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A critical review of the strategies towards reducing maternal mortality in a low resource setting: Using South Sudan as a case study

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Abstract
Background: Maternal mortality, a great tragedy of our time, occupies a large armamentarium in the world reproductive health burden picture and has remained a recurring problem in the global family health.
Objective: To review the strategies towards reducing maternal mortality in a low resource setting; using South Sudan as a case study
Methodology: Electronic search of published articles on maternal mortality and maternal mortality-related issues, published between 1992 and 2022, was conducted through PubMed, Cochrane libraries, Google search engine and semantic scholar. This was complemented with advanced search using Boolean operators to make the search more focused. The search was however restricted to only articles written in the English language.
Conclusion: South Sudan needs a selfless leadership structure in order to achieve the necessary will for the actualization of the outlined sociocultural, economic and medical strategies to combat the country's exceptionally high maternal mortality ratio.

Keywords: Review, maternal mortality, low resource setting, South Sudan

Introduction

One of the greatest tragedies of our time, maternal mortality, takes up a significant amount of space in the picture of global reproductive health and has remained a recurring problem in global family health [1]. Seeing healthy women pass away due to their divinely mandated procreative function can be both interesting and heartbreaking. Regardless of the location or length of the pregnancy, maternal mortality, also known as maternal death, refers to the death of a woman during pregnancy, labour or within 42 days of terminating the pregnancy due to a cause connected with or made worse by the pregnancy or its management [2]. The maternal mortality ratio (MMR) has dropped over the preceding 25 years by about 44%, with significant differences between developing and industrialized countries [3]. Over 99% of maternal deaths take place in developing countries, with sub-Saharan Africa carrying about 66% of these deaths [3].

The United Nations established an objective to lower the global maternal mortality ratio to below 70 maternal deaths per 100,000 live births by 2030, with no country having a maternal mortality ratio above 140 per 100,000 live births, and in accordance with Sustainable Development Goal 3.1 in 2015 (4). Maternal mortality in Africa dropped from 718 per 100,000 live births in 2000 to 442 per 100,000 live births in 2017, according to a report [4]. Despite this impressive decline, South Sudan continues to have one of the worst rates of maternal deaths in sub-Saharan Africa. According to studies [5, 6], South Sudan's maternal mortality rate (MMR) in 2015 was 800 per 100,000 live births; however, another study stated that when isolated South Sudanese regions are taken into consideration, this figure may be underestimated [7].

With a population of roughly 11.38 million people, the majority of whom are children, adolescents and young adults, South Sudan, a landlocked nation in northeastern Africa, remains one of the nations with the worst maternal mortality rates in the world [8].

Its neighbours include Ethiopia, Sudan, Kenya, Uganda, the Central African Republic and the Democratic Republic of the Congo. There are about sixty different indigenous ethnic groups. Roman Catholics and other Christian denominations make up the majority of the population, with Muslims and traditionalists accounting for the remainder. The nation is among the least developed and one of the poorest in the world, and it also has one of the highest rates of illiteracy. More than 80% of the people in the country engage in animal husbandry or subsistence farming. The country is categorized as a war/conflict zone because the 2013 civil war caused havoc on the economy of the country.

Petroleum is their most valuable natural resource. The country is renowned for having a consistently high rate of maternal mortality [9].

Maternal deaths can often be caused by direct, indirect, fortuitous or late factors. Direct or obstetric factors account for the majority of maternal deaths. Infectious factors (15%), complicated abortion (13%), hypertensive diseases (12%), labour obstruction (8%) and postpartum haemorrhage (28%) are the commonest causes of maternal deaths [10]. Malaria, tuberculosis, and Human Immunodeficiency Virus (HIV) infection have been revealed as common causes of maternal deaths in sub-Saharan Africa [10, 11]. Parity, poverty, poor funding, insurgencies, the number of antenatal visits, the availability of skilled birth attendants during labour, poor governance and other cultural and social variables are also significantly linked to maternal mortality in sub-Saharan countries [11, 12].

Justification for the review

Two important metrics are included in Target 3.1 of the Sustainable Development Goals: the proportion of deliveries attended to by health personnel with required skills and proficiency; and the maternal death rate per 100,000 live births (3.1.1 and 3.1.2 respectively) [13]. In South Sudan, more than 70% of births are not attended by professional birth attendants (14). Civil disturbance has impeded the expansion and development of health-related infrastructures and prevented pregnant women from using the available maternity and child health services in the country [15].

The nation's usually low literacy level with poor socioeconomic status is also not unconnected with poor utilization of maternal and child health‘s services by expectant mothers [16]. Mothers who have received education are more likely to be knowledgeable, seek out health care, visit antenatal clinics more frequently and give birth in a hospital [15].

Ineffective governance, civil unrest, lack of health infrastructures, shortage of medical supplies, inadequate mother care and odd sociocultural norms have all been linked with low health facility delivery rate in the nation [15]. Poor referral system, lack of skilled birth attendants, inadequate capacity building and training in the health sector, poor care with lengthy wait time and hostility towards health facility staff have also been identified as factors that negatively affect the utilization of health facilities in South Sudan [17, 18]. Three hundred and three thousand maternal deaths (303,000) were recorded worldwide in 2015; with about 1,500 of the deaths occurring in South Sudan [5]. South Sudan's healthcare system and maternity care have been adversely affected by spiraling violence and inter-communal conflicts [19]. There is strong evidence that reducing maternal mortality partly requires the presence of trained attendants during pregnancy and childbirth [20]. But in South Sudan, 81% of women give birth at home, with only 10% receiving medical assistance [16].

Most of the nation's roads are not appropriate for effective transportation, general infrastructures are poor and quality power supply is lacking [21]; all of these have been connected to delay in receiving maternity care, especially in the most severe situations [22, 23]. There are roughly 1147 healthcare facilities in South Sudan, 37 (3%) of which are hospitals, while the rest are basic health centers [24]. The medical facilities also lack enough staff in addition to poor equipment. As a result, the entire healthcare system suffers greatly, which raises the rate of maternal deaths. One in seven pregnant women die in South Sudan, which has one of the highest maternal death rates in the world [25]. The high fertility rate among Sudanese women of reproductive age further complicates the problem [25]. Therefore, it is crucial to assess South Sudan's maternal mortality status in light of the SDGs because the situation there is a near-ignored emergency.

Interventions instituted: challenges and barriers

In general, immediate and remote plans approached within the context of primary, secondary and tertiary levels of preventive are required for maternal mortality prevention. It's interesting to note that the United Nations Organizations (UNO) and their partners have been putting various strategies and interventions into place to lower the unacceptably high maternal mortality ratio in the nation, partly through the Sustainable Development Goals (SDGs) and partnering with the government of South Sudan [13]. However, cultural, social, political and logistic challenges have made achievement of appreciable progress difficult.

International organizations have made efforts to reduce illiteracy level in South Sudan under SDG 4 by promoting opportunities for lifelong learning for everyone and providing equal and accessible quality education [26]. This strategy will strikingly result in a significant decrease in the morbidity and mortality of adolescent pregnancy by increasing the average age at which school-aged Sudanese girls start to have children. The provision of formal education to all girls will improve their understanding of and use of maternity services [27, 28]. In the country, according to a study, only 20% of children enroll in secondary school, with only 3% of them graduating [29]; school enrollment rate is also affected by the substandard status of the available schools, security threat, poor healthcare services for students and environmental risks in schools [30]. As a result, a sizable fraction of children are deterred from enrolling because of the unclean and hazardous environment. Additionally, it has been challenging to secure suitable and quality teachers due to poor incentives and unfavorable working condition [31]. Schools in South Sudan are often shut down because of the ongoing hostilities and unrest; onsequently, schools frequently fall short of fulfilling their purpose [30].

South Sudan has made significant efforts to improve on her trained birth attendants in compliance with SDG 3.1.2. [32]. The South Sudanese government has been attempting to expand the number of skilled birth attendants and fully functional health facilities with the aid of foreign partners. However, due to difficulties with long travel time to healthcare institutions, inadequate transportation system and financial constraints on paying medical expenses, encouraging results are not achieved [25]. In South Sudan, other contributory factors to maternal deaths include unfavorable social environment, husband domination, misunderstandings about prenatal care, the idea that pregnancy is harmless and skepticism about the value and effectiveness of medical treatment [25].

Maternal health and the reduction of maternal mortality are intrinsically linked with the availability of basic social amenities including a reliable transportation system and effective communication services [33]. This fact inspired the creation and execution of South Sudan's Infrastructure Action Plan (IAP), a blueprint for steady economic growth [34]. The African Development Bank Group (AFDB) and the South Sudanese government developed this initiative to address South Sudan's infrastructure shortcomings. Among the major infrastructural action projects covered by this effort are the management of lands and water resources, the promotion of agriculture and food security, the provision of transportation services, electricity and an efficient communication network. The main problems with IAP, however, include uncertainty over the amount of Sudan's net oil income, doubt about the availability of funds, the slow development of implementation capabilities and the program's detrimental macroeconomic effects [34].

Family planning services have been shown to be invaluable in preventing maternal death by reducing high parity and enhancing spacing out children [35, 36]. Family planning was judged crucial by the South Sudanese government in 2017 for reducing maternal mortality and improving women's health [37]; initiatives were conceptualized to make family planning products available, affordable and socially acceptable. Despite these initiatives, South Sudan's contraceptive prevalence remains around 3%, and more than 30% of married women lack access to modern contraceptive methods [38]. Low contraceptive prevalence in South Sudan is partly as a result of poor perception, accessibility challenge, cost and a negative attitude toward contemporary contraceptive technology [39].

Recommendations

Communities of South Sudan are ‘distinguished’ by high incidences of maternal deaths (40,41). A daring strategy using both immediate and remote actions will be required to lower the rate. These programmes will primarily focus on SDGs 3.1.1 and 3.1.2, as well as SDGs 1 and 4. (bringing maternal mortality ratio below 70per 100,000 live births, the proportion of births attended by skilled health personnel; equity and equality in education and promotion of life-long learning opportunities for all especially children and adolescents).

For all these strategies to be effective, immediate peace-making initiatives and policies are necessary. South Sudan is a young country with troubled and violent regions [42]. Every activity, policy, programme or action is disrupted in a conflict zone; some sensitive populations like children, pregnant women and adolescent girls are exposed and their risk of dying in such a situation of neglect is heightened. Maternal mortality is more likely due to the sustained war/conflict situations in the country; which has a negative impact on maternity services. This emphasizes the need for further aids, rescue efforts and security-related actions from international organizations. Thus, it is now crucial to step up efforts in peacekeeping mission and any complementary local peacekeeping initiatives.

Promotion of education for the entire Sudanese community is crucial in lowering the alarmingly high maternal mortality rate [43]. In addition to availability of adequate number of well-equipped healthcare facilities, faithful utilization of the facilities requires community involvement. Maternal mortality will be considerably reduced if a pregnant woman and her family/community are aware of the risks associated with her pregnancy and have access to a patient-centered healthcare facility that offers high quality and prompt intervention [10]. The use of healthcare facilities is not particularly popular among South Sudanese people. Therefore, greater lobbying is needed to change how the community views the importance and benefit of receiving maternity care. Community’s great involvement should be part of the experimental maternity care programmes now being implemented in South Sudan. Individuals from the communities could be appointed as "guardians" of maternal health. It is essential to engage community leaders, lawmakers, religious organizations and transportation unions in the efforts to end maternal death. Based on their local regulations for pregnant women’s health, these community members can fashion out a range of specialized community groups. They can act as a go-between for expectant mothers and healthcare facilities, file complaints when they see service flaws and negotiate healthcare expenses with facilities. The South Sudanese government must also reconsider the necessity of increasing human capacity, particularly at the basic and secondary levels of care. All local health personnel, especially midwives and doctors, should receive extended and specialized training,. Policies for training abroad should also be put in place with the aim of keeping their expertise in maternity care current. Although it is a good move to train orthodox personnel to replace traditional birth attendants (TBAs), it might not be a perfect option [44]. As the majority of pregnant rural South Sudanese still have faith in TBAs, efforts to make TBAs useless could be ineffective [45]. A study showed that some highly educated women depend on TBAs for maternity care [46]. Specific educational programmes and seminars could be developed to sensitize TBAs to the risk indicators of pregnancy, labour and delivery as well as the importance and benefit of quick referral. The appropriate interpersonal skills required in handling the TBAs should be taught to the medical staff.

Additionally, South Sudan might adopt the Swedish approach to lowering maternal mortality [47, 48]. Sweden has been able to do this since the 1800s by creating a strategy that adamantly and blindly supports the development of midwifery capability. All deliveries in Sweeden are attended by midwives and the standard of care is high [47]. Sweden had the lowest maternal mortality rate in the 20th century, and the country has established herself as one of the countries with the lowest maternal mortality rates globally. It is well known that a well-trained midwife's attendance during labour is crucial for preventing maternal death. Although training more obstetricians and gynecologists is advantageous, training more midwives is simpler, quicker and more economical. The training plan for South Sudan should offer more chances for midwives to advance their careers; other countries have even created post-basic training in midwifery [49].

Also required is a review of South Sudan's emergency obstetric and family planning services. Rapid, effective and timely interventions are required for handling emergency obstetric conditions like postpartum haemorrhage, obstructed labour, eclampsia, unsafe abortion and pregnancy-related infections. In addition to the requisite staff, facilities for emergency Caesarean section, blood transfusion and essential drugs for maternity care must be available. For on-the-ground medical officers, it is urgent to review continuous medical education with a focus on the skills necessary for comprehensive maternity care, including the performance of fundamental life-saving obstetric procedures like Caesarean section, manual placenta removal, labour management, episiorrhaphy, post-abortal care and so on. The reproductive health specialists on ground should be made to undergo professional update programmes with drills on advanced surgical/obstetric life-saving procedures; in line with available evidence.

It has been established that access to family planning services and information is essential for achieving sexual and reproductive health. It has become imperative to put strategies in place to increase contraceptive prevalence in the country, especially in the high parity age range, as South Sudan has one of the lowest contraceptive prevalence rates in the world (3%) [38]. The nation's maternal mortality rate would be reduced if family planning services were made easily available and reasonably cheap.

The effectiveness of Confidential Enquiries into Maternal Deaths (CEMD) as a strategy to reduce maternal mortality has been demonstrated [50]. Maternal death surveillance and response (MDSR), an effective adjunct to CEMD in the fight against maternal death, is being adopted by many countries (46); the country needs to improve on her MDSR framework.

The Nigerian government's innovative program tagged, "Community Health Influencers, Promoters and Services" (CHIPS) programme [51] seeks to train community members (with a basic education who have been recommended by local stakeholders for their good morals and conduct) on classroom-based instruction and practical sessions on managing common life-threatening medical issues and emergencies, especially in the area of reproductive health. They are drilled to help other community members who require medical attention, especially expectant or laboring women. CHIPS members differ from TBAs in that they all have a basic education and are chosen by community stakeholders based on merit, and have acquired the required healthcare competencies through formal training and drills led by midwives, doctors and other pertinent medical specialists. These characteristics set CHIPS members apart from TBAs. In regions where there is a dearth of nurses, midwives or doctors who are trained to assist in emergency situations, the initiative will expand and spread the tentacles of the nation's health personnel if it is well-coordinated. South Sudan's government could modify and profit from this scheme.

Furthermore, there is strong evidence for complementary and goal-oriented interventions from NGOs and other allied organizations in peacekeeping operations, community health advocacy for a shift in how the community views and addresses maternal issues like education of girls, the presence of skilled birth attendants, family planning services, confidential investigations into maternal deaths and related initiatives [52, 53]. The South Sudanese government needs the assistance of both national and international NGOs for all the aforementioned maternal health programmes in order to achieve better results.

The need for partnership and action plan

Studies have shown that South Sudan has consistently been ranked among the countries with the highest rates of maternal death worldwide [6, 25]. It is now vital to create an international cooperation and collaboration in order to stop the tide of maternal mortality in the country because this has remained a peculiar and persistent health anomaly in the country. With the proposed plans and initiatives, it is imperative to establish or strengthen the current partnership and strategic plan for reducing maternal mortality between South Sudan (the Ministry of Health of the Republic of South Sudan) and global health players like the World Health Organization (WHO), World Bank, United Nations or any other transnational non-governmental organization, such as the Bill & Melinda Gates Foundation, Catholic Relief Services, etc. [11].

The focus of the partnership and the action plan for maternal health should be on capacity building and community advocacy. The development of human resources in reproductive health, particularly in the area skilled birth attendants, should be emphasized as part of the capacity building in maternal health. The International Leadership Business Forum [54] and the Partnership Preparation Package of the World Health Organization, as well as the Project/Program Planning Guidance Manual of the International Federation of Red Cross and Red Crescent Societies [55] could all be incorporated into the partnership development plan. The established programmes should have reasonable time frames and focus on various zones and areas of the nation, beginning with those with the highest rates of maternal death. Pilot projects are essential and have to be supported.

Strategic and operational objectives

The main strategic goal should be in line with SDG3, which aims to increase the proportion of parturients cared for by skilled health personnel and lower the global maternal mortality rate to less than 70 per 100,000 live births [26]. The community's acceptance of the appropriate maternal health-seeking behaviours should be part of operational objectives. This acceptance is evidenced by the number of pregnant women who register for and attend antenatal care, the number of pregnant women who give birth in the current orthodox medical facilities, the number of skilled birth attendants who attend to women in labour and the usage rate of modern contraceptives.

Table 1: Recommended programmes

Programs	Community advocacy		Health facility interventions & development programs		
Projects	Maternal mortality awareness initiatives/campaigns in the community	Establishment of regional committees and their chairpersons; for meetings, feedback, other assistance, and logistical planning.	Midwifery capacity building/ training	Training of medical officials in obstetrics and gynaecology; research arms for policy creation and revision.	Reorientation and 'training' for traditional birth attendants, influential community members, and advocates.

Possible health facility interventions and development programmes: nature and approach

Administrative, clinical and research arms of any of the assisting global health players should coordinate customized programmes to promote "learning by doing", skills and proficiency required by midwives, medical officers and other allied health personnel in maternal healthcare process. Participating providers should benefit from clinical and didactic trainings, conferences, technical help, capacity building, webinars and other services provided by the employees of the assisting player. In terms of time allocation, training could be delivered in ratio of 1:3 (classroom to practical sessions). The clinical mentorship programmes for a group of recruited midwives, physicians or other allied health professionals can take about four weeks and eight hours per day. There could be six training sessions every year, with participants having the option of being in close proximity to the training facility for the duration of the programme. Upon completion of any training programme, it is appropriate for students to obtain a certification.

An assisting player can also collaborate with the schools of midwifery and nursing in South Sudan to provide practical mentoring in holistic reproductive health care and other

reproductive health-related medical and surgical areas. The collaboration's scope should also include policy reforms and formulation of research. In addition to classroom teaching, trainees can polish their skills in simulation laboratories and through externship at reproductive health clinics; and under supervision, trainees could treat patients. Promoting a "team science" approach in research and collaboration between students and instructors is crucial for the development of local scientific facts and knowledge.

The training programmes should be based on the World Health Organization's (WHO) standards for reproductive health in low-resource settings, which will also include local and up-to-date procedural training materials as well as adaptations to the African environment; which uses an incremental pedagogical framework and a competency-based, learner-centered approach. As a certification requirement, the curriculum could also contain "do-it-yourself" workshops. All didactic and practical training modules, books, materials and films should be made available on the website of the supporting player. Trainers should be expected to maintain daily training logs for the clinical mentoring track, documenting the operations performed, the support necessary for each procedure and the trainees' development. The lead trainer creates a summative evaluation for each competency area following training sessions.

Focus areas for clinical capacity building (Fig. 1) should include labour and labour management (with newborn care), management skills/proficiency in postpartum haemorrhage, post-abortal care and family planning services, management of hypertensive disorders of pregnancy (preeclampsia and eclampsia), pregnancy-related infections; malaria, tuberculosis and Human Immunodeficiency Virus (HIV) in pregnancy, and procedures like episiotomy repair, instrumental vaginal delivery, Caesarean section, sub-total hysterectomy and; advanced life-saving and conservative procedures in PPH for the specialists; maternal and newborn research and confidential enquiry mechanisms (Maternal and perinatal death surveillance response, MPDSR).

Fig 1: Recommended reproductive health services delivery package

Conclusion

Strong and dependable political leadership, as well as the required amount of political will is essential for the success of SDG 3 (and other related and complementary SDGs) in South Sudan. South Sudan also needs a selfless leadership structure in order to achieve the necessary will for the actualization of the outlined sociocultural, economic and medical strategies to combat the country's exceptionally high maternal mortality ratio. It will be of immense value to organize interdisciplinary health summits that will be saddled with the responsibility of reassessing the existing maternity care policies and formulating new ones.

Conflict of Interest
Not available

Financial Support
Not available

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