries were eutocic. With regard to the mothers, 20% were adolescent while 11% were 36 years old or older, 22% were HIV-positive and 11% were being treated with highly active antiretroviral therapy (HAART). In the newborn population studied, 25% were born preterm, 39% were small for their gestational age (SGA) and 31% were clinically diagnosed with asphyxia. Oxygen therapy was required for 69.5% of the newborns, first-line antibiotic treatment (penicillin and aminoglycoside) for 83.4% and corrective surgery was done on 29.1%. 49.7% died during hospitalization.

Conclusions
The epidemiology of the CAs that we investigated at the BCH is comparable to that described by the literature in other developing countries. All of the cases were diagnosed postnatally, and the prognosis for this group of pathologies was extremely unfavorable, with a nearly 50% premature mortality rate. The variability of CAs underscores the need for a multidisciplinary approach to their clinical management, as well as for prospective data collection; indeed, a shared registry is now being planned.

MALFORMAZIONI CONGENITE NEI PAESI IN VIA DI SVILUPPO: UNO STUDIO RETROSPETTIVO PRESSO L'OSPEDALE CENTRALE DI BEIRA (MOZAMBICO)

AUTORI:
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3. Unidade Operacional de pesquisa, Médicos com África, CUAMM.

INTRODUZIONE
Le malformazioni congenite (MC) sono una delle principali cause di mortalità e morbidità neonatale e infantile, in particolare nei Paesi in via di sviluppo (PVS). Ad oggi, la letteratura disponibile sull'epidemiologia delle MC nei PVS è molto scarsa.
Presentiamo un primo studio descrittivo sulle MC nell'Ospedale Centrale di Beira (HCB) in Mozambico.

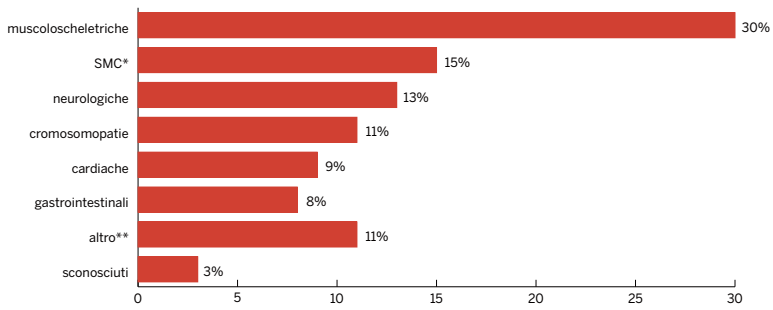
OBIETTIVO PRIMARIO
Conoscere l'epidemiologia delle malformazioni congenite nell'HCB

METODI
Questo studio retrospettivo ha incluso tutti i neonati con diagnosi, certa o sospetta, di MC ricoverati nella Neonatologia dell'HCB da Gennaio 2015 a Dicembre 2016. Sono state analizzate le seguenti variabili: sesso, peso alla nascita, età gestazionale, indice di Apgar, parto (tipo e luogo), informazioni sulla madre (età, sierologie per HIV, sifilide, farmaci in gravidanza), diagnosi, comorbidità, complicanze, trattamento, esito. L'analisi dei dati è stata eseguita usando il programma Excel®.

RISULTATI
Lo studio ha incluso 151 neonati (58% di sesso maschile, 56% con basso peso alla nascita). Di questi il 35% è nato nell'HCB, il 52% nei centri di salute, l'11% in casa (parto non assistito). Nell'82% dei casi il parto è stato eutocico.
Per quanto riguarda le madri: il 20% era adolescente e l'11% aveva oltre 36 anni, il 22% era HIV-positivo, l'11% in terapia con HAART.
Nella popolazione studiata, il 25% era pretermine, il 39% era piccolo per età gestazionale, il 31% presentava una diagnosi clinica di asfissia.
Sul piano diagnostico, le MC presentavano la distribuzione rappresentata nella fig 1.
Il 69,5% dei casi ha avuto bisogno di terapia con ossigeno; l'83,4% di terapia antibiotica di prima linea (penicillina e aminoglicoside), e il 29,1% è andato incontro a una chirurgia correttiva. Il 49,7% decedeva durante il ricovero.

CONCLUSIONI
L'epidemiologia riscontrata nell'HCB è sovrapponibile a quella descritta in letteratura in altri PVS.
Tutti i casi di MC hanno avuto una diagnosi postnatale e, con una mortalità precoce di quasi il 50%, la prognosi di questo gruppo di patologie è altamente infausta.
La variabilità delle MC sottende la necessità di un approccio multidisciplinare per la gestione clinica. Necessaria inoltre una raccolta prospettica dei dati: un registro condiviso è infatti già in fase di progettazione.

Figura 1: Distribuzione delle MC nell'HCB (01.01.15 - 31.12.16)



SMC*: SINDROME MALFOMATIVA COMPLESSA
ALTRO**: MISCELLANEA TRA MALFORMAZIONI MAXILLOFACCIALI, ORL, UROGENITALI, OFTALMOLOGICHE, ONCOLOGICHE E DERMATOLOGICHE

Thermal effect of a woolen cap in low birth weight infants during kangaroo mother care

POSTER PRESENTATION

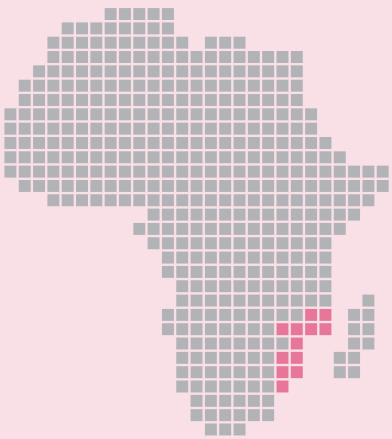
Conference
6° Congresso Nazionale AMIETIP – Accademia Medica e Infermieristica di Emergenza e Terapia Intensiva Pediatrica *(6th National Congress of the Italian Academy of Emergency Medicine and Pediatric Intensive And Critical Care)*

Location
Rimini, Italy

Presentation date
23rd – 25th November 2017

Authors
Trevisanuto D., Putoto G., Pizzol D., Serena T., Manenti F., Massavon W., Tsegaye A., Wingi O., Cavallin F.

Focus country
Mozambique



Introduction and Aim
Sub-Saharan Africa holds one of the highest neonatal mortality rates, predominantly due to preterm birth complications. Neonatal hypothermia is associated with morbidity and mortality, especially in preterm. Preventing neonatal hypothermia is fundamental in low-resource settings where supportive care is limited. During Kangaroo mother care (KMC), the World Health Organization guidelines recommend to cover the head, but this practice is not consistently followed. The aim of the present study was to assess the effectiveness and safety of using a woolen cap in maintaining normothermia in LBWI during KMC.

Methods
The study was carried out in three African hospitals. In the participating hospitals, KMC represents a standard of care, but babies' heads often remain uncovered. Infants satisfying the inclusion criteria were inclused. The study was approved by the Ethics Committees for Human Investigation of the three participating hospitals, too.

Results
Three hundred LBWI candidate for KMC in three African hospitals were randomly assigned to KMC with (CAP) or without (NOCAP) woolen cap in a 1:1 ratio during the first week of life. Mean time spent in normal temperature range was 55% (SD 24) in CAP and 56% (SD 24) in NOCAP groups. Multivariable analysis estimated a rate ratio of 0.92 (95% C.I. 0.84 to 1.00; p=0.06) for the effect of the cap vs. no-cap on time spent in normal temperature range. The use of a woolen cap is safe but does not provide any advantages in maintaining LBWI in normal thermal range during KMC in African low-resource settings. LBWI spent only half of the time in the normal temperature range during KMC despite warm rooms and skin-to-skin contact.

Conclusions
More efforts should be directed to new strategy in maintaining normotermia in LBWI in low-resource settings, essential target to aim the Millennium Develompment Goal 4.

Infectious and tropical diseases

Giant rhinophyma in low-resource setting: a case report

PAPER

Authors
Antunes M., Frasson G., Ottaviano G., Schiavone M., Pizzol D.

Published in
International Journal of Dermatology, 2017 June

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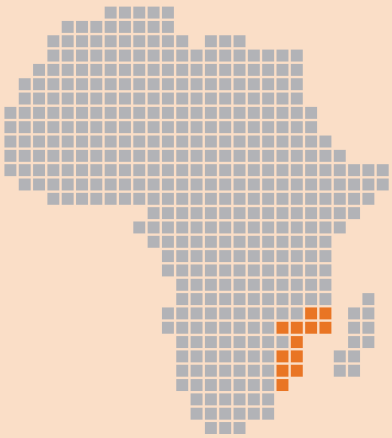
Topic
Infectious and tropical diseases

Focus country
Mozambique



This paper is not available as open access, which is why only an abstract is posted. If you would like to read the entire paper, please go to the web page given and follow the instruction.

Abstract

Rhinophyma is a progressive disorder that deforms the nose, considered the end phase of rosacea. The disorder involves the distal part of the nose increasing in size due to the formation of large inflammatory nodules. A variety of treatments and approaches have been offered to manage rhinophyma, specifically surgery for the most severe, intractable cases. Surgical treatment is an advanced solution that is not always available in low-income countries, where the only solution to the disorder is surgery for excision, followed by electrocoagulation and skin grafting.

The article describes the management and treatment of a case of rhinophyma in a patient at Central Hospital of Beira in Mozambique, with satisfactory results.

The health system still needs to be strengthened to prevent and treat the disorder and close the current gap between traditional and conventional medicine.

International Journal of Dermatology

Case report

Giant rhinophyma in low-resource setting: a case report

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Introduction

Rhinophyma is considered the final stage of evolving acne rosacea and is characterized by skin thickening and painless hyperplasia of the sebaceous glands and connective tissue, leading to progressive nose skin deformity which causes an enlargement of the lower two-thirds of the nose.[1,2] It can also affect the chin (gnatophyma) as well as the forehead (metophyma), eyelids (blepharophyma), or ears (otophyma).[3,4] Although acne rosacea is a common disease with a prevalence ranging from 0.5 to 10%, affecting women mainly, rhinophyma mostly occurs in men with a ratio of male to female patients ranging from 12:1 to 30:1, maybe due to their androgenic influence.[2] Rhinophyma is mostly seen in men over 40 years of age.[4]

Currently, etiology is still unclear, and it is likely to be a multifactorial mechanism leading to unregulated superficial vasodilatation and, consequently, chronic edema, inflammation, fibrosis, and hyperplasia.[5] Moreover, alcohol and caffeine consumption, sun damage, and sun exposure are considered to be exacerbating factors due to their vasodilatation properties.[5] Pathological mechanisms of rosacea are due to an exacerbated response by innate immunity to environmental stimuli such as UV, microorganisms, and physical and chemical trauma. It seems that the main role in pathogenesis is played by abnormal vascular reactivity.[4]

The diagnosis is clinical, but histopathology is useful not only in confirmation but also to exclude malignancies as basal cell carcinoma (occurring from 3 to 10% of rhinophyma cases) and other types of skin cancers as granuloma eosinophilicum, angiosarcoma, sarcoidosis, sebaceous carcinoma, adenoid and squamous cell carcinoma, lymphoma, and sebaceous adenoma.[2,6] A spontaneous regression of rhinophyma is rare.[2] Late stages of rhinophyma present only in low-income countries today, where patients have no possibility to treat the disease early. For these patients, two types of treatment are available: medical and surgical therapy. Oral isotretinoin seems to be an effective and well-tolerated treatment by reducing facial cutaneous blood flow and sebaceous gland growth. Daily doses of isotretinoin range from 0.2 mg/kg to 1 mg/kg, generally for 6 months.[3,4,7] Surgery is reserved for advanced stages of rhinophyma and is considered the optimal treatment. The surgery aim is to remove the hypertrophied sebaceous glands, with subsequent normalization of nasal contour. Two different surgical approaches have been described in literature.[3,8] The first one

Social determinants of therapy failure and multi drug resistance among people with tuberculosis: A review

PAPER

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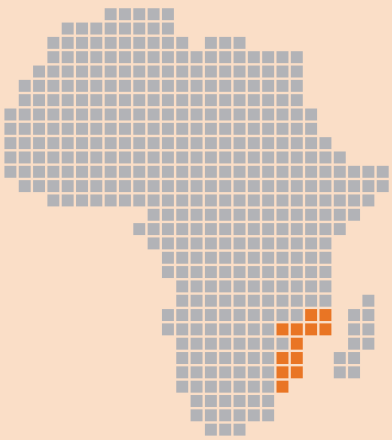

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Abstract

Social determinants influence health and the development of infectious diseases, including tuberculosis (TB). However, a paucity of data is available considering the relationship of social determinants influencing therapy failure and multi drug resistance (MDR). A review was therefore conducted to investigate the relationship of common social determinants on therapy failure and MDR in people with TB.

Fifty studies were conducted in Asia, Europe and Africa with a total of 407,555 participants with TB. Analysis demonstrated that low income, low education, and alcohol abuse were associated with therapy failure for TB. Similarly, these factors also influence MDR in TB.

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Review

Social determinants of therapy failure and multi drug resistance among people with tuberculosis: A review

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ABSTRACT

Background: Social determinants influence health and the development of tuberculosis (TB). However, a paucity of data is available considering the relationship of social determinants influencing therapy failure and multi drug resistance (MDR). We conducted a review investigating the relationship of common social determinants on therapy failure and MDR in people with TB.

Methods: PubMed and SCOPUS were searched without language restrictions until February 02, 2016 for studies reporting the association between socioeconomic factors (income, education and alcohol abuse) and therapy failure or MDR-TB. The association between social determinants and outcomes was explored by pooling data with a random effects model and calculating crude and adjusted odds ratios (ORs) ±95% confidence intervals (CIs).

Results: Fifty studies with 407,555 participants with TB were included. Analysis demonstrated that low income (unadjusted OR = 2.00 (95% CI: 1.69–2.38; I^2 = 88%; 33 studies, adjusted OR 1.77, $p < 0.0001$), low education (unadjusted OR 2.11, 95% CI 1.55–2.86, 26 studies, adjusted OR 1.69, $p < 0.0001$) and alcohol abuse (unadjusted OR = 2.43 (95% CI: 1.56–3.80, 16 studies, adjusted OR 2.13, $p < 0.0001$) were associated with therapy failure. Similarly, low income (unadjusted OR = 1.67; 95% CI: 1.12–2.41, $p = 0.006$; 14 studies, adjusted OR 2.16, $p < 0.0001$) and alcohol abuse (unadjusted OR = 1.88; 95% CI: 1.18–3.00, 7 studies, adjusted OR 1.43, $p = 0.06$) were associated with MDR-TB. Increasing age of the population was able to explain a consistent part of the heterogeneity found.

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Development Cooperation: Which Role in Combating Tuberculosis?

PAPER

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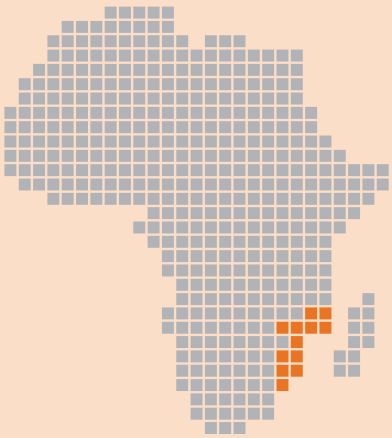

Abstract

Tuberculosis (TB) remains one of the top ten causes of death worldwide. An estimated 10.4 million people were diagnosed with TB worldwide in 2015, and incidence and mortality rates are significantly higher in low and middle income countries.

For this reason, a number of collaborations were started to reduce the rate of people suffering from TB. For this reason, we need to strengthen both treatment and prevention of TB by health education and awareness raising. People are often reluctant to be tested for TB out of fear of marginalization. Other critical points include the high cost of care and inadequate level of health care workers.

A multidisciplinary approach is therefore needed to fight TB and one that is dynamic and suits the setting where we work. Development cooperation could have a major impact on social, clinical, and scientific levels. The challenge is to be immersed in the context, gain the trust of health workers and local authorities, and pass on their quality knowledge. This is the only way to ensure a sustainable, lasting, and high impact intervention.

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Letter to Editor OMICS International

Development Cooperation: Which Role in Combating Tuberculosis?

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Dear Editor

Despite the years go by, Tuberculosis (TB) remains one of the top ten causes of death worldwide [1]. It has been estimated that in 2015 10.4 million people were diagnosed with TB worldwide, causing 1.8 million deaths. The incidence and mortality rates are significantly higher in low and middle income countries; in particular, over 90% global TB cases and deaths occur in developing countries. [2]. For these reasons, the entire healthcare communities of these countries are devoted to fighting TB, and the cooperation among various healthcare organizations play a key role in the process. The post-2015 global tuberculosis target aims to reduce TB incidence by 90% by 2035 [3]. The WHO urges the developing countries to provide integrated patient-centered care and prevention, bold policies, and supportive systems, research and innovation [3]. We believe these approaches are an effective means to achieve the goals in fighting TB, and healthcare cooperation is essential in driving these changes. But how can these goals are achieved? A rapid social and healthcare acceleration will surely bring forth challenges amongst the poor and socially excluded groups. Thus, many aspects in life, healthcare, economy and diseases are closely interwoven in fighting and eradicating TB [4].

A pharmacological approach alone is unlikely to be sufficient to eradicate TB and synergistic actions are needed. Expanding care, strengthening prevention, and intensifying research will be central of health programs.

Accurate information dissemination and healthcare education play a central role in disease intervention. In low-income countries, heath care has to deal with many socio-cultural aspects as myths, superstitions and traditional healers that turn away patients from conventional medicine. Moreover, people are often reluctant to be to be tested for TB in fear of marginalization.

From a clinical point of view, in low-income countries, there is the highest burden of disease and the lowest health care resource both in in terms of health workers and infrastructures. For an effective and appropriate approach in order to eradicate or, at least contain TB, it is mandatory to improve and increase efforts in terms of early and reliable diagnosis, appropriate management and effective follow-up. In our opinion, these goals can be achieved by joint efforts through cooperation of all healthcare providers in order to increase the number of competent healthcare workers and to standardize the medical procedures. In particular, facilitated diagnosis of TB would be pivotal to fight TB, especially in low income countries where incidence is high and radiological techniques are scarce. Chest ultrasonography (CUS) is becoming an attractive non-invasive medical imaging modality for resource-limited settings, [5] where radiological equipment and expertise are scarce. Chest ultrasound may become a tool for TB diagnosing in low settings and research has a crucial role in developing new diagnostic methods.

In fact, although we face with little research capacity in low-income settings, operational research could play a crucial role in TB fighting. Through a scientific approach we can achieve many results: 1) to assess TB burden, including risk factors, at risk hotspot and associated diseases; 2) to reduce the gap between demand and healthcare delivery, identifying the best strategy and evaluating the effectiveness of intervention; 3) to increase local staff capacity building and, thus, convey appropriate competences and skills.

In conclusion, we think that only a multitasking, dynamic and into the context, development cooperation could have high social, clinical and scientific impacts on prevailing in the fight against TB. The challenge for aid workers will be to immerse themselves in the context, gain the trust of healthcare workers and local authorities and pass on their knowledge adapting to the environment without losing quality. Only in this way could we ensure a sustainable, lasting and high impact intervention for the people, the centre of our works, actions and dreams.

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Depression comorbid with tuberculosis and its impact on health status: cross-sectional analysis of community-based data from 48 low- and middle-income countries

PAPER

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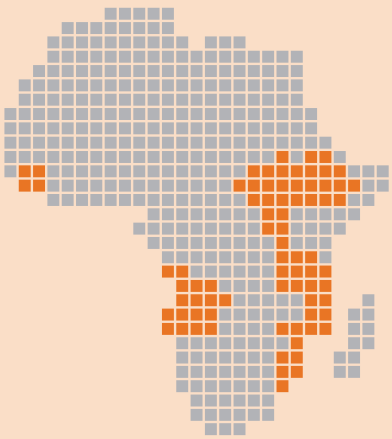

Abstract

Tuberculosis (TB) is one of the top ten causes of death worldwide, with the vast majority of cases and deaths occurring in lower-income countries. Individuals affected by TB often suffer from depression as well, a comorbidity that increases their risk of adverse health outcomes and may also result in poor adherence to treatment, consequently leading to a higher mortality rate. As little is currently known about the topic, we carried out a study to assess the association between depression and TB and the negative consequences of their combination on individuals in 48 lower- and middle-income countries, using data from the World Health Survey (WHS) from the 2002-2004 period.

The study involved 242,952 individuals aged 18 or older, 1.7% (3,347) of whom were diagnosed with TB. Depression symptoms appearing over the past 12 months were classified into four categories: depressive episode, brief depressive episode, subsyndromal depression and absence of depression. More cases of depression were found in TB patients (23.7%) than in those without the disease (6.8%, P <0,001). Tuberculosis was associated with a 1.98 (95% CI 1.47–2.67), 1.75 (95% CI 1.26–2.42) and 3.68 (95% CI 3.01–4.50) times higher odds for symptoms of subsyndromal depression, brief depressive episode, and depressive episode, respectively.

Patients suffering from TB therefore seem to have a greater probability than those without the disease of suffering from depression as well, something which puts their already precarious health conditions at further risk. It is urgent, therefore, to implement health policies that take a multidisciplinary approach to the treatment of TB patients, especially those living in low- and middle-income countries, where epidemic levels of TB exist alongside a dearth of mental health services.

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Depression comorbid with tuberculosis and its impact on health status: cross-sectional analysis of community-based data from 48 low- and middle-income countries

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Abstract

Background: Depression in tuberculosis increases the risk for adverse health outcomes. However, little is known about comorbid depression and tuberculosis in the general population. Thus, we assessed the association between depression and tuberculosis, and the decrements in health status associated with this comorbidity in 48 low- and middle-income countries.

Methods: Cross-sectional, community-based data from the World Health Survey on 242,952 individuals aged ≥ 18 years were analyzed. Based on the World Mental Health Survey version of the Composite International Diagnostic Interview, past 12-month depression was categorized into depressive episode, brief depressive episode, subsyndromal depression, and no depression. Health status across six domains (cognition, interpersonal activities, sleep/energy, self-care, mobility, pain/discomfort) was assessed. Multivariable logistic and linear regression analyses were performed to assess the associations.

Results: The prevalence of depressive episode among those with and without tuberculosis was 23.7% and 6.8%, respectively ($P < 0.001$). Tuberculosis was associated with a 1.98 (95% CI 1.47–2.67), 1.75 (95% CI 1.26–2.42), and 3.68 (95% CI 3.01–4.50) times higher odds for subsyndromal depression, brief depressive episode, and depressive episode, respectively. Depressive episode co-occurring with tuberculosis was associated with significantly worse health status across all six domains compared to tuberculosis alone. Interaction analysis showed that depression significantly amplifies the association between TB and difficulties in self-care but not in other health domains.

Conclusions: Depression is highly prevalent in adults with tuberculosis, and is associated with worse health status compared to tuberculosis without depression. Public health efforts directed to the recognition and management of depression in people with tuberculosis may lead to better outcomes.

Keywords: Tuberculosis, Depression, Low- and middle-income countries, Epidemiology

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Background

Tuberculosis (TB) is one of the top 10 causes of deaths globally [1]. In 2015, there were 10.4 million new TB cases and 1.8 million deaths due to TB. Over 95% of TB cases and deaths occur in developing countries [1]. Depression often coexists with TB [2], and this comorbidity is associated with poor adherence to TB treatment and higher mortality [3]. Lack of adherence to anti-TB regimens may lead to higher risk for drug resistance, morbidity, and mortality, as well as community exposure to TB [4, 5].

In low- and middle-income countries (LMICs), the prevalence of depression is high and may be increasing [6]. A recent large prospective study from Korea found that depression at baseline is associated with a higher risk for incident TB [7]. Depression may lead to an increased susceptibility to TB by compromising immunity or through neglected self-care [8]. Thus, depression may be an unrecognized driver of the global TB and multidrug resistant TB (MDR-TB) epidemics [2]. However, the few previous studies on the association between depression and TB from LMICs have only been conducted in clinical settings with small sample sizes, and information from the general population is lacking. Furthermore, there is limited information on the joint effect of TB and depression on health status. We therefore assessed the association between TB and depression, and whether the co-occurrence of TB and depression confers a more pronounced decrement in health status and function compared to TB alone using community-based, predominantly nationally representative data from 48 LMICs that participated in the World Health Survey (WHS). Epidemiological data on the TB/depression comorbidity and its effect on health outcomes are crucial to provide a more accurate assessment of the public health significance of this comorbidity.

Methods

The survey

The WHS was a cross-sectional survey carried out in 70 countries from 2002 to 2004. Survey details are available elsewhere (http://www.who.int/healthinfo/survey/en/). Briefly, single-stage random sampling and stratified multi-stage random cluster sampling was conducted in 10 and 60 countries, respectively. Eligible participants were those with a valid home address and aged ≥ 18 years. One individual was randomly chosen from the household with the use of Kish tables. The questionnaire was subject to standard translation procedures to ensure comparability between countries. Face-to-face interviews were conducted by trained interviewers. The overall individual response rate was 98.5% [9]. To adjust for non-response, sampling weights were generated using the population distribution as reported by the United Nations Statistical Division. Ethical approval for the survey was provided by ethical boards at each study site. All participants gave their informed consent.

Variables

TB

Because the WHS did not include mycobacterial culture or sputum smear examinations, TB was based on past 12-month symptoms of active TB. Specifically, as in previous WHS publications [10–12], those who had both (1) a cough that lasted for 3 weeks or longer and (2) blood in phlegm (or coughed up blood) were considered to have active TB. Previous studies have shown that the presence of these typical symptoms are likely to have a sensitivity and specificity of 65–70% and 55–75%, respectively, in the detection of TB [10].

Depression

The severity of depressive symptoms was established based on the individual questions of the World Mental Health Survey version of the Composite International Diagnostic Interview, which assessed the duration and persistence of depressive symptoms in the past 12 months [13]. Following the algorithms used in a previous WHS publication [14], four mutually exclusive groups were established based on the ICD-10 Diagnostic Criteria for Research (ICD-10-DCR) [15], where criterion B referred to symptoms of depressed mood, loss of interest, and fatigability. The algorithms used to define the four mutually exclusive groups were the following:

Depressive episode group
: At least two criterion B symptoms with a total of at least four depressive symptoms lasting 2 weeks most of the day or all of the day.

Brief depressive episode group
: Same criteria as depressive episode but did not meet the 2-week duration criterion.

Subsyndromal depression
: At least one criterion B symptom with the total number of symptoms being three or less. The criteria of duration of at least 2 weeks and presence of symptoms during most of the day had to be met.

No depressive disorder group
: None of the above.

In some analyses, we also dichotomized this variable as the absence or presence of depressive episode.

Health status

Health status was assessed with the use of 12 health-related questions pertaining to six different domains, namely (1) mobility, (2) pain and discomfort, (3) self-care, (4) cognition, (5) interpersonal activities, and (6) sleep and energy. These domains correspond to frequently used

health outcome measures including the Short Form 12 [16], the Health Utilities Index Mark 3 [17], and the EuroQol 5D [18], and have been used as indicators of health status in prior WHS studies [19, 20]. Each domain consisted of two questions that assessed health function in the past 30 days. The actual questions can be found in Additional file 1: Table S1. Each item was scored on a five-point scale ranging from 'none' to 'extreme/cannot do'. For each separate domain, we used factor analysis with polychoric correlations to obtain a factor score which was later converted to scores ranging from 0 to 100 with higher values representing worse health function [20].

Control variables

The selection of the control variables were based on past literature [10]. Sociodemographic variables included age, sex, education (no formal education, primary education, secondary or high school completed, or tertiary education completed), wealth, household size, and setting (rural or urban). Principal component analysis based on 15–20 assets was conducted to establish country-wise wealth quintiles. Current smoking was dichotomized as 'Yes' and 'No'. Respondents were asked how many standard drinks of any alcoholic beverage they had on each day of the past 7 days. Females who reported consuming at least four drinks, and males who reported consuming at least five drinks, on 1 or 2 days in the past 7 days were considered infrequent heavy drinkers, and respondents who drank these amounts at least 3 days in the past 7 days were considered frequent heavy drinkers. All other respondents, apart from lifetime abstainers, were considered non-heavy drinkers [21, 22]. Body mass index (BMI; kg/m^2) was based on self-reported weight and height, and was categorized as < 18.5 (underweight), 18.5–24.9 (normal weight), 25.0–29.9 (overweight), and ≥ 30 (obese). Diabetes was based on self-reported diagnosis.

Statistical analysis

Publically available data of the WHS included 69 countries. The data were nationally representative for all countries with the exception of China, Comoros, the Republic of Congo, Ivory Coast, India, and Russia. We excluded 10 countries as they lacked sampling information. A further 10 high-income countries were deleted as the focus of the study was on LMICs. Finally, Turkey was deleted due to lack of information on education and diabetes. Thus, a total of 48 countries, of which 21 (n = 105,286) and 27 (n = 137,666) were low-income and middle-income countries, respectively, at the time of the survey (2003) according to the World Bank, were included in the final sample. According to the United Nations' classification system (http://unstats.un.org/unsd/methods/m49/m49regin.htm), these corresponded to 20 countries in Africa (n = 82,424), 6 in the Americas (n = 62,732), 13 in Asia (n = 81,633), and 9 in Europe (n = 16,163). Information on the individual countries is provided in Additional file 1: Table S2.

Statistical analyses were performed with Stata 14.1 (Stata Corp LP, College station, Texas). Descriptive analyses included unweighted Ns, and weighted proportions and means.

First, in order to assess the association between TB (exposure) and depression (subtypes; outcome), we conducted multivariable multinomial logistic regression analyses using the overall sample. We also assessed the association between TB (exposure) and depressive episode (outcome) using multivariable binary logistic regression while stratifying by region (Africa, Americas, Asia, Europe) or country income level (low-income, middle-income). For these stratified analyses, we could not assess all depression subtypes as the outcome as the number of individuals with TB was small in some subsamples.

Next, we created a four-category variable based on the presence or absence of depressive episode and TB, namely (1) no depression and no TB (n = 183,455); (2) depression without TB (n = 11,440); (3) TB without depression (n = 2617); and (4) TB with depression (n = 687), to assess whether TB with depression is associated with a larger decrement in health status as compared with TB alone. We conducted multivariable linear regression with this this four-category variable as the exposure and the six health status variables as the outcomes (mobility, pain/discomfort, self-care, cognition, interpersonal activities, sleep/energy). We also conducted age-stratified analyses to assess whether the TB and depressive episode comorbidity have different effects on health status by age groups. Age was categorized as 18–44 (young adults; 67.8%), 45–64 (middle-aged adults; 23.6%), and ≥ 65 (older adults; 8.6%) years, broadly representing distinct life stages [23]. In order to assess whether there is effect modification by depressive episodes in the association between TB and health status, we also conducted interaction analysis by including an interaction term in the model using the overall sample (TB × depressive episode). We did not conduct interaction analysis by age groups due to the small sample size and possibility for lack of statistical power.

All regression analyses were adjusted for age, sex, education, wealth, household size, location, smoking, alcohol consumption, BMI, diabetes, and country. Adjustment for country was performed by including dummy variables in the models, as in previous WHS publications [11, 19]. All variables were included in the models as categorical variables with the exception of age, household size, and the six variables on health status (continuous variables). The sample weighting and the complex study design were taken into account in all analyses. Results from the logistic and linear regression are presented as odds ratios (ORs) and b-coefficients, respectively, with 95% confidence intervals (CIs). The level of statistical significance was set at $P < 0.05$.

Under 10% of the data were missing for the variables used in the analysis with the exception of TB (17.7%), BMI (30.3%), and diabetes (12.6%). For the regression analyses, we conducted multiple imputation of missing values using the *mi* commands in Stata using chained equations (20 imputations) [24]. This method uses information from all other variables except the one being imputed to impute missing values. The variables included in the imputation model were the outcome and all other covariates [12]. The results based on complete case analysis were similar.

Results

The analytical sample consisted of 242,952 individuals with a mean (SD) age of 38.4 (16.1) years and 50.8% were women (Table 1). The prevalence (95% CI) of TB was 1.7% (1.5–1.8%). All types of depression were more frequent among those with TB, with the difference being particularly pronounced for depressive episode (Fig. 1).

The prevalence of depressive episode among those with and without TB was 23.7% (95% CI 20.5–27.1%) and 6.8% (95% CI 6.5–7.1%), respectively (χ^2 test $P < 0.001$). The results of the multivariable multinomial logistic regression using the overall sample showed that TB is associated with a 1.98 (95% CI 1.47–2.67), 1.75 (95% CI 1.26–2.42), and 3.68 (95% CI 3.01–4.50) times higher odds for subsyndromal depression, brief depressive episode, and depressive episode, respectively (Table 2). Older age, female sex, lower levels of wealth, smoking, and diabetes were significant correlates of depressive episode.

The association between TB and depressive episode estimated by multivariable binary logistic regression by regions or country income levels are shown in Table 3. TB was associated with a depressive episode across regions and county income levels although the estimates for Europe did not reach statistical significance, possibly due to lack of statistical power (OR, 2.67; 95% CI 0.75–9.52; $P = 0.1293$).

Compared to those with no TB or depressive episode, depression alone, TB alone, and comorbid TB/depression were all significantly associated with worse health status scores in all domains. Comorbid TB/depression was associated with the largest decline (Table 4).

The results of the age-stratified analyses are shown in Additional file 1: Table S3. The decline in health status associated with depression alone and co-occurring TB/depression was similar across age groups, but that of TB alone was less pronounced in the oldest age group (i.e., ≥ 65 years). In order to assess whether the difference between TB alone and comorbid TB/depression is statistically significant, we also conducted the same analysis but changing the reference category to TB alone (overall sample). The b-coefficients (95% CIs) for comorbid TB/depression (vs. TB alone) were mobility 19.17 (14.52–23.81), self-care 18.46 (13.41–23.54), pain/discomfort 20.14 (16.23–24.04), cognition 15.61 (11.13-20.09), interpersonal activities 15.04 (10.13–19.96), and sleep/energy 19.67 (14.47–24.88) (all $P < 0.0001$). Overall, the interaction analysis showed that depression significantly amplifies the association between TB and difficulties in self-care but not with other health domains (Additional file 1: Table S4).

Table 1 Sample characteristics

Characteristic	Category	Unweighted N	% or Mean (SD)
Tuberculosis	No	196,417	98.3
	Yes	3347	1.7
Depression	No depression	205,752	87.7
	Subsyndromal depression	5238	2.6
	Brief depressive episode	6674	2.9
	Depressive episode	13,965	6.9
Age, years	Mean (SD)	233,879	38.4 (16.1)
Sex	Male	104,355	49.2
	Female	129,448	50.8
Education	No formal	52,116	26.5
	Primary	76,193	30.9
	Secondary	86,740	33.5
	Tertiary	17,860	9.2
Wealth	Poorest	51,599	20.1
	Poorer	45,893	20.0
	Middle	42,317	19.9
	Richer	40,128	20.0
	Richest	37,724	20.0
Household size	Mean (SD)	242,311	5.7 (3.0)
Setting	Rural	117,556	56.5
	Urban	114,825	43.5
Current smoking	No	174,814	73.5
	Yes	54,746	26.5
Alcohol consumption	Lifetime abstainer	142,282	66.4
	Non-heavy	74,016	28.8
	Infrequent heavy	8817	3.7
	Frequent heavy	2411	1.0
Body mass index, kg/m^2	<18.5	16,883	13.8
	18.5–24.9	95,208	57.9
	25.0–29.9	38,700	19.3
	≥30.0	18,287	9.0
Diabetes	No	205,671	97.0
	Yes	6537	3.0

Data are unweighted N and weighted proportion or mean (SD)
SD standard deviation

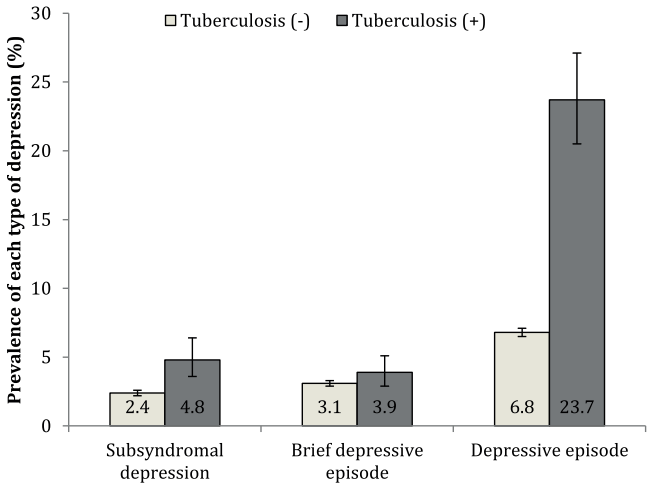

Fig. 1 Prevalence of each type of depression by the presence or absence of tuberculosis. Bars denote 95% confidence intervals. Estimates are based on weighted sample

Table 2 Association of tuberculosis and other covariates with depression estimated by multivariable multinomial logistic regression

		Depression subtypes (Reference = No depression)					
		Subsyndromal depression		Brief depressive episode		Depressive episode	
Characteristic	Category	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Tuberculosis	Yes vs. No	1.98 (1.47–2.67)	<0.0001	1.75 (1.26–2.42)	0.0008	3.68 (3.01–4.50)	<0.0001
Age, years	Per unit increase	1.02 (1.02–1.03)	<0.0001	1.01 (1.00–1.01)	0.0003	1.02 (1.02–1.02)	<0.0001
Sex	Female vs. Male	1.84 (1.60–2.12)	<0.0001	2.19 (1.94–2.46)	<0.0001	2.06 (1.87–2.27)	<0.0001
Education	No formal	1.00		1.00		1.00	
	Primary	0.86 (0.72–1.03)	0.1101	0.95 (0.82–1.10)	0.4629	0.92 (0.83–1.03)	0.1414
	Secondary	0.76 (0.61–0.94)	0.0133	0.98 (0.81–1.18)	0.8148	0.77 (0.67–0.88)	0.0001
	Tertiary	0.83 (0.53–1.30)	0.4073	0.80 (0.62–1.02)	0.0686	0.82 (0.53–1.25)	0.3464
Wealth	Poorest	1.00		1.00		1.00	
	Poorer	1.00 (0.80–1.25)	0.9855	0.98 (0.84–1.16)	0.8384	0.95 (0.85–1.07)	0.4023
	Middle	1.07 (0.86–1.34)	0.5281	0.90 (0.76–1.06)	0.2022	0.96 (0.84–1.08)	0.4651
	Richer	1.05 (0.81–1.36)	0.7289	0.97 (0.82–1.16)	0.7557	0.87 (0.76–1.00)	0.0486
	Richest	0.90 (0.64–1.26)	0.5175	0.80 (0.66–0.97)	0.0229	0.69 (0.57–0.83)	0.0001
Household size	Per unit increase	1.03 (1.00–1.06)	0.0296	1.01 (0.98–1.03)	0.4946	1.01 (0.99–1.04)	0.2889
Setting	Urban vs. Rural	0.93 (0.79–1.11)	0.4373	1.12 (0.98–1.28)	0.0978	1.05 (0.94–1.17)	0.4040
Current smoking	Yes vs. No	1.31 (1.10–1.55)	0.0026	1.26 (1.10–1.44)	0.0007	1.29 (1.14–1.45)	<0.0001
Alcohol consumption	Lifetime abstainer	1.00		1.00		1.00	
	Non-heavy	1.27 (1.09–1.47)	0.0026	1.51 (1.32–1.73)	<0.0001	1.10 (0.99–1.22)	0.0685
	Infrequent heavy	1.45 (1.02–2.06)	0.0407	1.72 (1.29–2.28)	0.0002	1.03 (0.83–1.29)	0.7845
	Frequent heavy	2.10 (1.15–3.85)	0.0159	1.85 (1.18–2.92)	0.0080	1.14 (0.79–1.65)	0.4887
Body mass index, kg/m^2	<18.5	1.02 (0.76–1.36)	0.8991	1.01 (0.83–1.23)	0.8988	1.08 (0.90–1.31)	0.4065
	18.5–24.9	1.00		1.00		1.00	
	25.0–29.9	1.10 (0.89–1.36)	0.3673	0.96 (0.83–1.11)	0.5485	0.99 (0.88–1.11)	0.8586
	≥30.0	1.09 (0.84–1.41)	0.5230	1.05 (0.86–1.29)	0.6136	1.05 (0.91–1.22)	0.4831
Diabetes	Yes vs. No	1.14 (0.84–1.54)	0.4000	1.39 (1.09–1.76)	0.0076	1.91 (1.62–2.24)	<0.0001

Model is adjusted for all variables in the Table and country

Table 3 Association between tuberculosis (exposure) and depressive episode (outcome) by regions or country income level

Region or country income level	OR (95% CI)	*P* value
Africa	3.50 (2.76–4.43)	<0.0001
Americas	2.74 (1.80–4.18)	<0.0001
Asia	3.75 (2.74–5.14)	<0.0001
Europe	2.67 (0.75–9.52)	0.1293
Low-income countries	3.52 (2.74–4.54)	<0.0001
Middle-income countries	3.24 (2.40–4.35)	<0.0001

Estimates are based on multivariable logistic regression
Models are adjusted for age, sex, education, wealth, household size, location, smoking, alcohol consumption, body mass index, diabetes, and country
OR odds ratio, *CI* confidence interval

Discussion

We found that TB is associated with the entire depression spectrum in the overall sample, and that the association between TB and depressive episode is comparable across regions and country income levels. Furthermore, the co-occurrence of depression and TB was associated with a major decrement in all health domains assessed compared to TB alone, with this additive effect being particularly pronounced for difficulties in self-care. The strengths of the study include the large sample size and use of predominantly nationally representative data from approximately one-fourth of the countries in the world obtained by standardized questionnaires across all countries. To the best of our knowledge, this is the first general population study on TB and depression. Furthermore, it is one of the very few studies assessing the association between TB and depression severity, and is the first to assess the joint effect of TB and depression on a variety of health conditions (i.e., mobility, self-care, pain/discomfort, cognition, interpersonal activities, sleep/energy). The finding that there may be a synergistic effect between TB and depression in terms of some health outcomes (i.e., self-care) is novel.

The association between TB and depression may be bidirectional [7, 25]. Depression itself may compromise immunity, leading to an increased risk for TB [8], while increased inflammation in TB may increase risk for depression [26]. Alternatively, depression may be a psychological reaction to the symptoms of TB (e.g., chronic cough, fatigue, weight loss) or associated disability [27], while hypoxia in chronic pulmonary diseases may induce depression [28]. It is also possible that patients with TB are perceived as a source of contagion in the community, which may lead to discrimination, stigma, social isolation, and rejection, and may predispose individuals to a higher risk for depression [27, 29]. Further, some anti-TB drugs can induce depression [27]. Finally, common risk factors, such as compromised immunity, stress, and malnutrition, may underlie the association [8, 26, 30, 31]. Regardless of whether depression and TB are etiologically related, the mere co-existence can complicate the diagnosis and management of these conditions, while it is also possible that they mutually influence each other and lead to the exacerbation of the other, altering the clinical course [27].

Other factors which were identified as significant correlates of a depressive episode in our study included sociodemographic factors (older age, female sex, lower levels of wealth), smoking, and diabetes. Previous studies have also found these factors to be associated with depression [32–36]. In particular, diabetes is known to increase risk for TB [37], and may be an important risk factor for TB in LMICs [10] as there is an upward trend in diabetes prevalence mainly driven by changes in lifestyles and diet in this setting [38]. On the other hand, diabetes and depression are often comorbid and common pathophysiological mechanisms (e.g., stress, inflammation) may underlie this co-occurrence [39].

In our study, compared to TB occurring in isolation, co-existing TB/depression was associated with decrements in all health domains assessed, while a significant interaction was observed for difficulties in self-care. These results are in line with a small cross-sectional study from Turkey showing that psychiatric comorbidity is associated with a higher rate of disability among TB patients [40]. Depression may lead to poor adherence to

Table 4 Association between TB/depressive episode groups and health status estimated by multivariable linear regression

	TB (-) Depression (+)		TB (+) Depression (-)		TB (+) Depression (+)	
	b-coefficient (95% CI)	*P* value	b-coefficient (95% CI)	*P* value	b-coefficient (95% CI)	*P* value
Mobility	15.92 (14.81–17.04)	<0.0001	8.63 (6.55–10.71)	<0.0001	27.80 (23.60–31.99)	<0.0001
Self-care	11.96 (10.78–13.13)	<0.0001	5.34 (3.20–7.48)	<0.0001	23.80 (19.11–28.49)	<0.0001
Pain/discomfort	18.70 (17.39–20.00)	<0.0001	10.27 (8.24–12.30)	<0.0001	30.41 (26.97–33.84)	<0.0001
Cognition	16.55 (15.26–17.83)	<0.0001	8.63 (6.35–10.91)	<0.0001	24.24 (20.19–28.28)	<0.0001
Interpersonal activities	12.69 (11.53–13.86)	<0.0001	4.41 (2.34–6.48)	<0.0001	19.45 (14.81–24.09)	<0.0001
Sleep/energy	19.61 (18.37–20.85)	<0.0001	10.32 (7.94–12.70)	<0.0001	29.99 (25.30–34.68)	<0.0001

Reference category is TB (-) Depression (-)
Health status was the outcome and scores ranged from 0 to 100 with higher scores corresponding to worse health status
Models are adjusted for age, sex, education, wealth, household size, location, smoking, alcohol consumption, body mass index, diabetes, and country
TB tuberculosis, *CI* confidence interval

anti-TB drugs, and thereby exacerbate the symptoms of TB and its associated disability. Indeed, a prospective study from Peru showed that co-occurring TB/depression leads to lower adherence to TB treatment and higher mortality when compared to TB without depression [3]. The fact that a significant interaction was observed for self-care may imply that there is a synergistic effect between TB and depression. It may be hypothesized, for example, that depression leads to poor TB treatment adherence and exacerbation of symptoms, which in turn may lead to a worsening of depression. However, the precise underlying mechanisms or the reason why an interaction was only observed for self-care is unclear and warrants further investigation. Finally, delayed diagnosis of TB in people with depression may also partly explain our findings. It has been reported that delayed detection of physical diseases may be common in individuals with depression [41]. Thus, it may be that, when individuals with prior depression are diagnosed with TB, their TB symptoms are more severe compared to those without prior depression. Lack of motivation or social support and cognitive impairment, which may affect decision-making [42], might limit access to healthcare among depressed individuals, leading to delayed diagnosis and treatment initiation for TB.

Previous studies have shown that treating the psychological aspects of TB may lead to better clinical outcomes. For example, a prospective controlled trial in India showed that psychotherapy during TB treatment leads to higher adherence, treatment, and cure rates [43]. Furthermore, a psychological support group intervention for patients with MDR-TB in Peru showed that such an intervention can improve treatment adherence and completion [44]. Additionally, the formation of 'TB clubs' in Ethiopia increased treatment completion rates and reduced the stigma associated with TB [45]. Recently, a randomized controlled trial in Ethiopia showed that psychological counseling and educational intervention can substantially improve treatment adherence rates in TB [46].

A multi-faceted approach is likely to be relevant in addressing comorbid depression and TB in LMICs. First, previous studies from LMICs have shown that the treating doctor is often not aware of co-existing psychiatric morbidity in TB patients [47]. Thus, training of medical professionals and students on the psychological aspects of TB may lead to early detection and better management of psychiatric complications, and ultimately to a better clinical outcome of TB. Next, a close collaboration between TB and mental health specialists would be important for the early detection and treatment of depression in TB. Previous studies have shown that training of non-mental health specialists in LMICs may only have a limited impact on depression detection rates [48]. Thus, screening for depression may be a cost-effective strategy to improve detection rates of depression in TB. However, symptoms specific to depression (e.g., low mood, anhedonia) and symptoms of depression that overlap with TB (e.g., fatigue) should be distinguished. Some studies have assessed the validity of depression screeners such as the Center for Epidemiological Studies Depression scale or the General Health Questionnaire 12 among TB patients [40, 49]. These studies found that these screening tools can be used among TB patients to detect depression but that there may be a disease-specific optimal cut-off. Future studies on the validity and reliability of such screening tools are warranted, as only scarce data from limited populations are currently available. Finally, patient education and community awareness regarding facts and myths of TB may also be important [50], as discrimination and stigma can be underlying causes of depression in TB.

Our results should be interpreted in the light of several limitations. First, we lacked information on HIV, which is known to be associated with higher risk for TB [1] and depression [51]. Thus, some of the association may be attributable to comorbid HIV. However, this may not have been a major limitation as our region-wise analysis showed that TB is associated with depression even in areas with very low HIV prevalence (e.g., the Americas). Second, our study was based on the symptoms of TB rather than a laboratory confirmed diagnosis. Although we used the identical definition for TB used in previous publications [10–12], it is possible that some level of symptom overlap may exist between respiratory diseases such as pneumonia, bronchitis, and chronic obstructive pulmonary disease, which may also cause cough of long duration and hemoptysis. Thus, our estimates may partially be representing the association between these conditions and depression. Furthermore, the potential misclassification may have led to an underestimation of the association between TB and depression. However, it is reassuring that the prevalence of depression in TB was within the previously reported range of estimates among patients with confirmed TB [2]. Additionally, we are not aware of any other population-based data with such a large number of LMICs that can be used to investigate the TB–depression relationship. Third, high-risk groups, such as the institutionalized and homeless, were not included in our study and thus our findings are not generalizable to this population. Finally, the direction of causality cannot be established due to the cross-sectional design.

Conclusions

In conclusion, individuals with TB have higher odds for depression, and the co-occurrence of TB and depression is associated with decrements in health. Screening for and addressing depression in individuals with TB may lead to better clinical outcomes. However, mental health services and specialists are limited in low-resourced settings where the highest burden of TB is located. Increased recognition

of co-existing depression in TB patients by health professionals and the use of non-specialist health workers trained in mental healthcare, especially in resource-limited settings, may be key. However, given that health-care workers are at increased risk of occupationally acquired TB in LMICs [52], sound infection control measures should be implemented to protect these individuals, yet this is a particular challenge in LMICs due to financial constraints. Finally, simultaneously addressing the mental and physical aspects of TB may lead to reduction in TB transmission [53], and also possibly in TB mortality and MDR-TB. This is an area for future research.

Additional file

Additional file 1: Table S1. Questions used to assess health status. **Table S2.** Countries included in the analysis and sample size. **Table S3.** Association between TB/depressive episode groups and health status by age groups estimated by multivariable linear regression. **Table S4.** Interaction effect of TB and depressive episode on health status. (DOCX 45 kb)

Abbreviations

BMI: body mass index; CI: confidence intervals; LMIC: low- and middle-income countries; MDR-TB: multidrug resistant tuberculosis; OR: odds ratio; TB: tuberculosis; WHS: World Health Survey

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Availability of data and materials

The dataset supporting the conclusions of this article is available (upon registration) from http://www.who.int/healthinfo/survey/en/.

Authors' contributions

AK conceived the study idea, analyzed and interpreted the data, and wrote the main body of the text. DV, AFC, JED, DP, JMH, NV, and BS contributed to the drafting of the manuscript, interpreted the data, and commented for intellectual content. All authors read and approved the final manuscript.

Ethics approval and consent to participate

Ethical approval was obtained from each of the following committees in the respective countries for the World Health Survey:

Country	Ethical committee approving the study
Bangladesh	Mitra and Associates
Bosnia and Herzegovina	The Federal Public Health Institute
Brazil	Fundacao Oswaldo Cruz
Burkina Faso	Institut de Recherche en Sciences de la Santé
Chad	Faculté des Sciences de la Santé, Univ N'Djamena
China	Centre for Health Statistics Information
Comoros	Bureau Comorien de Conseil
Republic of congo	Unité de recherche sur les systèmes de santé
Ivory Coast	Ministère de la Santé
Croatia	The Croatian National Institute of Public Health
Czech Republic	Institute of Health Information and Statistics
Dominican Republic	Centro de Estudios Sociales y Demográficos (CESDEM)
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Estonia	Saar Poll Ltd.
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Georgia	Georgian State Medical Academy (GSMA)
Ghana	Department of Community Health, Ghana Medical School
Hungary	Johan Bela National Centre for Epidemiology
India	International Institute of Population Sciences
Kazakhstan	Kazakstan School of Public Health (KSPH)
Kenya	Central Bureau of Statistics
Laos	National Institute of Public Health, Ministry of Health
Latvia	The Health Promotion Center
Malawi	Centre for Social Research (CSR)
Malaysia	Public Health Institute, Ministry of Health
Mali	Cellule de Planification et de Statistique (CPS)
Mauritania	Office Nationale de la Statistique (ONS)
Mauritius	Mauritius Institute of Health
Mexico	Instituto Nacional de Salud Pública
Morocco	Ministère de la Santé
Myanmar	Department of Medical Research, Ministry of Health
Namibia	Ministry of Health
Nepal	ORG-MARG Nepal PVT Ltd.
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Giant elephantiasis and inguino-scrotal hernia

PAPER

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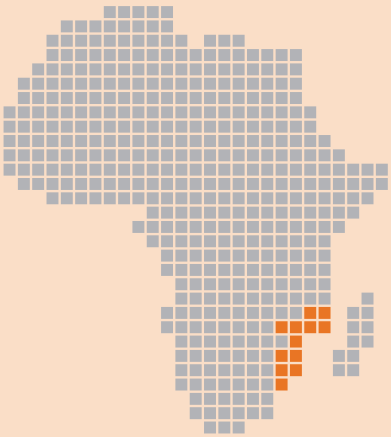

Abstract

WHO estimates that 25 million men experience genital disease. Inguinal hernia and lymphatic filariasis are two of the most frequent surgical diseases in Africa; in Mozambique and other sub-Saharan countries there are many cases of genital elephantiasis, caused by lymphatic obstruction and overload.

In medium- and low-income countries, serious cases often occur at the end stage of the disease due to a weak and inefficient health system; this is aggravated by the patients' lack of trust in the country's health system that can lead to delaying the suggested treatment for years. The treatment for elephantiasis is surgical removal.

The article describes the case of a patient with a severe case of elephantiasis treated at the Central Hospital of Beira in Mozambique. The surgery varied from the standard procedure because the patient also presented with chronic fibrosis.

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SYMPOSIUM

Giant elephantiasis and inguino-scrotal hernia

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Presentation of the case

A 65-year-old man presented in Beira Central Hospital, Mozambique, with a right scrotal mass (diameter 80 x 80 cm), evolved over 15 years. The patient could barely move, and his weight at admission was 142 kg (Fig 1A and 1B). History of previous diseases was unremarkable, his general condition was good, and he had normal vital parameters.

Physical examination showed wrinkled and thickened scrotal skin and right leg and foot edema. Due to his physical condition, penile erection had been impossible for many years. The patient was hospitalized for surgery with a diagnosis of "giant elephantiasis of the scrotum with bilateral inguinal hernia". The man was HIV negative, and preoperative tests showed only a moderate anemia (hemoglobin [Hb] = 7.7 g/dL). The patient was treated with folic acid and multivitamin tablets for 2 months. Finally, he was transfused (4 U), and his Hb increased to 10.2 g/dL before surgery.

Although guidelines suggest hygiene treatment with soap and water for 6 months and antibiotics therapy before surgery, it was not possible to accomplish this protocol, and we proceeded directly with surgery.

Anesthesia was induced intravenously by atropine, 0.5 mg, fentanyl, 150 μg, and thiopental, 500 mg, and it was maintained by fentanyl, 75 μg per hour.

The first step of the surgical procedure was the hydrocele's reduction, and 15 liters of a brown-colored liquid were aspirated from the mass. After this procedure, there remained a scrotal elephantiasis mass of 67 kg and a bilateral inguino-scrotal hernia. To proceed further with the procedure, it was necessary to do a Foley catheterization in order to get a careful dissection with cautery to delineate the penis circumferentially from the root of the scrotal lymphedema.

A bilateral inguino-scrotal incision was performed. The right testis was stiff and impossible to isolate; the left one was atrophic, and it was not possible to find it. The only solution was to do a bilateral orchiectomy and leave the cords behind in an attempt to form an alternative pathway for lymphatic drainage. The right scrotum presented also a giant inguino-scrotal hernia containing the colon, ileum, and part of the jejunum. The hernia sac was well separated from the internal ring and was easily opened. A hyperemic, inflamed appendix was found; thus, an appendectomy was performed, and the bowels were reduced into the abdomen. The neck of the large hernia sac was transected at the midpoint of the inguinal canal, and the proximal part was sutured—ligated. A high ligation of the proximal sac was done, and the stump was reduced, deep underneath the internal ring. The distal sac was left in place. The hernia repair was finally performed with polypropylene mesh, according to the Lichtenstein tension-

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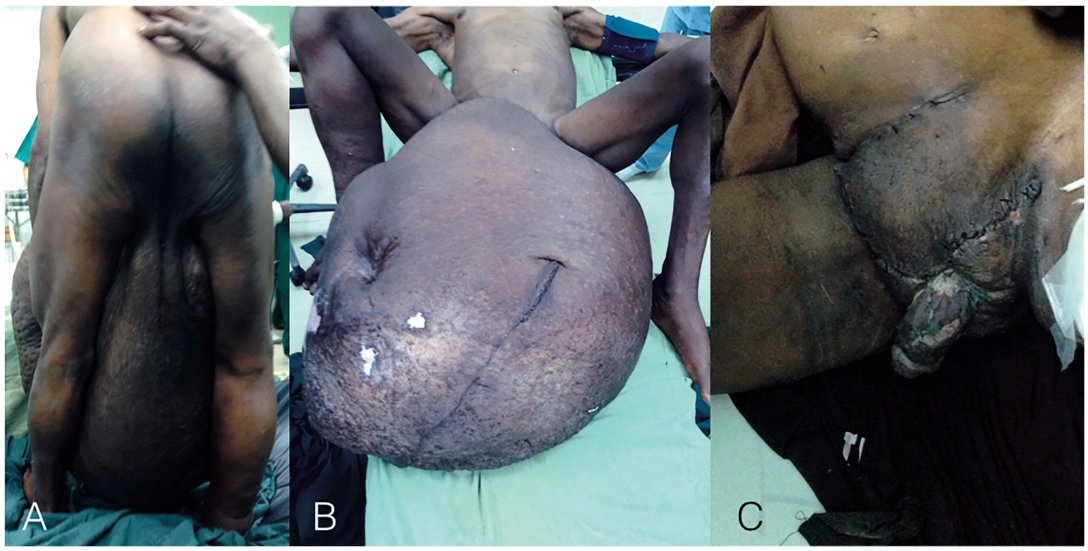

Fig 1. (A) and (B) Preoperative elephantiasis, (C) Postoperative result.

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free technique. Debulking of lymphedema was done, and the remaining scrotal skin was closed in a Y-shaped manner with the root of penis in the middle (Fig 1B).

During surgery, approximately 2 liters of blood were lost, and 6 units of packed red blood cells and 4 units of fresh frozen plasma were transfused.

Histologic examination showed vascular proliferation, edema, fibrosis, and chronic inflammatory infiltrate.

After 10 days, the patient presented with hypercreatininemia (1.8 mg/dL) and a granulate ulcer of the penis that healed spontaneously. The most important postoperative complication was urethral stenosis, and thus soprapubic cystostomy was performed. The patient was treated with antibiotic therapy for 10 days, and urethral dilatation was performed for 60 days. Eventually, the cystostomy was recovered.

A 6-month follow-up showed a clean scar (Fig 1C) and no sequela, except the erection was not recovered, even after the surgical operation.

Case discussion

Inguinal hernia and lymphatic filariasis

WHO estimates that 25 million men experience genital disease [1]. Inguinal hernia and lymphatic filariasis are 2 of the most frequent surgical diseases in Africa [1–2]. Inguinal hernia involves 4.6% of the population in Africa, and males between 20 and 60 years old are the most affected [3]. Over 15 million people are afflicted with lymphedema [1], with multiple etiologies that could be either congenital or acquired (neoplastic, infectious, granulomatous, reactive, disorders of fluid balance, and idiopathic) [4]. Scrotal elephantiasis occurs because of agenesia or hypoplasia, hyperplasia, reflux, overload, or obstruction of the lymphatics [4, 5]. In Mozambique, as in many other countries of sub-Saharan Africa, lymphatic filariasis represents the most important etiology [1]. Lymphatic filariasis is caused by nematode infection belonging to the family Filariodidea: *Wuchereria bancrofti* (responsible for 90% of the cases), *Brugia malayi*,

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and *B. timori* [1]. To guide the surgical management, a standardized clinical classification of hydroceles in lymphatic filariasis was developed based on size of hydrocele (stage I to VI) and on penis burial (grade 0 to 3) [6].

The presenting case

As a result of the weaknesses of healthcare systems in low- and middle-income countries, extreme presentations of late-stage diseases occur. In Africa, hernia surgery is one of the most frequent procedures done by surgeons, and the high incidence of elephantiasis is explained by filariasis that is endemic in this area. The rarity of our case report is due to 2 factors: the size and the overlap of 3 diseases. On the one hand, the patient presented to us after 15 years of evolving disease, weighing 142 kg before and 70 kg after the surgery. On the other hand, the surgery has resolved 15 liters of hydrocele, giant scrotal lymphedema, and hernia. Although these conditions led to an extreme deformity with ensuing physical, social, and psychological disability, the ineffectiveness of the health system and the lack of trust by the patient had delayed for years the necessary treatment.

The most frequent surgical treatments for genital elephantiasis are as follows: complete excision of all lymphedematous skin and subcutaneous tissue of the penis and scrotum and reconstruction with skin graft, lymphangioplasty, and lymphaticovenous anastomosis. However, our patient presented with chronic fibrosis, and suitable lymphatic channels were not present. For this reason, the excisional surgical repair was the approach required in order to provide the most successful result. While managing the giant inguinal hernia, due to the loss of domain within the abdominal cavity, we reduced the content only with difficulty, fortunately avoiding any respiratory impairment.

Ethics statement

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Key learning points

- This case is a rare giant hydrocele (stage IV, grade 3) in scrotal elephantiasis associated with bilateral inguino-scrotal hernia.
- Despite low-resource setting and extreme disease condition, a surgical procedure was performed successfully.
- Due to the high risk of relapse, a regular follow-up is crucial, but in low-resource settings, this rarely happens.
- It is mandatory to strengthen the health system, both in terms of healthcare and of prevention.

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Papillomavirus (HPV) in Low-Income Countries: Which Perspectives?

PAPER

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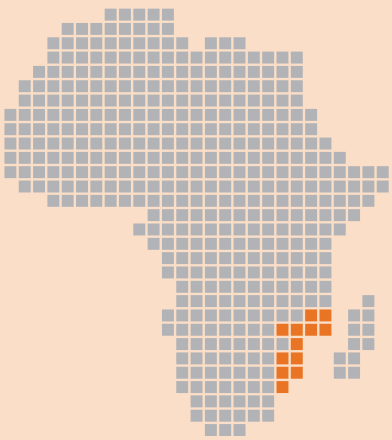

Abstract

Human Papillomavirus (HPV) is agent of the most common sexually transmitted diseases that can infect both females and males. In most cases HPV is asymptomatic and transient, but it may persist giving a variety of mucosal manifestations, such as warts and cancers, and it plays a role in infertility.

In low-income countries, such as Mozambique, despite the high incidence of HPV, to date, there are not yet effective prevention strategies, nor acceptable diagnostic and therapeutic procedures.

On this issue, the paper suggests an operational research approach in order to assess HPV burden and tailor the best solution for HPV infection in low-income countries.

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Papillomavirus (HPV) in Low-Income Countries: Which Perspectives?

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Abstract

Human Papillomavirus (HPV) is agent of the most common sexually transmitted diseases that can infect both females and males. In most cases HPV is asymptomatic and transient, but it may persist giving a variety of mucosal manifestations, genital and not, such as warts and cancers and playing a role in infertility. In low-income countries, despite the high incidence, to date, do not exist effective prevention strategies, neither acceptable diagnostic and therapeutic procedures.

In this paper we suggest an operational research approach in order to assess HPV burden and taylor the best solution for HPV infection in low-resources settings.

Keywords: HPV; Low-income countries; HPV prevention; HPV vaccine

Introduction

Human Papillomavirus (HPV) is an emerging disease affecting worldwide both genders although it was always considered as women disease [1]. While in West they were made strides about HPV prevention, diagnosis and therapy, in developing countries this topic is rarely addressed despite the high incidence and the advanced related diseases stage [2]. Although HPV is mainly asymptomatic, it can lead to benign papillomas and genital warts, generally solved by the host's immune system or to cancer [3,4]. On the one hand, in the general population, genital warts HPV related are the main anogenital viral sexual transmitted disease (STD) [5]. On the other hand, cervical, penile, anal or pharynx HPV related cancers cause growing concern and interest in worldwide population [6]. Moreover, recent evidence revealed a role of HPV in fertility both in males and females [7]. Studies about HPV infection in low resources settings show a high HPV prevalence both in female and male. Moreover, low-income countries represent a particular setting for HPV not only due to the inappropriateness of resources, both in terms of equipments and health workers, but also for the extremes of risk factors. In fact, all well known risk factors for HPV are prominent in developing countries: sexual intercourse at a young age, multiple sexual partners, high degree of parity, lack of circumcision, smoking, immuno suppression, co-infection with HIV and other STDs and of course, lack of condom use [8]. Considering all these aspects, it is mandatory to investigate, explore and identify for low-income countries the most appropriate and effectiveness strategies in term of prevention, diagnosis, therapy and follow-up in order to eradicate or at least reduce and contain the spread of HPV infection and its related diseases. In particular, operational research could play a key role in the assessment and characterization of HPV burden and, consequently, to draw the best solution.

Conclusion

Low-income countries are particular settings in term of health care not only due to the lack of resources but also for many socio-cultural aspects as myths, superstitions and traditional healers that turn away patients from conventional medicine. Moreover, people are often reluctant to be to be testedfor STIs as HIV and HPV due to the risk of stigmata and marginalization.

In our opinion, operational research could be a mile stone in addressing this issue and reducing the gap between patients needs and health care, not only allowing the assessment of needs and the identification of the best strategy, but it also represents the most appropriate tool to evaluate the effectiveness of intervention programs. Of course, to start research programs, lastingly and in a sustainable way, we cannot separate operational research from implementation and we have to take into account the context in which we work.

To date, researches in low-income countries bring out high HPV prevalence in males and females, both in genital and oral sites. Moreover, in these regions, the strong presence of most known risk factors makes mandatory to improve and increase the efforts and effectiveness of interventions in order to fight this emerging disease.

The first step should be the assessment of the HPV burden: to track the infection epidemiology, to identify the main risk factors and the hotspot most at risk, to consider the frequency of associated diseases and, to evaluate the awareness of HPV and attitude, both among patients and health workers. After the assessment, the goal should be to procure the appropriate resources. On one hand, it is essential to train and to implement capacity building of local staff in order to have health workers with appropriate competences and able to implement correct and quality procedures. On the other hand, there has to be an appropriate environment, with adequate structures and equipment. Considering HPV implications, mainly in low-income settings where it is difficult to have proper diagnostics and therapeutic procedures, the leading objectives should be prevention, education. In this respect, they are described several methods to inform population and promote health education: socio-cultural events as sport competitions, theatre, music; peer discussion groups with support of communication materials; media as radio, WhatsApp, Facebook and Tweeter. However, whereas the life cycle of HPV, it is crucial also to establish a follow-up for infected couples to allow a complete clearance of infection. Only in this way, in fact, we could ensure a sustainable, lasting and high impact intervention. Also considering the possibility of vaccination, which is often lacking in developing countries, proper and correct information and education play a key role on the intervention effectiveness.

In conclusion, we think that, an operational research approach, with strict and standardized methods, could have a high clinical, scientific and social impact allowing to win some social, economic and health societal challenges against HPV infection. Though in many countries the concept of "research" does not exist or is far from the standards, we are optimistic about the flourishing of operational research in low-income countries and its high impact. The challenge for researchers will be to immerse themselves in the context, gain the trust of healthcare workers and local authorities and pass on their knowledge adapting to the environment without losing quality.

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Strategy for improving access to HIV care for adolescents and youth: the experience took place in Beira, Mozambique

PAPER

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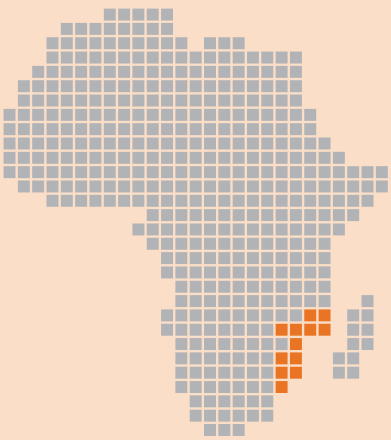

Abstract

Mozambique has the eighth highest HIV prevalence in the world, with adolescents representing a growing share of the affected population. Since 2014, Doctors with Africa CUAMM has been helping to support a network of clinics in the country aimed specifically at young people – *Serviços de Aconselhamento e Acompanhamento dos Jovens* (SAAJ) – that offer health counseling to this population, including on how to avoid contracting HIV. This retrospective study analyzed data collected in Beira between 2013 and 2014 in order to assess the impact of these youth counseling clinics as a new type of resource for HIV prevention in countries with limited resources. We found a significant increase in the number of consultations provided in 2014 as compared with 2013 (102,533 versus 63,959, $p < 0.01$). In 2013 the number of adolescents requesting counseling specifically for HIV was 23,970, while in 2014 the number rose to 32,251. Thus the study highlighted the effectiveness of, and the need to strengthen, such services in order to help adolescents and younger people learn more about HIV and improve their access to HIV care.

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STRATEGY FOR IMPROVING ACCESS TO HIV CARE FOR ADOLESCENTS AND YOUTH: THE EXPERIENCE TOOK PLACE IN BEIRA, MOZAMBIQUE.

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ABSTRACT

The objective of this paper is to respond to the urgent need for an increase in access to HIV care among adolescents and young people in Sub-Saharan Africa. Since 2014, doctors with Africa CUAMM in collaboration with UNICEF have been supporting specific ambulatories for the youth population (between the ages of 10- 24) aiming to improve health education, specifically in relation to HIV prevention. Mozambique has the eighth highest prevalence of HIV in the world. It represents one of the six countries in which half of the adolescents living with HIV reside. Beira is Mozambique's second largest city, and in 2009 it had the most women and men between the ages of 15-49 were living with HIV. This study retrospectively analyzes data collected between 2013 and 2014, which described the impact of a new health service in a low resource setting with high HIV prevalence. The specificity of the service, only dedicated to young people, is the basis for this paper. We observed a significant increase in counseling in 2014 compared to 2013 (102,533 vs 63,959, $p<0.01$), confirming that strengthening specific youth services is an effective intervention for improving access to care of this target population. Youth ambulatories are great instruments to improve access to HIV care among young people.

1. Introduction

It is estimated that 36,9 million people worldwide were living with HIV by the end of 2014 (1). Around 2 million people are newly infected with HIV and 26 new infections occur every hour in older adolescents (between the ages of 15-19) (2). Sub-Saharan Africa represents the most affected continent, where 85% of all adolescents were living with HIV in 2012 (3).

Mozambique has the eighth highest prevalence of HIV in the world, where 1,5 million people were living with HIV in 2014. The prevalence of HIV was estimated to be 10,6% by the end of 2014 (4), and it represents one of the six countries in which half of the adolescents living with HIV reside (2). Beira, the capital of the Sofala Province, is Mozambique's second largest city, with 17,8% of women and 12,6% of men between the ages of 15-49 were living with HIV in 2009 (5).

Currently, AIDS-related causes represent the first reason of death in the adolescent population in Sub-Saharan Africa and the second in the

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worldwide context (globally 120,000 adolescents died of AIDS in 2013) (1-2). This dramatic data is more worrying in the context where AIDS-related deaths are in decline for all ages, except for 10-19 year olds (2-6).

Many factors have contributed in making young people particularly vulnerable, including lack of knowledge about HIV/AIDS, lack of education and life skills, early sexual experiences, early marriage, sexual coercion and violence, trafficking and growing up without parents or other forms of protection from exploitation and abuse (7). Above all, poor access to health services (7) and insufficient specialized services for this target population in offering HIV testing and care represent important contributing factors (8).

Therefore, to decrease HIV transmission, in addition to assuring HIV test, early treatment and follow up, it is necessary to educate young people and to prevent as much as possible new infections (9). Moreover, in countries where HIV prevalence has declined, a change in sexual behavior among young people has been cited as an important contributing factor (10).

To reach these goals and to respond to the urgent need for an increase in access to health services among adolescents and young people in difficult economic situations, (11), Doctors with Africa CUAMM (DwA), an Italian non-governmental organization (12), in collaboration with UNICEF, have been supporting specific ambulatories for adolescents and young people since 2014, named "Serviço amigo do adolescente e jovem" (Saaj), which means "friendly health services for adolescents and young people". This service has been developed for individuals between the ages of 10-24, aiming to improve health education as well as access and health care. The Saaj intervention field involves sexual and reproductive health, giving great attention to HIV prevention and treatment.

In this retrospective study, we describe the impact of a new health service dedicated to youth in a low resource setting with high HIV prevalence.

2. Material and methods

Study design

We retrospectively analyzed the data collected between 2013 and 2014 (before and after the intervention supported by DwA and UNICEF) in 4 Saaj ambulatories in Beira, Mozambique.

Study setting

The Saaj ambulatories involved in our study were in 4 districts of Beira: Ponta Gea, Macurungu, Munhava and Nhaconjo, involving 225,661 people living in the area by the end of 2014 (Ponta Gea 71,212, Macurungu 33,848, Munhava 71 949, Nhaconjo 48,654) (13).

Saaj are specific ambulatories placed inside a public health center and dedicated exclusively to the health and care of adolescents and young people where they have free and voluntary access. Saaj offers the opportunity to receive counseling about reproductive and sexual health and offers specific support in the prevention and care of HIV. The group of health caregivers working within the Saaj is represented by general doctors, nurses, local psychologists. In addition to these professionals, there is a community young operators (between the ages of 16-24) who work inside and outside the Saaj, called "activistas".

They received basic training on adolescent health issues with a focus on ways of preventing sexually transmitted diseases and attended a course, held in the city of Beira, which was funded by DwA and UNICEF. The course lasted 80 hours (8 hours a day for 10 days in January and December 2013) and allowed the participation and training of 50 activistas. The primary task on an activista was to facilitate participation and to promote access to the care of adolescents and young people in different contexts. At the Saaj level, the activista welcomes the young and is a key person during counseling; at the community level, the activista is involved in the implementation of information campaigns on HIV and the prevention of sexually transmitted diseases in areas of increased social discomfort through different strategies. Strategies included street theatre to communicate with young people in a simple and direct way by creating an equal footing in the relationship between the activista and the youth, to facilitate the educational process.

Study population

We analyzed individuals between the ages of 10-24, who accessed 4 Saaj ambulatories from January 2013 to December 2014.

The outcome of this study was the number of adolescents and young people utilizing Saaj, stratified by gender and age, interested in receiving HIV counseling, tested for HIV, diagnosed positive for HIV and eligible for ART (antiretroviral therapy) or living on ART.

We included in HIV counseling all issues regarding HIV: information, serological status check, doubts in therapy, regardless of patient serostatus.

If the patient was seronegative, the HIV test was always recommended. If the test result was positive, then a specific counseling was performed to communicate the meaning of the result. The patient was then referred for a CD4 dosage to the health center laboratory. The result was then communicated to the Saaj nurse who delivered the result and gave advice to the young patient. At the same time, the process was submitted to the ART commission relating to the same health center, which assessed the eligibility at the beginning of therapy. The follow-up was determined by the ART commission according to national guidelines. In the event of a negative test, the patient was invited to repeat it every 3 months.

We defined subjects as "being enrolled in therapy" the seropositive patients who returned to Saaj for any counseling, and patients recently directed towards therapy as well.

Data collection, statistical analysis and ethical considerations

The data used in our study was obtained from the written register of each center, which reported for each visit, gender, age and type of consultation that lead the subject to Saaj (HIV or other). When the HIV consultation was performed, the subject was asked if he/she had already received the test (run/not run) and the test result (positive / negative), which was then reported. If the consultation involved a previously known HIV case, who discovered his/her serostatus between 2013 or 2014, the patient was asked if he/she was continuing follow-up therapy (enrolled in therapy/or not).

The data was registered monthly and entered in the Microsoft Excel program.

Differences in the data were determined by two-tailed student t-test after acceptance of normal distribution with the Kolmogorov-Smirnov test. p values (two sided) of less than 0.05 were considered to be statistically significant. Informed consent was not applicable.

Data utilization was approved by Health District Direction (Reference number 293/ 2015).

3. Results

In 2013 and 2014, consultations provided by the 4 Saaj were 63,959 and 102,533, respectively, with a significant increase of 60.3% (p<0.01). The rise was recorded in each center. (Table 1).

We registered more females than males in each center during both years. During 2013, we observed 43,170 female vs 20,789 male accesses. In 2014, we documented 77,109 female and 25,424 male accesses, respectively.

However, during 2014, the number of males attending Saaj increased in three out of four centers: + 2,888 counseling in Ponta Gea, + 2,749 in Macurungu, + 1,858 in Nhaconjo. Only Munhava registered a decrease in male admittances (- 2,860). (Table 1).

Health Center	Counseling		Male		Female	
	2013	2014	2013	2014	2013	2014
Ponta Gea	10,505	19,888	2,393	5,281	8,112	14,607
Munhava	23,438	26,242	9,767	6,907	13,671	19,335
Macurungu	16,017	19,659	5,380	8,129	10,637	11,530
Nhaconjo	13,999	36,744	3,249	5,107	10,750	31,637

Table 1 - Number of total counseling, male counseling, female counseling in each center during 2013 and 2014.

During 2013, the percentage of adolescents aged 10-14 who utilized Saaj were 13.5% versus 17% during 2014; the percentage between 15-19 years old was 40,9% during 2013 and 38.6% during 2014; among the age bracket 20-24, 45.6% in 2013 and 44.4% in 2014. (Table 2).

There was not any statistically significant difference between the percentage in 2013 and 2014 in any age group.

Age	2013			2014		
	Total (%)	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)
10-14 y	13.5%	3.9%	9.6%	17%	5.2%	11.8%
15-19 y	40.9%	11.3%	29.6%	38.6 %	17.1%	21.5%
20-24 y	45.6%	15.1%	30.5%	44.4%	12.1%	32.3%

Table 2 - Percentage of adolescents and young people accessing to Saaj divided by age, during 2013 and 2014

Considering half-yearly attendances, we observed no significant trend in the first half, p = 0.3 (2014 vs 2013), while a significant rise in the second half, p < 0.01 (2014 vs 2013).

Interestingly, we observed a steady increase in female counseling but only with a significant value in the second half, p < 0.01. Instead, considering male attendance, we observed a significant reduction in the first half, followed by a significant increase in the second one, p < 0.01 (2014 vs 2013).

Considering monthly attendance, in 2013, April registered the greatest value (8250), followed by January (6,526) and September (5,981). In contrast, during the same year the months with less turnout were August (3,649), June (,3712) and March (4,305). During 2014, we observed the highest attendance in October (14,974), August (13,895) and November (13,774) while the lowest was recorded in May (2,940), April (4,731) and February (4,849). (Table 3).

	2013		2014	
Month	Male	Female	Male	Female
January	2,698	3,828	1,369	3,536
February	2,084	3,663	1,319	3,530
March	1,649	2,656	1,432	4,359
April	2,761	5,489	1,348	3,383
May	2,213	3,367	396	2,544
June	1,380	2,332	1,895	6,569
July	2,078	2,934	2,245	6,932
August	1,249	2,400	4,091	9,804
September	1,156	4,825	1,940	6,438
October	1,270	4,264	3,358	11,616
November	899	3,816	3,283	10,491
December	1,352	3,596	2,748	7,907

Table 3 - Total of monthly attendance for all centers in male and female during 2013 and 2014

During 2013, 23,970 adolescents attended specific HIV counseling, this number was significantly lower than in 2014 when 32,251 specific counseling were registered, showing a rise of 8281 subjects.

In 2013, 20,320 HIV tests were performed, which represented 84.8% of people who received HIV counseling in that year at our centers. In 2014, the number of tests were 23,143, corresponding to 71.7% of all young people who received HIV counseling in 2014 in our centers.

In 2013, we recorded 1,653 positive tests corresponding to 8.1 % of all tests performed in that period.

During 2014, we observed a decrease in positive tests, recording 1,112 positive tests, that represented 4.8 % of all HIV tests performed during the year. (Table 4).

During 2013, 513 patients were recorded as enrolled in the therapy. During 2014, the number of patients recorded as being enrolled in the therapy was 462. (Table 4).

	HIV counseling (n)	HIV test (n)	Positive test (n)	Enrolled in therapy (n)
2013	23,970	20,320	1,653	513
2014	32,251	23,143	1,112	462

Table 4 - Total of HIV counseling, HIV test, positive test, and youths referred enrolled to therapy in all centers during 2013 and 2014.

4. Discussion

Adolescents and young people are at high risk of HIV infection and need specific attention from the Public Health (14). This must be addressed by a specific service dedicated to this target population.

Some studies show positive feedback if intervention for young people is done in a specific and informal setting (16) such as a Saaj.

Our study demonstrates a significant increase in the number of HIV consultations from before (2013) to after the DwA intervention (2014), confirming that strengthening specific youth services (including psychological support and dedicated counseling) is an effective intervention for improving access to care of this target population. The key points that have mainly contributed to achieve these results are: i) the peculiarity of the Saaj ambulatory, a structure exclusively dedicated to adolescents and the youth, and ii) the figure of the activista, in addition to the activity inside the Saaj, played a crucial role in maintaining the relationship with the young population living in the urban area.

During the periods this study used for its data, we observed an increase in the number requests for counseling, especially for females.

This finding can be explained not only in terms of HIV, but also in preventing pregnancy, which attracts a greater number of females. Moreover, females are more exposed to focused prevention and information campaigns, as the antenatal clinic represents a model (15), showing more readiness to access to health service (15). However, females are a critical and vulnerable population who frequently don't access health services because of social barriers or violence (16-17); the increase in female access represents positive feedback, which reinforces the need for supporting and propagating the Saaj ambulatories, especially to guarantee a higher universal health coverage in areas where it remains low.

Our data shows that early adolescents (between the ages of 10-14) have access to Saaj less than other age ranges (15- 19; 20-24). As school is the place where a wide number of early adolescent stay, this could represent the first step toward information and launching access to health public service. Starting from this hypothesis, we assessed the relationship between peak attendance at Saaj and the school calendar. However, no correlation was found probably due to low access to education, a high illiteracy rate and school desertion characterizing the population, especially for women who represent the most frequent users of Saaj (literacy rate for males 79.8%, literacy rate for females 56.5%) (18).

Nevertheless, school represents a milestone in the knowledge process (19), so by preventing school dispersion, promoting school attendance and building bridges between school and the health service, and placing Saaj ambulatories inside school areas, could be an efficient plan in increasing the rate of coverage in adolescent and young people.

Regarding prevalence of HIV tests, in 2014, despite an increase in absolute numbers of HIV testing, we recorded a lower percentage compared to 2013. This can be explained in part because the whole HIV counseling number (in which the percentage is calculated) also includes the follow-up counseling.

Moreover, other and more complex reasons can explain this low adherence to HIV test: failure to perceive to be at risk, not being ready to do the test, fear of knowing the result (20-21). Again, among adolescents the problem of communicating with parents if the result was positive and the fear of being stigmatized is higher than in adults. There is a consensus that any strategy to improve knowledge about transmission, therapy and prognosis of HIV disease is a successful key in fighting stigmatization (22). In this context, the measures implemented within the Saaj ambulatories, including psychological support and listening groups, aim at reducing the fear of adolescents and young people and the feeling of being stigmatized in the event of a positive test result.

When compared to studies referred to the same geographical region (23), our data shows a higher percentage of patients enrolled in the therapy. However, it must be notice that, in the present study, "subjects enrolled in the therapy" consisted of two groups: a first group involved young people newly diagnosed with HIV, who had carried out the CD4 and with the eligibility criteria, and a second group including patients undergoing ART treatment, who returned for counseling related to therapy itself.

This data suggests a problem of acceptability among this target population. Although receiving counseling, most young patients do not perform an HIV test and when they result positive, a part of them are susceptible to being lost to follow-up before starting or after beginning ART therapy (24-17).

The main priorities are: improving knowledge about prevention of the HIV infection, adhering to therapy in seropositive patients and preventing the loss to follow-up, which remains a high priority at every step of the therapy (25), using target interventions through strategies which appeal to the young to facilitate the achievement of these goals (26-27-28). Moreover, adolescents and youth are a complex and heterogeneous population, characterized by different social and sexual behavior (16), reflecting different ways of acquiring the infection (infection at birth or acquired by high risk behavior); for these reasons a specific and varied approach is necessary to reach this target population.

The main limitation of our study is the lack of the number of young people directed towards therapy who start the therapeutic journey. In any case, also in our study, the percentage of patients referred to the therapy remains low, according to previous experiences. More efforts are required to work on strategies targeted at not losing patients in this delicate phase of the therapy. We do not have the data of young people who, after knowing their HIV status, do not continue the therapeutic journey, which includes the CD4 execution. This finding is extremely important because it represents one of the key moments of drop-out in the therapeutic cascade in the youngest population (23). Therefore, we need more data to understand the reasons for this drop-out at this stage of the therapeutic cascade (25). Another limitation is the lack of data about the timing between the test execution, the CD4 execution and the start of ART therapy, in addition to the absence of data about the follow-up and the percentage of loss to clinic.

Despite the various limitations, the results of the present study give important information: the strengthening of the specific services for young people is an effective strategy in increasing access to care in this sensitive segment of the population, which, although highly affected by HIV, is also the segment with less access to services for diagnosis and treatment.
The development of a specific service for increasing access to healthcare by youth also for surgical issues (29). Increasing investments to fight stigmatization by knowledge campaigns, lead people newly diagnosed to care and assure the follow-up could encourage HIV test execution, and promote the completion of "HIV cascade of care".

5. Conclusion

In our study, we underline how specific ambulatories for young people can improve access to health services. Much remains to be done in increasing awareness about HIV, HIV tests and therapeutic compliance in this target population.

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Prevalence of Tuberculosis and Diabetes

PAPER

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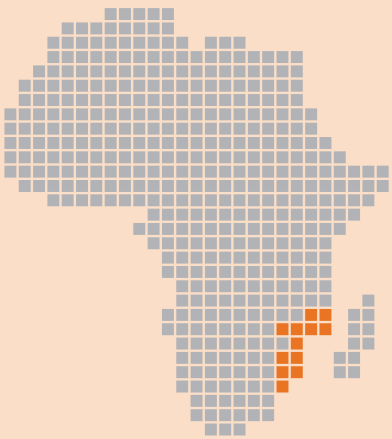

Abstract

Tuberculosis (TB) is one of the leading causes of death in sub-Saharan African countries, and its coexistence with diabetes mellitus (DM) is affecting more and more people. It has been observed that each disease may adversely affect the outcomes of the other, in terms of delayed diagnosis and healing, severity of symptoms, and mortality. There seems to be a higher prevalence of patients with TB that also have diabetes mellitus, but not vice versa.

This could be partially explained by social determinants of health (SDH), meaning the social conditions in which patients are born, grow up, and live. For example, malnutrition and physical inactivity lead patients with TB to stimulate the increase of glucose levels, which makes the development diabetes mellitus more likely.

We must therefore implement a multidisciplinary, integrated approach to TB and diabetes mellitus to improve prevention and treatment.

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Letter to Editor OMICS International

Prevalence of Tuberculosis and Diabetes

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Letter to Editor

Dear Editor,

Tuberculosis (TB) is one of the leading causes of death worldwide and, although great efforts have already been made, the way to defeat this disease is still long [1]. The burden of TB is higher in Sub-Saharan Africa and low income countries where, another increasing plague, the diabetes mellitus (DM) is affecting more and more people. The rapid increase of DM and its coexistence with TB and HIV is a clear example of overlap and interaction between communicable and non-communicable diseases requiring a multidisciplinary and integrated approach [2]. The association between TB and DM, in particular in low and medium income countries, has been showed to cause a mutual worsening of the natural history of both diseases. Although the pathophysiological mechanism is still unclear, it has been observed that each disease may adversely affect the outcomes of the other, in terms of delayed diagnosis and healing, severity of symptoms, mortality [2]. However, to date, contrasting data are available regarding TB prevalence in diabetes and vice versa and, recent findings suggest a high burden of diabetes among TB patients but low prevalence of TB among DM patients [3]. Apparently, this is a contrast that could be partially explained by social determinants of health (SDH). In fact, growing evidence suggests that the lack of efficacy in containing TB and the presence of multi drug resistance (MDR), is due to many factors including SDH [4]. SDH are defined as conditions in which people are born, grow, live, work and get old having an immediate impact on health and are greatly influenced by the distribution of money, power and resources [5]. In particular, low education, low income and alcohol abuse are significant predictors of therapy failure and MDR in people with TB.

On one hand, in fact, the high prevalence of DM in TB patients is a consequence of increased susceptibility. In fact, malnutrition and physical inactivity lead patients with TB to stimulate adrenaline, glucagon and cortisol at the same time, thus increasing glucose levels [6]. Moreover, the higher incidence of chronic calcified pancreatitis in patients with TB and vitamin A, C and D deficiencies might also explain the impaired glucose tolerance and increased risk of DM [7].

On the other hand, although diabetes seems to be a "risk factor" for TB, affecting innate as well as adaptive immune responses [8], the presence of diabetes in many cases, especially in developing countries, is to mean a well-being state and, thus, good SDH.

Regardless of the pathophysiologic basis, especially in developing countries, both diseases are increasing and represent a huge health, social and economic burden. For this reason, it is mandatory to strengthen the efforts in two main aspects: clinic and scientific.

In fact, on one side, it is necessary to develop integrated and multidisciplinary approaches in order to improve the prevention, the screening and the management of dual diseases. Moreover, to achieve more effective results, it is also critical to perform early diagnosis, treatment and management of co-morbidities and, regarding latent TB, preventive therapy.

On the other side, the complexity of the association between TB and DM requires a great effort from the scientific community to clarify the many outstanding issues and to develop appropriate and adequate strategies of health policies in different settings.

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Towards UNAIDS 90-90-90 Target: Preliminary Results from theTest &Treat Project in Shinyanga and Simiyu Regions, Tanzania

ORAL PRESENTATION

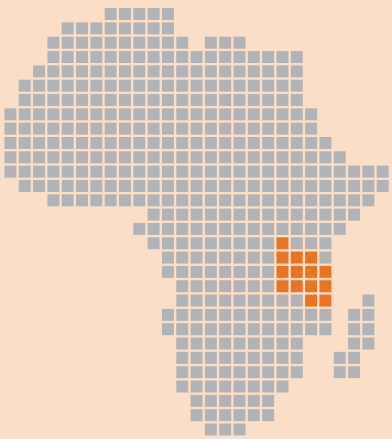
Conference
4th Tanzania Health Summit

Location
Dar es Salaam, Tanzania

Presentation Date
14th – 16th November 2017

Authors
De Nardo P., Rinke de Wit T., Hermans S., Pakker N., Bortolani A., Pozniak A., Corona G., Mfaume R., Kihuya M., Kwezi E.

Focus country
Tanzania



Background and Methods
In October 2016 the Tanzanian Ministry of Health adopted the Universal Test and Treat (UTT) approach to fight against HIV/AIDS. The *Test&Treat Project* in Shinyanga and Simiyu Regions, where HIV prevalence is estimated 7,4% and 3,6%, aims to implement a community model of HIV care encompassing both UTT and Differentiated HIV Care. Since April 2017 to date community HIV testing services and sensitization campaigns have been implemented in public areas, factories, schools, and places of worship. Moreover, HIV testing is offered routinely to all patients reporting to health facilities (HF). All people tested HIV+ are referred to a Counselling and Testing Clinic (CTC) to initiate ART. CHWs play a pivotal role in the linkage to care. In the second phase of the project, clients from the four project's CTCs who are stable on ART for at least 6 months will be referred to a community-based treatment group. We report preliminary data ofthe first quarter of the project.

Findings
From May to July 2017, 18,796 clients were tested through the campaigns, while 4,365 were tested at the project's HFs. More men were tested in the campaigns compared to HF (55% vs 37%; p<0.01). Overall 451 (2%) HIV+ clients were detected (male 40%). Of these, 50 (11%) revealed to already be aware of their HIV status. 1,005 (4.3%) children <5years were tested, of which 8 (0.8%) were found to be HIV+. Among the 200 clients newly diagnosed during the campaigns, 109 patients (55%) were linked to a CTC by 31 July 2017. Linkage to care in Simiyu Region was higher compared to Shinyanga (63% vs 47%; p=0.02). HIV Viral Load (HVL) data were available for 842 (32%) out of 2,596 patients on ART at the four project's CTCs. Of these, 680 (80%) had VL <1000 cp/ml.

Conclusions
Preliminary data of *T&T Project* demonstrate the potency of community HIV testing as compared to HF-based testing to identify HIV+ men. Linkage to care was suboptimal, therefore requiring further efforts. At the four project's CTC, viral suppression represents one of the biggest hurdles These findings identify promising areas of intervention to achieve the ambitious UNAIDS 90-90-90 goals.

Effectiveness of "Task Shifting" from clinical officers to nurses in delivering pediatric antiretroviral treatment: a retrospective cohort study in Beira (Mozambique)

POSTER PRESENTATION

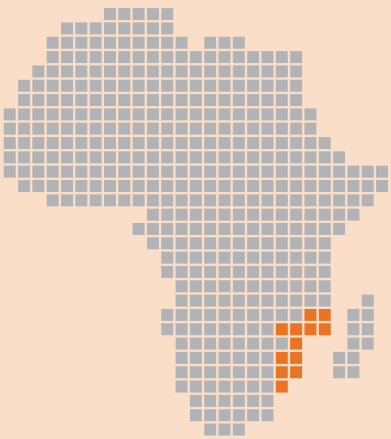
Conference
9th Italian Conference on AIDS and Antiviral Research (ICAR) 2017

Location
Siena, Italy

Presentation date
12th – 14th June 2017

Authors
Di Gennaro F., Pizzol D., Chhaganlal K.D., Monno L., Putoto G., Saracino A.

Focus country
Mozambique



Background
Mozambique has the 8th highest HIV prevalence in the world with 14,000 newly infected children every year. In 2015, antiretroviral treatment (ART) coverage in children was only 28%, with a 63% rate of retention in care. Based on WHO recommendations, in June 2013, Mozambique started lifelong ART implementation for all HIV+ breastfeeding women. Moreover, the care of newly infected children was shifted from clinicians working in outpatients HIV services to trained nurses working at Mother and Child Health (MCH) services. The study objective was to asses if this task shifting (TS) had a beneficial impact on pediatric ART management.

Material and Methods
The study retrospectively compared the rates of ART initiation and retention in care at 6 and 12 months for children treated by clinical officers in HIV services (Pre-TS cohort, from June 2012 to May 2013) versus those treated by nurses in MCH services (Post-TS cohort, from June 2013 to May 2014) in five Health Facilities (HF) in Beira, Mozambique.

Results
A total of 588 HIV infected children (51.3% females; 258 belonging to the Pre-TS cohort and 330 to the Post-TS one) were included. An increase of regular nutritional visits (51.8% vs 32.6%, $p<0.001$) and of isoniazid prophylaxis for children (30.6% vs 14.1%, $p<0.001$) was observed after the task shifting. On the contrary, a reduction of ART prophylaxis for children at birth (80.7% vs 70.9%, $p<0.001$) was registered. Moreover, similar percentages of ART withdraw (64.7% vs 63.8%), ART temporary interruption (1.2% vs 2.3%), death (5.4% vs 5.4%), and loss to follow-up (6.9% vs 5.1%) were observed in the two cohorts.

Conclusions
No clear evidence of a benefit in terms of ART initiation and retention in care for HIV-infected children was observed in our study after the task shifting from HIV services to MCH centers. Further prospective studies are needed to clarify the role of an integrated mother and child management in ART access in a country with high HIV prevalence.

9° CONGRESSO NAZIONALE 12-14 GIUGNO 2017 Università degli Studi di Siena
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Italian Conference on AIDS and Antiviral Research
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n. 269

Effectiveness of "Task Shifting" from clinical officers to nurses in delivering pediatric antiretroviral treatment: a retrospective cohort study in Beira (Mozambique)

Authors: Francesco Di Gennaro[1], Damiano Pizzol[2], Kajal D. Chaganlal[3], Laura Monno[1], Giovanni Putoto[4], Annalisa Saracino[1]
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4 Research Section, Doctors with Africa CUAMM; Padova – Italy

Background

- Mozambique has the world`s 8th highest HIV prevalence with 14,000 newly infected children every year.
- In 2015, antiretroviral treatment (ART) coverage in children was only 28% (23-34%), with a 63% rate of retention in care.
- In June 2013, Mozambique, as recommended by WHO (2), started the implementation of lifelong ART for all HIV infected breastfeeding women, regardless of their CD4 count and/or clinical status.
- Moreover, the care of newly infected HIV+ children was shifted from clinicians working in outpatients HIV services to trained nurses working at Mother and Child Health (MCH) services, with the aim of improving pediatric ART delivery by treating contemporary HIV-positive mothers and children (3) .
- The study objective was to asses if this task shifting (TS) had a beneficial impact on pediatric ART management .

Patients and methods

- The study retrospectively compared the rates of ART initiation and retention in care at 6 and 12 months for children treated by clinical officers in HIV services (Pre-TS cohort, from June 2012 to May 2013) versus those treated by nurses in MCH services (Post-TS cohort, from June 2013 to May 2014) in five Health Facilities (HF) in Beira, Mozambique.

Results

- A total of 588 HIV infected children (302 females, 258 of whom belonging to the 1st cohort and 330 to the 2nd one) were included.
- The general features and follow-up data in the two cohorts are summarized in **Table 1.**
- Baseline characteristics (gender distribution, mean age, weight/height at birth) did not differ in the two cohorts. An increase of regular nutritional visits (vs 51.8% vs 32.6%), ART prophylaxis for mothers (31.5% and 23.9%), isoniazid prophylaxis for children (30.6% vs 14%) were observed after the task shifting.
- On the contrary, a reduction of prophylaxis for opportunistic infection for mothers and ART for children at birth (80.7% vs 70.9%) were registered.
- There were no significant differences in HIV outcomes, including the rate of ART start (before 9 months of age, 34.5 vs 32.9%, and after 9 months, 65.5% vs 67.1%, respectively) and the mean time from HIV results to ART start (1.7 + 3.8 vs 2.1 + 4.8, respectively).
- A similar percentages of ART withdraw (64.7% vs 63.8%), ART temporary interruption (1.2% vs 2.3%), death (5.4% vs 5.4%), and loss to follow-up (6.9% vs 5.1%) were observed in the two cohorts.

Table 1. General baseline characteristics and clinical and laboratory outcomes during a one year follow-up for the enrolled patients in the two cohorts, pre- and post-task shifting.

Variable		N	Pre-TS	Post-TS
		588	258 (44%)	330 (56%)
Gender, N (%)	Females	302	139 (53.9%)	163 (49.4%)
Mean Age, months+SD		588	15.9 + 14.6	16.8 + 13.6
Weight at birth, N (%)	< 2.5 Kg	62	34 (24.8%)	28 (19.7%)
	> 2.5 Kg	217	103 (75.2%)	114 (80.3%)
Breastfeeding, N (%)		304	151 (84.4%)	153 (77.3%)
Duration of breastfeeding, months+SD		100	10.1 ± 4.6	12.4 ± 6.4
Weight, Kg+SD		578	7.8 ± 3	8.1 ± 3.1
Height, cm+SD		538	67.7 ± 16	69.6 ± 16.2
Weight/ Height (z score), N (%)				
Normal		309	146 (63.5%)	163 (55.6%)
Slight malnutrition		83	36 (15.7%)	47 (16%)
Moderate malnutrition		56	21 (9.1%)	35 (11.9%)
Severe malnutrition		75	27 (11.7%)	48 (16.5%)
Regular nutritional visits, N (%)		236	77 (32.6%)	159 (51.8%)
PMCT mother at first visit, N (%)				
None		106	42 (23.9%)	64 (32.4%)
Mono prophylaxis		72	36 (20.5%)	36 (18.3%)
Bi-Prophylaxis		91	56 (31.7%)	35 (17.8%)
ART		104	42 (23.9%)	62 (31.5%)
Age of mother, yrs+SD		512	26.7 ± 6.1	26 ± 5.7
Mother dead at consultation N, (%)		35	16 (7.3%)	19 (6.7%)
Age of father, yrs+SD		344	32.3 ± 9	32.6 ± 7.4
Father dead at consultation N, (%)		40	16 (8.8%)	24 (9.8%)
HIV positive father, N (%)		101	40 (65.6%)	61 (71.8%)
WHO clinical staging, N (%)	1	310	144 (58.5%)	166 (52.8%)
	2	114	48 (19.5%)	66 (21%)
	3	99	31 (12.6%)	68 (21.7%)
	4	37	23 (9.4%)	14 (4.5%)
ART prophylaxis at birth, N (%)		292	146 (80.7%)	146 (70.9%)
CTZ prophylaxis, N (%)		528	232 (92.8%)	296 (93.1%)
INH Prophylaxis, N (%)		128	34 (14.1%)	94 (30.6%)
AFB test, N (%)	Positive	21	7 (4.4%)	14 (7%)
TB treatment, N (%)		51	13 (5.6%)	38 (13.8%)
Hemoglobin test at ART start N, (%)		236	77 (32.6%)	159 (51.8%)
Hemoglobin value at ART start, mg/dl+SD		313	9.51 ± 7	10.1 ± 8.6
Blood collected for CD4 at ART start, N (%)		326	168 (68.9%)	158 (50.5%)
CD4 count at ART start, N (%)		326	1172 ± 835	1360 ± 1209
CD4 count every 6 months, N (%)		110	56 (24.5%)	54 (18.4%)
PCR results, N (%)	< 6 months	13	8 (33.3%)	5 (17.2%)
	> 6 months	40	16 (66.7%)	24 (82.8%)
Rapid test results, N (%)	< 18 months	59	18 (34.6%)	41 (36.3%)
	> 18 months	106	34 (65.4%)	72 (63.7%)
Mean age at first rapid test, months+SD		165	25.4 ± 16.4	23.9 ± 13.1
Mean time from referral to rapid HIV test months+SD		165	0.6 + 2.3	1 + 6.1
Mean age start of ART, months+SD		494	18.1 ± 15.6	17.2 ± 14.1
Start of ART, N (%)	< 9 months		72 (32.9%)	95 (34.5%)
	> 9 months		147 (67.1%)	180 (65.5%)
Mean time from referral to start of ART, months+SD		494	2.3 ± 4.4	1.1 ± 5
Mean time from HIV results to start ART, months+SD		359	1.7 ± 3.8	2.1 ± 4.8
Final Outcome, N (%)				
Abandoned		379	165 (63.8%)	214 (64.7%)
Suspended		10	6 (2.3%)	4 (1.2%)
Loss to follow up		35	18 (6.9%)	17 (5.1%)
Death		32	14 (5.4%)	18 (5.4%)
Unknown		134	56 (21.6%)	78 (23.6%)

Legend: N=number, %=percentage, SD=standard deviation; Pre-TS=Task Shifting; Post-TS=Task Shifting, WHO=World Health Organization, PCR=Polymerase Chain Reaction, PMCT=Prevention of Mother to Child Transmission; ART= Antiretroviral treatment, CTZ=Cotrimoxazol, INH=Isoniazid , AFB=Acid-Fast Bacillus Testing ; TB=Tuberculosis

Conclusion

- No clear evidence of a benefit in terms of ART initiation and retention in care for HIV-infected children was observed in our study after the task shifting from HIV services to MCH centers.
- The retrospective nature of the analysis, based on data collection in difficult field conditions, or the short time of follow-up could have hindered to demonstrate an improvement of ART management.

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Universal coverage and equity

Gender Inequalities in Remote Settings: Analysis of 105,025 Medical Records of a Rural Hospital in Ethiopia (2005–2015)

PAPER

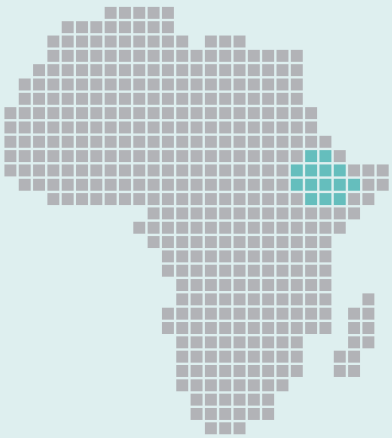
Authors
Accorsi S., Somigliana E., Farese P., Ademe T., Desta Y., Putoto G., Manenti F.

Published in
Journal of Community Health, 2017 March

Link
https://link.springer.com/article/10.1007%2Fs10900-017-0321-z

Topic
Universal coverage and equity

Focus country
Ethiopia



This paper is not available as open access, which is why only an abstract is posted. If you would like to read the entire paper, please go to the web page given and follow the instruction.

Abstract

This retrospective study conducted in a nonprofit hospital in Ethiopia clearly shows that gender inequality persists in sub-Saharan Africa. The study collected data on 105,025 patients who used the services of the private hospital, between 2005 and 2015, where the cost of care has been supported externally since 2001.

More women (61.9%) than men were admitted overall, likely because the majority of services have to do with obstetric service. Excluding admissions for malaria, men used the hospital services for injuries and musculoskeletal diseases.

The frequency of admissions changed with age and gender. Female admissions prevailed in the reproductive age period (from 15 to 44 years of age) while male admissions prevailed in the younger and older age groups.

The trend did not change over the 11 years of the study. Gender difference in access to health services persist, especially in Africa's poorest, most remote areas. However, the growing number of admissions in obstetrics is encouraging for a possible change in the current trend.

J Community Health
DOI 10.1007/s10900-017-0321-z

ORIGINAL PAPER

Gender Inequalities in Remote Settings: Analysis of 105,025 Medical Records of a Rural Hospital in Ethiopia (2005–2015)

Sandro Accorsi[1] · Edgardo Somigliana[2] · Pasquale Farese[1] · Tsegaye Ademe[3] · Yonas Desta[4] · Giovanni Putoto[3] · Fabio Manenti[3]

Abstract Gender inequalities in Sub-Saharan Africa are deemed relevant but data to support this view are scanty. Retrospective analysis of a large dataset of 105,025 patients admitted to an Ethiopian rural private, non-for-profit hospital over a 11 years period (2005–2015). Since 2001, the hospital and the local community are involved in a long-term, comprehensive and externally-supported health care intervention. The total number of admissions was higher for females (61.9% of the total) mainly because of the high frequency of admissions for obstetrics conditions. The total male-to-female ratio (M:F) was 0.6. Except for malaria, men had more admissions for the other leading causes, with the highest M:F being found for injuries (2.7) and musculoskeletal diseases (1.7). Overall, excluding admissions for pregnancy-related issues, the M:F was 1.4. The frequency of admissions changed with age and gender. Female admissions prevailed in the reproductive age period (from 15 to 44 years of age) while males admissions prevailed in the younger and older age groups. The case fatality rate was higher for men (M:F = 2.0). The total M:F and the M:F excluding pregnancy-related admissions did not change during the study period. Gender inequalities do exist in rural remote setting but tend to affect women differently during their lifespan. Even if gender inequalities generally favor males, the substantial proportion of admissions for pregnancy-related situations is encouraging.

Keywords Gender · Remote setting · Pregnancy · Inequality

Introduction

There has been a remarkable improvement in health status in developing countries over the past two decades [1]. However, despite the progress achieved so far, there is the unfinished Millennium Development Goals (MDG) agenda around mortality reduction, particularly maternal and newborn mortality, and challenges are still to be addressed in improving the health of the population across the life course and in addressing health inequalities. Furthermore, the MDGs and their focus on aggregated measures of progress masked the inequalities in health outcomes that exist between and within countries and among subgroups in a given population [2]. Learning from the MDG experience, the new 2030 agenda for sustainable development has been firmly anchored in the principle of universality [3], with a strong commitment to equity [4] and a focus on vulnerable groups bearing a disproportionately high burden of poor health and having the greatest need for health services [5]. Women and children should receive utmost consideration here. It is worth noting that the focus on maternal and child health helps to target those in poverty: in fact not only are death rates higher among the poor compared with the rich, but also the highest poor-rich mortality ratio is observed for complications of pregnancy and childhood infectious diseases [6].

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Published online: 16 March 2017

Programming interventions on Community Health Insurance: a feasibility case study in Uganda

ORAL PRESENTATION

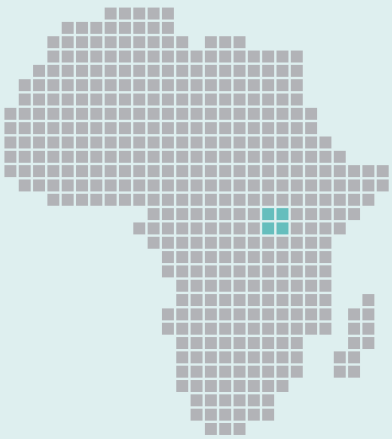
Conference
V Convegno CUCS - Coordinamento Universitario Cooperazione allo Sviluppo

Location
Milan, Italy

Presentation Date
14th – 15th September 2017

Authors
Nannini M., Biggeri M., Putoto G., Maciocco G.

Focus country
Uganda



Introduction and Aim
Financial protection in case of illness is indispensable in preventing catastrophic health expenditures. In low and middle income countries (LMICs) Community-based Health Insurance (CHI) constitutes an innovative tool to provide universal financial protection for the rural populations. The feasibility case study on CHI was carried out in Oyam district, Northern Uganda. This rural territory, which is part of a post-conflict region, counts an estimated population of 408,000 and presents poor health indicators. The objective of the research was to determine whether the necessary conditions for the establishment of a successful CHI scheme are present in Oyam district.

Methodology
After reviewing the existing literature on community health financing, the research adopted a mixed-methods approach, involving both quantitative and qualitative methods. The study team performed in a pilot area of the district a Household Survey, a Stakeholder Analysis –composed by Key Informant Interviews and Structured Focus Group Discussions-, Investigation on the local solidarity groups and Geo-referencing activities. The main subjects of enquiry were health seeking behaviour of the target population; their ability to pay; premium calculation; and background information needed to guide decision-making.

Results
The evidence arising from the data analysis validated all the feasibility conditions. Moreover, specific estimates indicated possible scenarios about premium charge. The community showed high levels of interests for the scheme and an initial ownership of the initiative.

Conclusions
Overall, the results demonstrated that a viable CHI model can be implemented in Oyam district. This option has the potential to improve access to health care of the local population.

Exploring the feasibility of community health insurance: A case study in Uganda

ORAL PRESENTATION

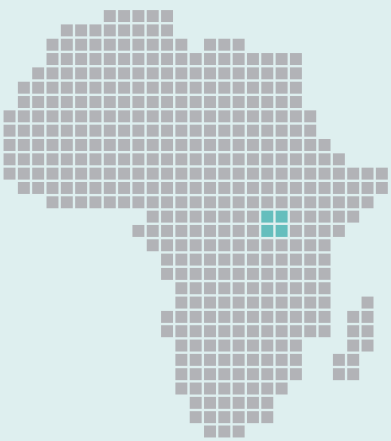
Conference
Fourth SITES-IDEAs Annual Conference on Development Topics

Location
Rome, Italy

Presentation Date
28th – 30th September 2017

Authors
Biggeri M., Nannini M., Putoto G.

Focus country
Uganda



Abstract

Financial protection in case of illness is indispensable in preventing catastrophic health expenditures. In low and middle-income countries Community-based Health Insurance (CHI) constitutes an innovative tool to improve access to health care for the rural populations. Accordingly, this system is indicated as a promising avenue to the achievement of Universal Health Coverage (UHC). The feasibility case study on CHI was carried out in Oyam district, Northern Uganda. The rural territory, which is part of a post conflict region, counts an estimated population of 408,000 and presents poor health indicators. The objective of the research was to determine whether the necessary conditions for the establishment of a successful CHI scheme are present in the local context. We adopted a mixed-methods approach, involving both quantitative and qualitative methods. These included a Household Survey, Key Informant Interviews and Structured Focus Group Discussions, performed in a pilot area of the district. The main subjects of enquiry were health seeking behaviour of the target population, their preferences, ability and willingness to pay. The evidence arising from the data analysis validated all the feasibility conditions. Overall, the results demonstrated that a viable CHI model can be implemented in the local context, with the potential to improve access to health care for the local population.

Improving the Performance of health Facilities in Napak District Using Health Facility Quality of Care Assessment Tools

POSTER PRESENTATION

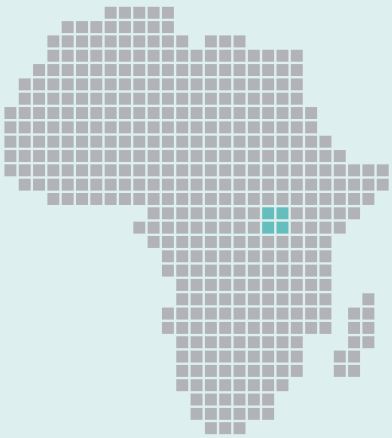
Conference
Health's 4th National Quality Improvement Conference

Location
Kampala, Uganda

Presentation date
29th – 31st August 2017

Authors
Ssenyondo M., Lokadio N., Achom V., Masereka E., Ogwang D., Ictho J., Lochoro P.

Focus country
Uganda



Introduction
Health Facility Quality of Care Assessment Program (HFQAP) is a national initiative aimed at improving quality of care in health facilities in Uganda. We report on the remarkable improvement in the scorecard ranking following assessment of health facilities in Napak district using the HFQAP guidelines.

Methods
We trained district based assessors on the methods of the assessment, communicated officially to facilities indicating dates of the assessment, had entry meetings at facilities followed by the actual assessment and debrief. Baseline assessment was conducted in August 2016; quality improvement projects instituted in areas of poor performance and did a follow-up assessment in May 2017. Scores were recorded on a summary sheet and shaded on a score card; using GREEN for score 1 and RED for score zero. Facilities were ranked from STAR 0 to STAR 5 using the HFQAP standards (<55% STAR 0, 55 – 64% STAR1, 65 – 74% STAR2, 75 – 84% STAR3, 85 – 94% STAR4 and >95% STAR5). Certificate of appreciation was awarded to best performing facilities.

Implementation outcomes
- 100% of the 14 facilities showed remarkable improvements from baseline ranging from 16% to 42% in nearly all service areas
- 57% of the facilities scored STAR 1 compared to 0% at the baseline assessment

Lessons for effective implementation
- Continued mentorship and coaching
- Awarding of best performing facilities
- Establishing 'model facilities' to be exemplary to other facilities
- Follow-ups on set action points
- Instituting Quality Improvement project to address quality gaps

MINISTRY OF HEALTH

MEDICI CON L'AFRICA CUAMM Doctors with Africa

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Improving the Performance of health Facilities in Napak District Using Health Facility Quality of Care Assessment Tools

Authors: Ssenyondo M[1], Lokadio N[1], Achom V[2], Masereka E[1], Ogwang D[1], Ictho J[3], Lemukol J[2], and Lochoro P[3]

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Introduction

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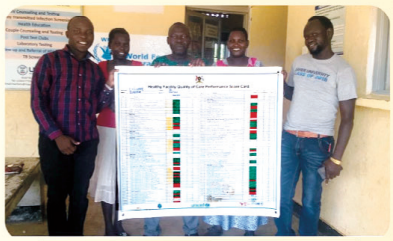
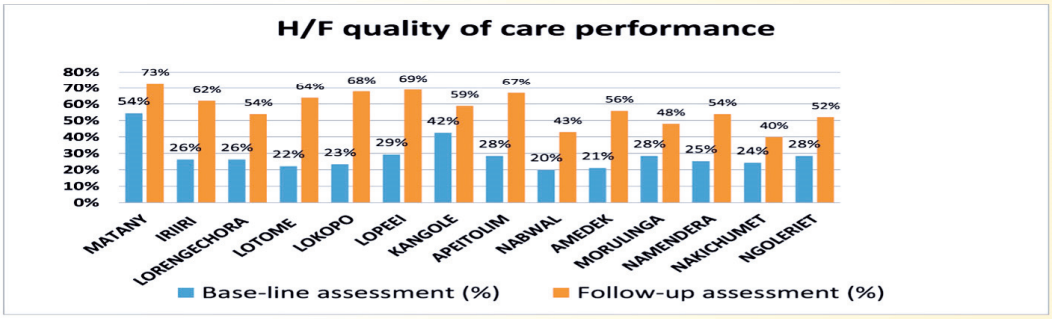
Assessors Shading the Score Card - Lotome HC III



Display of Final Score Card - Lotome HC III

Trends of HF performance from baseline



Implementation outcomes

- 100% of the 14 facilities showed remarkable improvements from baseline ranging from 16% to 42% in nearly all service areas
- 57% of the facilities scored STAR 1 compared to 0% at the baseline assessment

Lessons for effective implementation

- Continued mentorship and coaching
- Awarding of best performing facilities
- Establishing 'model facilities' to be exemplary to other facilities
- Follow-ups on set action points
- Instituting Quality Improvement project to address quality gaps

Acknowledgments:

CUAMM, UNICEF and Napak district local government

Nutrition

The outcome of Community - Facility nutrition interventions

POSTER PRESENTATION

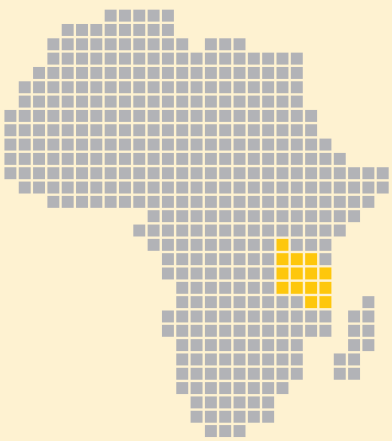
Conference
4th Tanzania Health Summit

Location
Dar es Salaam, Tanzania

Presentation date
14th – 16th November 2017

Authors
Halidi H., Sanga E.

Focus country
Tanzania



Abstract

Reducing stunting and acute malnutrition rates among children under-five is DOCTORS WITH AFRICA CUAMM focus through "Accelerating Stunting Reduction Program (ASRP)-TubadiLISHE and "Scaling Up Integrated Management of Acute Malnutrition - IMAM" in Iringa and Njombe regions.

- With support of tools/equipment and therapeutic foods 15 hospitals, 49 health centers and now scale up SAM management following IMAM national guidelines
- Villages and CHWs currently involved (SBCC /CCD/ Growth Monitoring approach) are 424 and 855 respectively; 55% were oriented on MUAC too. Coverage will increased from December 2017.
- Giving 146 progressive farmers who established 73 farm schools in 73 villages. Kitchen gardens adopted in 12, 849 households (65%). CHWs reached 108,013 beneficiaries and only 24% being male through counseling groups, village meetings and clinic days gatherings.

Poor capacity of caregivers drive to unsuccessful referrals, deaths and absconds; community leaders involvement; constant meetings with village leaders, CHWs and HWs and linking them with TASAF initiatives a bridge to capacitate poor households.

Counseling groups approach seemed new to beneficiaries contributing to low male involvement and participation; engaging in farming/home gardening and small livestock keeping a way to involve them. Remoteness of villages with high stunting and acute malnutrition rates; train more CHWs, support remote health facilities to scale up IMAM services Low rates of SAM tested for HIV; linking with existing HIV based programmes. Staff rotation within the facility; conduct on job mentoring and support orienting of non-trained staff.

The integration of community-facility based nutrition interventions is crucial to sustain nutritional services to beneficiaries and eventually improves quality services and increasing awareness and involvement in behavior change initiatives on eating habits and production.

Chronic diseases

Laparostomy in a rural hospital: an African case report for a very important tool to be spread and increased

PAPER

Authors
Arzu G.D., Conventi R., Putoto G., Onapa E.

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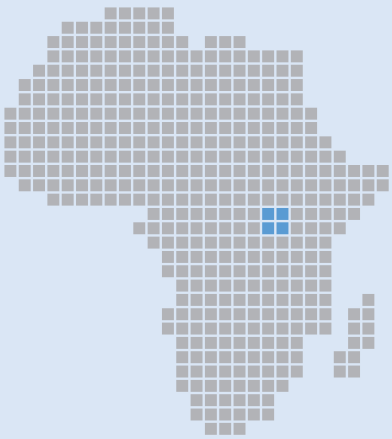
Topic
Chronic diseases

Focus country
Uganda



Abstract

Laparostomy is a surgical technique enabling the surgeon to leave abdominal fascial edges opened after a laparotomy. This is a useful tool that can be very important in patients with intraabdominal hypertension. Conditions to proceed with the open abdomen operation include: trauma, severe abdominal sepsis, intestinal infarction, and vascular surgery in order to avoid abdominal compartment syndrome, or if a second evaluation is needed to check the condition of the abdomen and the gut.

This technique was used in Aber, Uganda, during surgery on a patient with intestinal obstruction where performing a primary anastomosis during the first operation was at high risk of failure. Open abdomen is a very important technique, relatively new, that can impact positively in treating some surgical patients even in rural hospitals and in the absence of an Intensive Care Unit. Laparostomy should be implemented more in low-income African countries.

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Journal of Peritoneum *(and other serosal surfaces)* 2017; volume 2:31

Laparostomy in a rural hospital: *an African case report* for a very important tool to be spread and increased

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Abstract

Laparostomy is a surgical technique enabling the surgeon to leave abdominal fascial edges opened after a laparotomy. This is a useful tool that can be very important in patients with intra-abdominal hypertension. Open abdomen indications are: trauma, severe abdominal sepsis, intestinal infarction, vascular surgery and when the surgeon cannot close the abdomen due to high intra abdominal pressure in order to avoid abdominal compartment syndrome or in case of a second look in order to evaluate the conditions of the abdomen (and particularly of the gut). We used this technique in a low income country for a patient with intestinal obstruction where performing a primary anastomosis during the first operation was at high risk of leakage.

A middle-aged woman was admitted in Pope John's Hospital - Aber, Uganda for abdominal pain and intestinal obstruction (IO) symptoms. A laparotomy found a tract of small gut necrotic and twisted under a single adhesion. The small gut above the volvulus was dilated for the obstruction created by the adhesion. We decided to excise the necrotic intestine and leave the abdomen open for a second look and delayed anastomosis and closure. The managing of the IO was conducted by inserting a big Foley catheter in the proximal intestine to drain its enteric content in a similar fashion to *a guided external fistula*.

Open abdomen is a very important technique, relatively new, that can impact positively in treating some surgical patients even in rural hospitals and in the absence of Intensive Care Unit. A simple trick can solve successfully the IO due to the volvulus. Laparostomy should be spread more in African and low-income countries.

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Case Report

A 42(?)-year old woman came to Aber Hospital at around 7:00 p.m. and was admitted in October 2015 to the surgical ward complaining severe abdominal pain, she was not passing stools and flatus for the past 5 days and she had no history of previous surgeries. The patient was hemodynamically stable, although slightly tachicardic (BP 100/70, HR 100 bpm). Clinically she presented with severe abdominal distension and signs of peritonitis. Rectal exploration was carried out at hospital admission showing empty rectus. We tried to manage this case conservatively by passing a rectal tube thinking it could have been a sigmoid volvulus, very frequent in African communities but after a plain abdominal XR we realized the distension was coming from the small gut. Blood tests showed a mild leukocytosis, normal Hb and PLT. The patient started resuscitation fluids, IV antibiotics, and pain relief, we passed a NGT and urinary catheter. An explorative laparotomy was planned the following day: despite she was slightly peritonitic at presentation, it was impossible to set up the theatre and perform the operation sooner due to logistic deficiency. The NGT output before the operation was about 100 mls and urine output about 1500 mls. The operation was undertaken the following morning, as soon as it was possible to arrange the theatre (around 8:00 a.m.), and the patient's vital signs were stationary from the former evening. The patient was premedicated with diazepam and pethidine. General anesthesia was induced with an iv ketamine bolus and iv suxamethonium, then maintened with ketamine iv in continuous drip (due to lack of inhalation anesthetic drugs) and atracurium. Both induction and maintenance were carried on by a Technician in Anesthesia, due to the lack of Doctors specialized in Anaesthesia. We performed a laparotomy (midline over and below the umbelicus) finding a small gut intestinal infarction due to a kinking under an adhesion. A fast but accurate exploration of the abdomen showed presence of matt fluid. Proximal bowel loops appeared distended up to Treitz ligament (about 4 cm in diameter), thickened, hyperemic, edematous and paralytic. Distal ones appeared empty. The necrotic loop was located at about 3 m from Treitz and at about 30 cm from the ileo-cecal junction, with a total extension of about 1.5 m. We performed an intestinal resection of the necrotic gut about 1.5 m wide (Figure 1, proximal extremity of the ileal loop on the lower side of the picture), closing both of the

Case Report

extremities of the resection with continuous Vicryl 3/0 seromuscular sutures. We decided not to anastomize primarily the vial remaining segments because resection edges appeared suffering and of different size. Therefore, since during the operation we noticed that local conditions of the surgical field did not allow a safe anastomosis, we decided to leave the abdomen opened. To avoid peritoneal contamination (there was even no availabilty of reliable sucking devices) and to spare time we decided not to drain the intestinal fluids of the distended gut by opening the small intestine. Thus, we inserted in the distal tract of the upper resection, through an enterotomy on the antimesenteric side of the ileum, a big Foley catheter (n. 22) fixed with a double purse string with the purpose of derivating the intestinal content of the distended intestine outside (Figure 2). The abdominal wall was left opened likewise a laparostomy, protecting the abdominal content with a sterile plastic urine bag sutured with Vicryl 3/0 to the fascial edges (Bogota bag) (Figure 3).[1] The duration of the whole operation was approximately one hour. It is possible that in another setting (a hospital supplied with more resources), the author might have opted for another operation and would have probably performed a primary anastomosis draining the intestinal obstruction during the same procedure, but in a rural hospital everything should be done to minimize the post op complications. The woman was sent in surgical ward for resuscitation and stabilisation, as the ICU is unavailable. In the I POD the discharge of intestinal content was about 400 mls and the following day, before taking again the patient to the theatre, about 700 mls. After 48 hours the patient was brought back to the theatre for the second look operation. We found a very detended intestine and no signs of peritonitis. After removal of the Foley catheter we proceeded to perform an ileo-ileal side-to end anastomosis with an interrupted Vicryl 3/0 single layer suture. The gut appeared vial, vital and patent. Finally we closed the muscular sheath using a Nylon n. 2-interrupted suture without need of detensive incisions on the pararectal fascial edges (Figure 4). Skin was sutured using Nylon 2 interrupted stitches. The PO period was uneventful and without any complication, the patient was dis-

Figure 1. Resected necrotic gut.

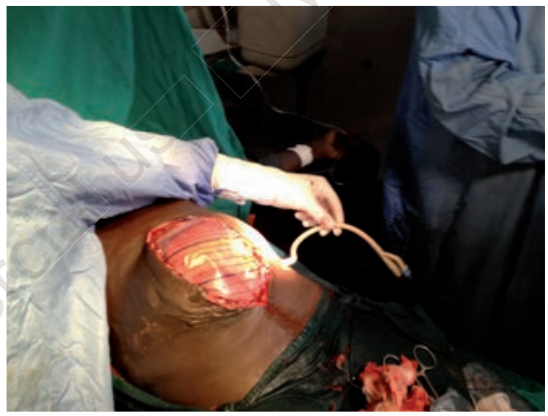

Figure 3. Bogota bag in place.

Figure 2. Derivating the intestinal content using a big Foley catheter.

Figure 4. Abdominal wall closed after the second-look operation.

pagepress

Case Report

charged in 8 POD after the second operation. No major clinical problems were found at the follow up. No previous literature is present regarding this technique in rural Uganda.

Discussion

The aim of this paper is to show that is possible to carry out the open abdomen technique with limited resourses. It is well known and accepted that laparostomy is useful in many cases in which closing the abdominal wall can be dangerous and at risk of developing high intra abdominal pressure.[2,3] Open abdomen allows surgeons to abbreviate initial surgery in very severe compromised patients and relook surgery in patients with ongoing sepsis. It can prevent abdominal compartment syndrome[4] until the patient is appropriately resuscitated and hemodynamically stable but also it permits to delay intestinal anastomosis[5] avoiding stoma formation and enables the surgeon to revise the abdominal cavity regularly and to check the efficacy of the drainage without repeated damages to the abdominal wall.[6]

Stage laparotomy was initially described in trauma setting, with resection of injured bowel without anastomosis and returning to complete GI reconstruction once the patient is stable and more likely to heal.[7]

Especially in poor countries open abdomen may prove to be a useful surgical option in those patients having severe sepsis and septic shock, but also in more stable patients and less severe diseases as a substitute of the so called *on demand* strategy.[2,8-12] This patient had three reasons to develop acute abdomen (vascular, mechanical and septic), resulting in a surgical indication as the patient developed intestinal necrosis and small bowel obstruction due to the single adhesion and secondary peritonitis due to the bacterial translocation and potentially contamination of the surgical field with enteric fluid.

In patients with compromised tissue perfusion, primary anastomosis is at high risk of anastomotic leakage resulting in increased mortality. In these patients, consideration should be given to initially control the source of peritoneal contamination and delay the bowel anastomosis.[13,14] The open abdomen procedure is a significant surgical advance, as part of damage control techniques in severe abdominal trauma.[15] Surgeons should be aware of the pathophysiology of severe intra-abdominal sepsis and always keep in mind the option of open abdomen in order to be able to use it in the right patient at the right time. However, the use of this technique has been described in very modern contests, but only few Authors relate about their experience in poor countries where human and technical resources are limited.[16] In low income countries, surgery is not widely recognized as a public health issue.[17] The first and usual application of laparostomy is for management of traumas and abdominal sepsis. Nevertheless, many further indications were afterwards found as appropriate applications of open abdomen.[13] Thus it is advisable every time the closure of the abdominal wall is not possible or determines a high risk of complication with need of relaparotomy.[18] With this kind of operation, revisions allow to identify quickly anastomotic dehiscences or any problem that can occur into the abdomen.[19] Caronna *et al*. hypothesised the usefulness of laparostomy for the early diagnosis and treatment of complications in management of typhoid intestinal perforation in rural hospital in northwestern Benin.[19] Open abdomen procedure is defined as intentionally leaving the fascial edges of the abdomen un-approximated (laparostomy). The abdominal contents are exposed and protected with a temporary coverage.[20,21] The choice of submitting this case to an open abdomen technique was due to the previous experience of the senior surgeon in the same hospital. An abrupt power cut can bring huge complications even to routine surgery. We performed a very similar operation of IO in a younger woman and during the procedure, at the time of suction of the intestinal content, suddenly the power was off: despite our efforts, the result was the massive contamination of the abdomen with a very poor control source.[22,23] What is it possible with so limited resources? Can we perform lightly a primary ileostomy and condemn the patient to a hard time until the closure of the ileostomy is possible (if it will ever be) or can be done? Are we sure about the presence of a surgeon able to close the stoma after the complete recovery of the patient? Making an anastomosis and waiting the almost sure breakdown of the anastomosis in a contamined field? How to manage the much distended bowel, minimizing the surgical procedure and the possible complications? Why don't we try an open abdomen procedure with a simple trick performable everywhere? The problems we faced with were the intestinal obstruction, the peritonitis secondary to the intestinal necrosis, the necrotic intestine to be resected, the anastomosis to be performed. The case we present is about IO due to a volvulus with intestinal necrosis of the small gut treated with damage control techniques. We feel that open abdomen technique is helpful in treating intestinal obstruction, especially in the absence of intensive care unit. The placement of a big Foley catheter creating an external enteric fistula can be useful to solve *naturally* the distension and intestinal edema, avoiding the contamination of the abdomen. Improvements in understanding and preventing paralytic ileus through changes in postoperative care and, we suppose more importantly, in the managing of the operation, may facilitate recovery of gastrointestinal function after abdominal surgery, avoiding the so feared acute gastrointestinal failure in the postoperative patient.[8] An important challenge is also to explain to the all staff (particularly to the anesthetists) this very new technique that may seem so far to the very aggressive routine approach.[24] With limited resourses available open abdomen technique remains a big challenge in poor countries. In order to succeed in this great challenge it is important to understand the pathophysiology of abdominal hypertension[25] and spread the new knowledge among physicians and surgeons working in low-income hospitals.[26] Even in case of scarce resources, the concept of damage control surgery and its application with tension-free closure of the abdominal wall after abbreviated laparotomies can increase survival rates in critical patients.[27] Moreover the awareness of the potential complications for clinicians and staff using laparostomy should be mandatory not to turn a good surgical tool into malpractice.[28]

Conclusions

Laparostomy is a safe and feasible procedure in low-income countries and it should be supported.

We found this simple trick (insertion of a big Foley), more physiological in draining the intestinal content than squeezing the intestinal content up through the NG tube or sucking the bowel through a new opening of the gut with the risk of contamination and poor source control. This simple procedure obtained almost complete normalization of the abdominal surgical field, restoring the normal size of the intestine without traumatic procedures. In low-income countries it is advisable to manage complicated intestinal obstruction with laparostomy, in opposite to rich countries where technical resources are not comparable.

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High prevalence of erectile dysfunction in diabetes: a systematic review and meta-analysis of 145 studies

PAPER

Authors
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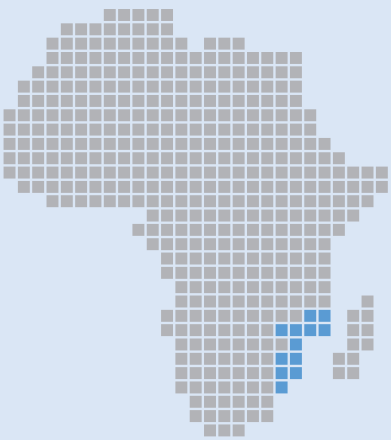
Topic
Chronic diseases

Focus country
Mozambique



This paper is not available as open access, which is why only an abstract is posted. If you would like to read the entire paper, please go to the web page given and follow the instruction.

Abstract

Erectile dysfunction is common in diabetes, affecting more than half of men with the condition and with a prevalence odds of approximately 3.5 times more than controls.

The study evaluated the prevalence of erectile dysfunction in patients with diabetes mellitus (DM), type 1 and type 2, evaluating the data of 145 studies already published representing a total of almost 89,000 men. It showed that 52.5% of diabetic males in general suffer from erectile dysfunction. This symptom affects 37.5% of men with juvenile diabetes (insulin-dependent) and 66.3% of patients with diabetes type 2 (insulin resistant). The study's results suggest the need for improved control and treatment of the disease.

DIABETICMedicine

DOI: 10.1111/dme.13403

Systematic Review or Meta-analysis

High prevalence of erectile dysfunction in diabetes: a systematic review and meta-analysis of 145 studies

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Abstract

Erectile dysfunction may be common among men with diabetes, but its prevalence is still debated. We aimed to assess the relative prevalence of erectile dysfunction in diabetes searching major databases from inception to November 2016 for studies reporting erectile dysfunction in men with Type 1 and Type 2 diabetes mellitus. We conducted a meta-analysis of the prevalence [and 95% confidence intervals (95% CIs)] of erectile dysfunction in diabetes compared with healthy controls, calculating the relative odds ratios (ORs) and 95% CIs. A random effect model was applied. From 3747 initial hits, 145 studies were included representing 88 577 men (age: 55.8 ± 7.9 years). The prevalence of erectile dysfunction in diabetes overall was 52.5% (95% CI, 48.8 to 56.2) after adjusting for publication bias, and 37.5%, 66.3% and 57.7% in Type 1, Type 2 and both types of diabetes, respectively (P for interaction < 0.0001). The prevalence of erectile dysfunction was highest in studies using the Sexual Health Inventory for Men (82.2%, 17 studies, P for interaction < 0.0001). Studies with a higher percentage of people with hypertension moderated our results (beta = 0.03; 95% CI, 0.008 to 0.040; P = 0.003; R^2 = 0.00). Compared to healthy controls (n = 5385) men with diabetes (n = 863) were at increased odds of having erectile dysfunction (OR 3.62; 95% CI, 2.53 to 5.16; P < 0.0001; I^2 = 67%, k = 8). Erectile dysfunction is common in diabetes, affecting more than half of men with the condition and with a prevalence odds of approximately 3.5 times more than controls. Our findings suggest that screening and appropriate intervention for men with erectile dysfunction is warranted.

Diabet. Med. 000, 000–000 (2017)

Introduction

The WHO Global Report on Diabetes states that the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014, and that the global prevalence among adults has risen from 4.7% to 8.5% over the same period. The main and most considered complications of diabetes weigh on the heart, blood vessels, eyes, kidneys and nerves, and diabetes has been associated recently with specific cancers, physical and cognitive disability, and depression [1,2].

Increasing attention is focusing on erectile dysfunction in men with diabetes due to its multifactorial pathophysiology and the concurrence of the same components as vasculopathy, neuropathy and depression [3]. Erectile dysfunction is defined as the inability to achieve and/or maintain an erection sufficient to permit satisfactory sexual intercourse [3]. Although erectile dysfunction is considered an age-related disease, affecting 20% of men aged > 40 years, it can be present across all the life-span from adolescence, especially when risk factors such as diabetes, metabolic syndrome or cardiovascular diseases coexist [4]. Diabetes is considered the main risk factor for the development of erectile dysfunction and since the 1970s the association between diabetes and the development of erectile dysfunction has been documented both in animal models and humans [5].

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Prevalence of diabetes mellitus in newly diagnosed pulmonary tuberculosis in Beira, Mozambique

PAPER

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Topic
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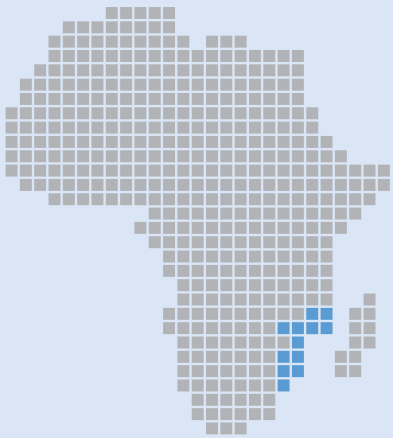

Abstract

Mozambique is one of the countries worst affected by tuberculosis (TB). Despite significant efforts to reduce its high incidence and mortality rates, several factors continue to hamper effective treatment and containment of the disease in individuals also affected by other infectious diseases or by non-communicable ones such as diabetes mellitus (DM). The number of patients affected by both TB and DM in Mozambique is on the rise, and a multidisciplinary approach is needed to manage such cases.

Conducted in Beira, Mozambique, the present study assessed the prevalence of DM in individuals with pulmonary TB. Three hundred and one patients recently diagnosed with the latter (203 men and 98 women, with an average age of 36.7 years) were recruited in three health centers in Beira in 2016. DM was diagnosed in just 3 of them (1%), while impaired glucose tolerance (IGT) was found in another 6 (2%).

Thus despite growing scientific evidence showing an association between TB and DM, our own study found a low prevalence of DM in TB patients. This finding is not at odds with the hypothesis of a mutual interaction between the two diseases, but might instead be a result of the malnourishment of the patients enrolled in the study, given that approximately 60% of them were underweight.

Prevalence of diabetes mellitus in newly diagnosed pulmonary tuberculosis in Beira, Mozambique.

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Abstract:
Introduction: Data regarding the association between diabetes mellitus (DM) and tuberculosis (TB) in Africa are scarce. DM screening among TB patients in Mozambique was carried out.
Methods: The study was implemented from January to August 2016 in three Urban Health Centers in Beira, Mozambique and recruited adult (>18 years) patients newly diagnosed with pulmonary TB.
Results: Three hundred and one patients were enrolled (67.4%, males mean age 31.7(SD 11 years). Diabetes was diagnosed in only 3 patients (1%) and impaired glucose tolerance (IGT) in an additional 6 subjects (2%).
Conclusion: A lower than expected prevalence of DM was observed, which could be explained by the lack of traditional risk factors for DM (overweight, age over 45 years, hypertension and smoking) in Mozambique.
Keywords: Diabetes mellitus, pulmonary tuberculosis, Beira, Mozambique.
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Introduction

Tuberculosis (TB) is one of the leading causes of death worldwide. Mozambique represents one of the most affected countries in the world, with an estimated prevalence of over 500 per 100,000 population[1]. Although great efforts have already been made, the way to defeat TB remains long. The WHO End TB Strategy aims to a 90% reduction in TB deaths and an 80% reduction in the TB incidence rate by 2030[1].

Many factors contribute to the lack of efficacy in containing TB, as social determinants of health (SDH) and concomitance of other co-morbidities, such as co-infections (in particular with HIV) and non-communicable diseases, such as diabetes mellitus (DM)[2].

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SDH, which can be defined as conditions in which people are born, grow, live, work and get old, are strongly influenced by the distribution of wealth, power, resources and they have an immediate impact on health[2]. In fact, it is well known the association between low socio-economic levels and TB[3]. Furthermore, TB is the most common opportunistic infection among HIV-positive patients and, especially in sub-Saharan Africa, the burden of HIV/TB co-infection is the highest worldwide, with almost 80% of all cases of incident TB in persons with HIV infection[4].

Growing evidence suggests that TB and DM represent a mutual risk factor of occurrence of each other[5], causing also a reciprocal worsening, due to both pathogenic mechanisms[6], and metabolic factors[7]. In fact, if on one hand patients with DM have a higher risk of acquiring TB, on the other hand, patients with DM and TB have a high likelihood of delayed diagnosis, healing, and increased severity of symptoms and mortality for both diseases[8]. Nowadays, sub-Saharan Africa and low income

countries are increasingly affected by DM[9-10] and, the increasing frequency of DM co-existing with TB and HIV, is an example of interaction between communicable and non-communicable diseases, requiring a multidisciplinary and integrated approach[8]. In Mozambique, data on the prevalence of DM in TB patients are limited. The few data available on DM in this country in the general population shows a national prevalence of 2.9%[11-12], and people are often unaware of their condition[11-12]. The present study aimed to assess the prevalence of DM in patients newly diagnosed with pulmonary TB in Beira, the second largest city in Mozambique, to better define the relationship between TB and DM.

Patients and methods

Study design and population

This study took place in three urban health centres of Beira city involved in the National Tuberculosis Control Programme (PNCT): Ponta-Gea, Munhava and Macurungo, that are largest in Sofala's Province. The study was implemented from January to August 2016 and we recruited a total of 301 patients who were newly diagnosed with pulmonary TB. Inclusion criteria were: age ≥18 years, a confirmed TB diagnosis (positive sputum smear result or GeneXpert positive result or culture positive result) and starting of anti-TB treatment. Exclusion criteria were: previous TB treatment or TB treatment started within the previous two months. Informed consent was requested from all enrolled patients. Anti-TB treatment was prescribed according to guidelines of the National Tuberculosis and Leprosy Control Programme of Mozambique[13].

Methods

A face-to-face interview conducted by a trained nurse encompassed questions about demographic characteristics (age, residence, education, occupation, marital status, monthly income), possible pregnancy, risk behaviours (sexual behaviour/partnerships, concurrent sex partners, condom use, smoke and alcohol abuse, etc.) and medical history, including TB and diabetes symptoms. A basic physical examination (vital signs, weight, height, waist circumference, blood pressure and general appearance) was performed. The body mass index (BMI) was calculated. Moreover, subjects with unknown HIV status received a pre-HIV test, other suggestion to undergo a rapid HIV test, if not done before. For the diabetes diagnosis, two consecutive fasting blood glucose tests were performed to each participant. We did a screening and diagnosis for TB infection according to clinical, microbiological and radiological algorithm established by the WHO Guidelines for patients with or without HIV infection[1] and in patients with TB infection, the clinical severity was evaluated based on extension, site and number of localizations of disease (pulmonary/extrapulmonary). According to the WHO guidelines, patients were considered as non-diabetic if both measurements were ≤110 mg/dl, and as diabetic if both measurement were above 126 mg/dl. If at least one value was between 110 and 126 mg/dl, the Oral Glucose Tolerance Test (OGTT) was performed: patients were considered diabetic when plasma glucose at 2 hours was ≥200 mg/dl[14].

All TB-diabetic patients underwent fundus examination, urinary stick and assessment of diabetic complications.

Statistical analysis

Data obtained from the answers to the questionnaire were imported on Excel 5.0 and analysed using the STATA 13.0 software.

Mean and standard deviation for continuous variables and frequency for categorical variables were calculated as descriptive statistics. Due to the small number of diabetic patients, a comparison between diabetic and non-diabetic subjects was not possible.

Ethical approval

The study was approved by the Comité Nacional de Bioetica para a Saúde/ National Bioethics Committee for Health by the protocol Ref: 168/CNBS/15.

Results

Socio-demographic characteristics

The social-demographic characteristics of the study population and patients' life style are reported in Table 1. The 301 patients with a new diagnosis of pulmonary TB included 203 males (67.4%) and 98 females (32.6%), mean age 36.7 years. Nearly a half 141 patients (47.5%) had no educational degree; 157 (52.9%) patients were employed and only 10 (3.8%) had a monthly income higher than 100 Euros. Only 7 patients (2.4%) claimed to have more than one sexual partner and 32 (11.3%) stated to always use condoms. The majority of subjects 274 (93.2%) declared non smoking while alcohol consumption was moderate, and only 2 patients (0.7%) were daily drinkers.

Table 1: Socio-demographic and lifestyle characteristics

Variable	N. (%)
Numberof cases examined	301
Gender	
Female	98 (32.6%)
Male	203 (67.4%)
Age	
Mean age (years)	36.7
Range (years)	18 – 83
Educational degree	
None	141 (47.5%)
Primary school	125 (42.1%)
Secondary school	25 (8.4%)
University degree	6 (2.0%)
Occupation	
Unemployed	95 (32%)
Housewife	18 (6%)
Student	27 (9.1%)
Worker	157 (52.9%)
Monthly income (Euro)	
None	106 (40.8%)
< 25	29 (11.2%)
25- 50	53 (20.4%)
50 – 100	62 (23.8%)
> 100	10 (3.8%)
BMI	
Severe thinness	59 (19.6%)
Moderate thinness	32 (10.6%)
Light Thinness	78 (26%)
Healthty	128 (42.5%)
Overweight	4 (1.3%)
Sexual partner/s	
No	110 (37.4%)
One	177 (60.2%)
More than one	7 (2.4%)
Condom Use	
Never	131 (46.1%)
Sometimes	121 (42.6%)
Always	32 (11.3%)
Smoking	
No	274 (93.2%)
1-5/day	15 (5.1%)
20/day	5 (1.7%)
Alcohol drinking	
No	260 (87.8%)
Once a week	34 (11.5%)
Every day	2 (0.7%)

Clinical and laboratory characteristics

The main laboratory and clinical characteristics are shown in Table 2. The most sensitive test for TB diagnosis was GeneXpert, which was positive in 56 of 58 (96.6%). A chest X-ray was performed for 155/301 subjects and 148 of 155 (95.5%) showed TB-compatible lesions.

The HIV status was known for 282 patients: of them, 161 (57.1%) were positive. Sixty-six patients (26.7%) were on anti-retroviral treatment (ART). The BMI was below healthy range in 169 (55.6%) whereas 4 subjects (1.3%) were overweight. One individual (0.3%) had hypertension.

Table 2 Clinical and laboratorial characteristics

Variable	N. (%)
Sputum Examination	
Negative	50 (16.9%)
Positive	246 (83.1%)
Sputum colture	
Negative	3 (75%)
Positive	1 (25%)
GeneXpert	
Negative	2 (3.4%)
Positive	56 (96.6%)
Chest X-ray	
Negative	7 (4.5%)
Positive	148 (95.5%)
HIV	
Negative	121 (42.9%)
Positive	161 (57.1%)
ART	
Yes	66 (26.7%)
No	181 (73.3%)
Diabetes	
Yes	3 (1%)
No	290 (97%)
IGT	6 (2%)
High Blood Pressure	
Yes	1 (0.3%)
No	293 (99.7%)

Diabetes was diagnosed in only 3 patients (1%) and IGT in additional 6 subjects (2%). Nobody was aware of their diabetic status.

Reported clinical signs and symptoms are summarized in Table 3. The most frequent TB symptoms were: cough (90.9%), weight loss (88.2%), asthenia (58.8%) and fever (58.8%). The patients with DM and IGT reported weight loss, polyuria and asthenia.

Table 3 Main symptmoms reported from patients with pulmonary TB

Symptoms	N. (%)
No symptoms	3 (1%)
Cough	269 (90.9%)
Fever	174 (58.8%)
Astenia	215 (72.6%)
Dyspnea	95 (32.1%)
Hemoptysis	4 (1.4%)
Night sweats	118 (39.9%)
Weight loss	261 (88.2%)
Polyuria	13 (4.4%)
Polydipsia	7 (2.4%)
Polyphagia	11 (3.7%)

Discussion

In sub-Saharan Africa, there is an emerging strong correlation between communicable and non-communicable diseases due to the long lasting presence of epidemic infections such as HIV and TB and the increasing incidence of chronic diseases as DM and hypertension. In 2030, people living with diabetes in Africa are estimated to rise from 21.1 million in 2010 to up to 23.9 million[15]. In the same area, DM causes about 4.9 million deaths per year and approximately 76% of these deaths occur in people aged less than 60 years[9]. Diabetes is considered among priorities in the National Strategic Plan for the prevention and control of non communicable diseases also in Mozambique[13]. However, the prevalence of DM seems to be quite low, around 3% in the general population aged from 25 to 64 years old, and it is higher among people living in rural areas[11]. Our study showed a low prevalence of DM in newly TB-diagnosed patients (1%) compared to data regarding the general population, although a disorder in glycometabolic control was found in 3% of subjects.

This finding in our population could be explained by the lack of some of the risk factors recognised for the onset of DM, including overweight, age over 45 years, hypertension and smoking[14]. In fact, in our population the mean age was 36.7 with only few patients overweight and affected by hypertension. Indeed, two out of three diabetic patients in our study were older than 45 years and were smokers, whereby one subject was HIV positive. Among the six patients with IGT the median age was 32, there was no smoking, three were HIV positive and one consumed alcohol.

In low-income countries, the association between TB and DM is variable, ranging from 1.9% to 35%[14]. Other authors reported a higher incidence of DM in TB patients from African countries or low income settings[10-16]. On the contrary, other studies showed a low association of DM and TB in low-income settings[17], which was explained by the young age of enrolled patients, similarly to the results of the present study[18-19].

Furthermore, this study underlines the importance of other factors associated with the onset of TB, including SDH. The phenotype of newly diagnosed patients with-pulmonary TB in Beira was outlined: patients are mainly young, underweight, with a low educational background and low income, without smoke nor alcohol habits, basically without hypertension and diabetes mellitus but in most cases living with HIV infection. According to our data, SDH appear to influence the onset of TB but also the frequency of MDR and the adherence to therapy[3]. HIV is the most well known disease associated with TB; and our data confirms this correlation as almost 60% of patients with a known HIV status were seropositive. On the other hand, additional risk factors for TB such as smoking and alcohol use, are almost inexistent in our

study. A limitation of our study is that, our data could be biased because they were not verified and were based on personal interview. Another drawback of the study is the small sample size and lack of a control group.

Conclusion

Our study shows a low prevalence of DM in newly diagnosed patients with pulmonary TB in Mozambique. The lower than expected DM prevalence, however, does not clash with the hypothesis of a mutual interaction existing between these two diseases. Future studies enrolling a greater number of diabetic patients would be crucial in order to assess definitive epidemiological data to contribute to the TB End Strategy in one of the most affected countries like Mozambique.

Conflict of interest

All authors have no conflict of interest

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Diabetes in Low Income Countries: Drugs or Education?

PAPER

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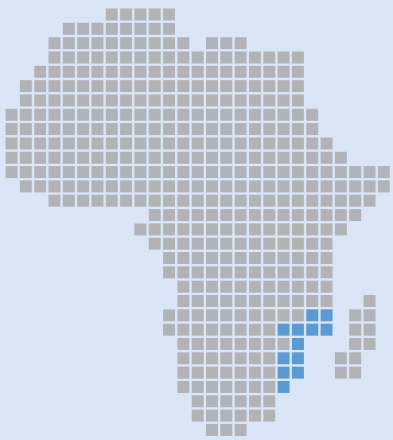

Abstract

The prevalence of diabetes continues to increase worldwide, and is rising more rapidly in middle- and low-income countries. In order to improve health care for those affected by the disease, it is important to take into account both the World Health Organization's guidelines for its management and the education level and social determinants of health of the population in question. Indeed, these factors can have a strong bearing on the success or failure of the treatment of diseases, especially chronic ones such as diabetes, where optimal compliance with the treatment regimen is key to achieving good outcomes. The degree to which individuals have the capacity to understand basic health information and to make appropriate decisions vis-à-vis their own health is known as "health literacy". In countries with limited resources the level of such literacy is very low, leading to even more difficult interactions between patients and health workers and thereby increasing the likelihood that treatment will be unsuccessful. It is therefore critical not only to meet the health needs of patients, but also to tackle their educational deficits in order to help them improve their comprehension of health information, thereby spurring them to comply with treatment regimens in a conscious, and thus consistent, manner.

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Editorial OMICS International

Diabetes in Low Income Countries: Drugs or Education?

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Editorial

Diabetes prevalence is rising all over the world but, more rapidly, in middle- and low-income countries and WHO projects that it will be the seventh leading cause of death in 2030. The WHO main strategies to achieve effective measures for the surveillance, prevention and control of diabetes and its complications, especially in limited resources setting include: I) to provide scientific guidelines for the prevention, II) to develop norms and standards for diabetes diagnosis and care, III) to build awareness on the global epidemic of diabetes, and IV) to conduct surveillance of diabetes and its risk factors [1].

However, to strengthen the health service delivery, to provide the health supplies and to promote awareness events, are necessary but not sufficient activities in the absence of a minimum level of education. In fact, growing evidence suggests to consider social determinants of health, defined as conditions in which people are born, grow, live, work and get old, of paramount importance as they might be the key of an effective strategy to improve health status, in particular, therapy success or failure.

"Health literacy" was defined as people's knowledge, motivation and competences to access, understand, appraise and apply health information in order to actively participate and take decisions in own issues concerning health [2]. It is a dynamic outcome of socio-demographic, individual and environmental factors and it requires two crucial parts: the understanding of health information and the active interaction with healthcare professionals. Moreover, it should be dynamic and open to change in order to be a real determinant of (self-) health. In high-income countries, despite a good level of health literacy, communication problems between healthcare providers and patients are common and many patients are dissatisfied with the quality of the interaction with their healthcare provider. It might be due to the attention of health professionals to diseases and their management, rather than on the people [3].

In low income countries, other than a low quality of health professionals training, there are low levels of health literacy due to the social determinants such as low educational level, low income, ethnic minority status and living alone. This implies an even more difficult interaction between patient and health professional, a higher likelihood of not understanding the disease and the importance of therapy and, thus, the failure to apply or incorrect application of treatment. This is particularly relevant for chronic diseases, as diabetes, that imply constant and long-term adherence and follow-up.

Considering this, it is clear that education is the fundamental basis for an effective health literacy and thus to get adherence and therapy success. Health policies and strategies should be developed focusing on health literacy within prevention, patient education, and other public health interventions. Finally, health professionals should aim at adequate information-giving and shared decision-making, considering patient-as-person and understanding the personal meaning of the illness for each individual [4].

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Using smart phones and imaging of an enhanced visual-assessment device to detect cervical cancer in low-resource settings: a pilot program in the federal democratic republic of Ethiopia

POSTER PRESENTATION

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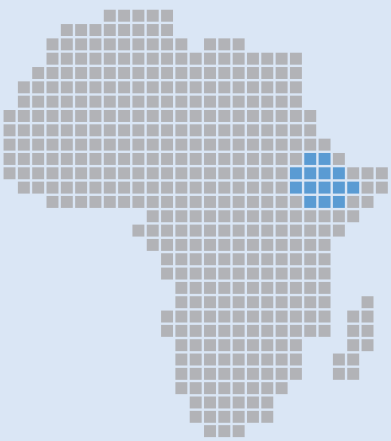

Introduction
In Ethiopia, cervical cancer is the second most prevalent type of cancer among the adult population accounting for 13.4% of all cancer cases. The MobileODT® Enhanced Visual Assessment (EVA) system is designed to function as a portable colposcope and improve diagnostic accuracy during visual inspection thanks to a magnifying lens with flashlight, therefore it should reduce the subjectivity of VIA testing.

Study design and Setting
This was a pilot study to assess the readiness and capability of the MobileODT® EVA system for large-scale, national uptake. After an initial assessment, eight facilities of the Oromia region were randomly selected as intervention sites, while three were selected as control sites. All the intervention sites were provided with one device. All images taken by the health workers of the health facilities during the screenings were stored through the app and all the diagnosis were reviewed by a blind expert supervisor, who was the gynecologist of the referral hospital.

Results
The study was conducted from March 2017 to July 2017. During this period, 610 women were screened in the control sites and 1,458 women received a cervical cancer screening in the intervention sites. Of these, 731 (50%) were screened with MobileODT® EVA, while the remaining 50% was tested with normal visual inspection with acetic acid. Data on VIA positivity rate were compared between intervention and non-intervention sites: at baseline was 6.3% (33 out of 528 women) in intervention group and 5.9% (11 out 185 women) in comparison group (p=0.99), while at end line, it was 6% (16 out of 268 women) vs 3.7% (4 out 107 women) (p=0.46). The overall agreement between the diagnosis provided by the health workers and the one provided by the gynecologist was good as they agreed in 92% of cases.

Conclusions
MobileODT® EVA could be a technology able to improve diagnostic accuracy during visual inspection in cervical cancer screening. However, this pilot study shows that to successfully implement this technology, additional efforts need to be put in place to increase the commitment of health workers in using it and in educating women in accepting VIA screening and in particular the screening executed with the support of MobileODT® EVA.

USING SMARTPHONES AND IMAGING OF AN ENHANCED VISUAL-ASSESSMENT DEVICE TO DETECT CERVICAL CANCER IN LOW-RESOURCE SETTINGS: A PILOT PROGRAM IN THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

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INTRODUCTION
Cervical cancer is the leading cause of cancer deaths in Africa, accounting for more than 61,000 deaths in 2015[1]. In Ethiopia, cervical cancer is the second most prevalent type of cancer among the adult population accounting for 13.4% of all cancer cases[2]. Currently the country uses visual inspection with acetic acid (VIA) as its primary screening method for cervical pre-cancer. VIA is a subjective test, and accurate diagnosis hinges on the ability of the provider to visualize the cervix properly and correctly differentiate between cervical lesions, so the process would benefit from improvements in technology. The MobileODT® Enhanced Visual Assessment (EVA) system is designed to function as a portable colposcope and improve diagnostic accuracy during visual inspection thanks to a magnifying lens with flashlight, therefore it should reduce the subjectivity of VIA testing. The built-in app is devised to enhance clinical supervision through the capture and transmission of real-time documentation of patients' lesions.

AIM
To demonstrate the capability of the MobileODT® EVA system as a tool for improving visual inspection during routine cervical-cancer screening in health facilities and mobile outreaches in Ethiopia.

STUDY DESIGN AND SETTING
This was a pilot study to assess the readiness and capability of the MobileODT® EVA system for large-scale, national uptake. After an initial assessment, eight facilities of the Oromia region (St. Luke Catholic Hospital, Dire Dulete HC, Woliso 1 HC, Goro HC, Chitu HC, Dilela HC, Gurura HC, Obi HC) were randomly selected as intervention sites, while three were selected as control sites (Woliso 2 HC, Dulele HC, Korke HC).

All the intervention sites were provided with one device and health workers already trained on VIA screening were trained on how to use the device. Health workers from control sites, who were previously trained on standard VIA, continued providing normal service at their facility.
All women receiving a cervical cancer screening were eligible for the inclusion in the pilot study after signing an informed consent. All images taken by the health workers of the health facilities during the screenings were stored through the app and all the diagnosis were reviewed by a blind expert supervisor, who was the gynecologist of the referral hospital.
The capability of the system was measured as:
VIA-positivity rates over time (baseline vs end line) within the intervention group, defined as the number of VIA-positive patients divided by total patients screened;
VIA-positivity rates compared between intervention and non-intervention sites at baseline and endline;
Agreement between providers' VIA interpretation and expert supervisors' interpretation.

RESULTS
The study was conducted from March 2017 to July 2017. During this period, 610 women were screened in the control sites and 1,458 women received a cervical cancer screening in the intervention sites. Of these, 731 (50%) were screened with MobileODT® EVA, while the remaining 50% was tested with normal visual inspection with acetic acid **(Table 1)**. The main reasons for the low use of MobileODT® EVA, were: i) several technical problems that did not make possible the use of the technology or the storage of the pictures; ii) high turnover of the health staff; iii) low commitment of the health staff; iv) resistance and distrust of women to be screened with MobileODT® EVA.

Table 1.
Number of women screened and those screened via mobile ODT per each health center.

Health Center	Women visited with MobileODT®	Total women screened (including MobileODT®)	MobileODT® usage rate
Gurura Health Centre	45	95	47%
Goro Health Centre	75	96	78%
Obi Health Centre	31	108	29%
Woliso Number 1 Health Centre	72	129	56%
Dilela Health Centre	85	128	66%
Chitu Health Centre	113	129	88%
St. Luke Hospital	184	414	44%
Dire Dulete Health Centre	126	359	35%
Total	**731**	**1458**	**50%**

The VIA-positivity rate in the intervention group was 6.3% (33 out of 528 women) at baseline (calculated as the average of the two months before data collection, January-February) and 6% (16 out of 268 women) at end line (considered as the last month of data collection, July). The difference was statistically not significant (p=0.99). Data on VIA positivity rate were compared between

intervention and non-intervention sites: at baseline was 6.3% (33 out of 528 women) in intervention group and 5.9% (11 out 185 women) in comparison group (p=0.99), while at end line, it was 6% (16 out of 268 women) vs 3.7% (4 out 107 women) (p=0.46).
When only data from women screened via MobileODT® EVA were analyzed, the difference in terms of number of positive cases detected between the intervention and non-intervention group further increased (7.7% vs 3.8%), despite it was still not enough to reach the statistical significance.
The overall agreement between the diagnosis provided by the health workers and the one provided by the gynecologist was good as they agreed in 92% of cases **(Table 2)**.
Specificity resulted to be very good (99%), meaning that the proportion of patients without the disease, among all those without the disease, who was considered negative by the health worker of the HC was good.
However, sensitivity value of 51% means that the ability of the identification of positive cases was poor by the health worker of the HC.

Table 2.
Summary of test results according to providers' diagnosis and gynecologist's verification.

	VIA positive by Gynecologist	VIA negative by Gynecologist	Totals
VIA positive by the trained HCWs	49	7	56
VIA negative by the trained HCWs	47	537	584
Totals	**96**	**544**	**640**

CONCLUSIONS
MobileODT® EVA could be a technology able to improve diagnostic accuracy during visual inspection in cervical cancer screening. Hence, it could improve the ability of the provider to visualize the cervix properly and differentiate between cervical lesions to make an appropriate diagnosis.
However, this pilot study shows that to successfully implement this technology, additional efforts need to be put in place to increase the commitment of health workers in using it and in educating women in accepting VIA screening and in particular the screening executed with the support of MobileODT® EVA.
Lastly, although data on agreement between health center HCWs and the gynecologist was good, the ability of the personnel working at health centers to identify positive cases needs to be improved.

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Non-communicable diseases at Tosamaganga DDH: a pilot experience

POSTER PRESENTATION

Conference
4th Tanzania Health Summit

Location
Dar es Salaam, Tanzania

Presentation date
14th – 16th November 2017

Authors
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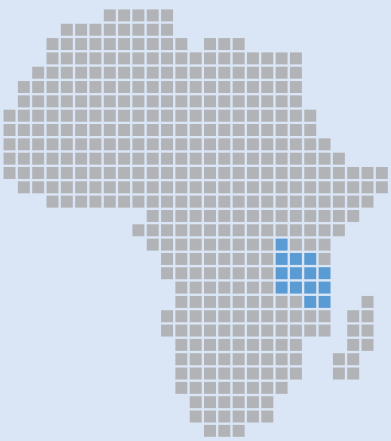
Focus country
Tanzania



Abstract

Morbidity and mortality due to Non-Communicable Diseases (NCD) are growing exponentially and their prevention and treatment are now recognized as priorities.
At the Outpatient Department (OPD) of the Council Designated District Hospital (DDH) of Tosamaganga, Iringa D.C., a dedicated service for NCD patients is now active. Between October 27th, 2016 and August 18th, 2017, 777 visits were performed (310 first visits and 467 follow-up). Subjects mean age was 58.4 years; 69% female. Chronic diseases were distributed as follows: hypertension 41%, other cardiovascular diseases 22%, diabetes 11%, gastrointestinal diseases 11%, chronic anemia 5%, chronic renal failure 4%, chronic pulmonary diseases 4%, neurologic diseases 2%. Patients arrived from all over the region, but regular follow-up was prerogative for patients living nearby the hospital.

To better evaluate the presence of barriers to accessibility and continuum of care for NCD patients, a questionnaire was submitted to 95 subjects hospitalized at Tosamaganga DDH between February 1st and May 30th, 2017. 56.8% were female with average age of 52 years and 41 years for male; mean BMI was 21 Kg/m2 for female and 22 Kg/m2 for male. On admission, the prevalence of chronic diseases was 34.7%, being only 21% of these patients on regular treatment. At discharge, 49.5% of subjects were classified as affected by NCDs; 68.7% of them were admitted for complications of chronic diseases, while 26.2% by other NCDs such as injuries or psychosis. Subjects with known chronic diseases had a mean hospitalization of 7.6 days; when disaggregating this group in subjects on regular medications, the average days of hospitalization was 6.3, while it was 8.3 for subjects not on regular medication. Reasons for not taking the medicines were mainly economic or cultural.

These data confirm that NCDs are arising also at a District Hospital and suggest that: i) to increase accessibility to chronic care, decentralization may be of benefit; ii) education to the need for chronic treatment is necessary to reduce complications and repeated hospitalization. Further studies are needed to better understand these results and the magnitude of the problem.

Improving the diagnosis of diabetes and hypertension in patients with tuberculosis in Luanda

WORKSHOP PRESENTATION

Original Title
Médicos com Africa CUAMM 20 anos com Angola para o direito à saúde – Workshop da apresentação final do projecto "Melhorar o diagnóstico da diabetes e hipertensão nas pessoas com Tuberculose em Luanda"

Presentation
Melhorar o diagnóstico de Diabetes e Hipertensão em pacientes com Tuberculose em Luanda

Location
Luanda, Angola

Presentation date
22nd September 2017

Promoters
Doctors with Africa CUAMM
World Diabetes Foundation
República de Angola - Ministério da Saúde

Focus country
Angola

Background and Aim
Angola has one of the highest rates of tuberculosis (TB) in the world, with an incidence of 370 cases per 100,000 inhabitants (2014 data). The prevalence of diabetes mellitus (DM) is also on the rise due to more sedentary life styles and unhealthy dietary habits.
While the country is skilled at TB management and control, this is not the case for noncommunicable diseases (NCDs), which have been made a priority only in recent years. Furthermore, there is a growing urgency for combined treatment strategies for NCDs and infectious diseases (IDs). To tackle the problem of NCD/ID comorbidity, Doctors with Africa CUAMM launched a screening program for DM and hypertension (HTN) in patients with TB (TB/DM-HTN) in partnership with the World Diabetes Foundation and the Angolan Health Ministry.

Methods
The screening, which was conducted from August 2014 to December 2016 in 2 hospitals and 4 health centers specialized in TB treatment, was carried out on 7,205 TB patients (3,598 men and 3,607 women) living in the urban area of Luanda Province.

Results
The gross prevalence of DM was 6%, with a slightly higher prevalence in men (6.3%) than in women (5.7%). In addition, we found that DM prevalence tended to rise in older and/or heavier patients. HTN was found in 1,352 patients with TB and a DM prevalence of 10.1%.
Low education level seemed to play an important role in increasing TB and DM comorbidity: 9.3% of the patients with both TB and DM were illiterate, 7.7% had a primary school education level, 5% a secondary school education level, and 4.1% a higher education level.

Conclusions
These project findings will be helpful both as a basis for future research and in terms of a possible further integration of the DM screening service into Angola's *National Tuberculosis Control Program*, a step that would necessitate improvement of the capacity for early diagnosis of both diseases and a high-level intervention to improve access to health services for their free treatment.

Review Meeting and exit strategy meeting for Cervical Cancer Screening and Treatment Service

WORKSHOP PRESENTATION

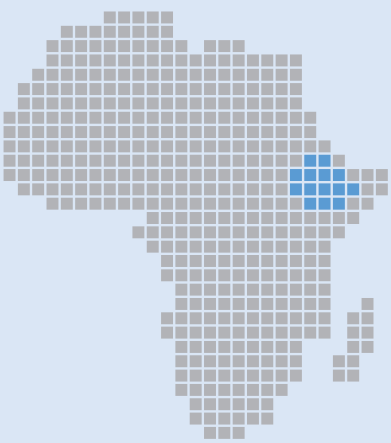
Presentation
Review Meeting and exit strategy meeting for Cervical Cancer Screening and Treatment Service

Location
Wolisso, Ethiopia

Presentation date
18th October 2017

Promoters
Doctors with Africa CUAMM
Bristol Myers Squibb Foundation
PRRR
Oromia Regional State
Federal Democratic Republic of Ethiopia

Focus country
Ethiopia



Abstract

Cervical cancer is the leading cause of cancer deaths in Africa, accounting for more than 61,000 deaths in 2015. In Ethiopia, cervical cancer is the second most prevalent type of cancer among the adult population accounting for 13.4% of all cancer cases.

In September 2015, Doctors with Africa CUAMM started in Health Facilities of Goro, Wonchi, Wolisso Rural Woredas and Wolisso Town Administration the intervention of Cervical Cancer Screening (CCS) and Treatment Service with the use of MobileODT® Enhanced Visual Assessment (EVA) system. The study want to demonstrate the capability of the Mobile ODT EVA system as a tool for improving visual inspection during routine cervical-cancer screening and the capability for clinical-supervision activities. The study measured the ability of trained health professionals to accurately differentiate those who are positive VIA and negative VIA: sensitivity (the ability of the HCWs to identify the disease) = 0.51 (95% CI 0.41 to 0.61); specificity (fraction of those without disease who will have a negative test result) = 0.99 (95% CI 0.97 to 0.99); positive predictive value (the chance that a person with a positive test truly has the disease) = 0.88 (95% CI 0.76 to 0.94); negative predictive value (the chance that a person with a negative test truly has not the disease) = 0.92 (95% CI 0.89 to 0.94).

Only 50% of the women were screening using mobile ODT. The main reasons for the low use of MobileODT® EVA, were: i) several technical problems that did not make possible the use of the technology or the storage of the pictures; ii) high turnover of the health staff; iii) low commitment of the health staff; iv) resistance and distrust of women to be screened with Mobile ODT.

Mobile ODT EVA cab be potentially used to improve diagnostic accuracy during visual inspection in cervical cancer screening. However, there is a need to send images at real time to ask for a second person opinion on the screening result. In areas where it is not possible to send image at real time, there shall be a mechanism of giving feedbacks on the diagnosis made by the health care workers. Furthermore, it appeared that HCWs were missing significant number of VIA positive women even looking at a magnified images. Continuous mentorship and follow up is required.

Integrated community based HIV and cervical cancer screening project Kilosa District

WORKSHOP PRESENTATION

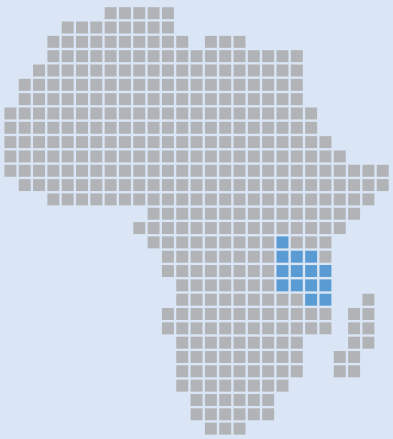
Presentation
Integrated community based HIV and cervical cancer screening project Kilosa District

Location
Dar es Salaam, Tanzania

Presentation date
8th December 2017

Promoters
Doctors with Africa CUAMM
Bristol Myers Squibb Foundation
PRRR

Focus country
Tanzania



Background and Aim
Tanzania has one of highest cervical cancer burdens in the world and the highest in Eastern Africa with Agestandardized incidence rate (ASR) of 50.9 cases per 100,000 women. Moreover, Tanzania is among the countries most by HIV/AIDS. In July 2015, CUAMM started in Kilosa District the "Integrated community based HIV and cervical cancer screening project" with the aim to contribute to the reduction of the burden of cervical cancer through an integrated approach addressing also HIV among the population living in the catchment area of St. Kizito Hospital. Moreover the proposal focused on community involvement for awareness raising on cancer screening and treatment and HIV prevention within the existing mobilization activities, thanks to Community Health Workers (CHWs) and Village Leaders who have carried out Home Visiting. Direct beneficiaries were women in child bearing age living in the catchment area of the targeted Health Facilities, more specifically 56,333, 22% of the total Project Area Population (256,058).

Results
The intervention has involved all 3 health levels in the area of Kilosa District: 1 Hospital (Hospital St. Kizito), 6 Health Centers and 31 Outreaches - Mobile Clinics, that were organized in some Dispensaries of the catchment area. Starting to July 2015 to December 2017, the programme for HIV and cervical cancer counselling, HIV test, cervical screening and treatment has been good. Between April 2016 and November 2017, on a population of 56,333 childbearing women, 18,714 women have been screened for cervical cancer with VIA technique. 497 (2.6%) women have been found VIA positive; of these, 490 (98.6%) have been treated with Cryotherapy. During counselling, 49 women were found suspicious for cancer have been referred to Mikumi St. Kizito Hospital; 31 of these have been treated with LEEP. Of the 18,714 women who screened, 18,590 (99%) have been tested for HIV. Of these, 910 (4.8%) have been found HIV positive.

Conclusions
The response of the community to outreach activity continues to be excellent: the involvement of CHWs and Village Leaders has been very effective in terms of community mobilization and dissemination of information concerning cervical cancer prevention and treatment. In addition, women in the area of intervention have been well received to participate in the cervical cancer knowledge, screening, and treatment.

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