SSMJ
South Sudan Medical Journal

ISSN 2309 - 4605 eISSN 2309 - 4613

Volume 18. No 2. May 2025

www.southsudanmedicaljournal.com

Midwives: Critical in Every Crisis

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ISSN 2309 - 4605 eISSN 2309-4613 Volume 18. No 2. May 2025

A Publication of the Health and Social Sciences Research Institute of South Sudan

Juba, South Sudan

Email: southsudanmedicaljournal@gmail.com **Website:** www.southsudanmedicaljournal.com

Index and Copyright Information

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Midwives: Critical in every crisis

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Established in 1992 by the International Confederation of Midwives (ICM), the world celebrates the International Day of the Midwife (IDM) on 5 May yearly to celebrate and raise awareness about the midwifery profession. This year's theme is "Midwives: Critical in Every Crisis." [1]

In many countries, midwives are the first contact a pregnant woman makes for antenatal care. Midwives are critical in identifying, preventing, and/or managing and referring complications or problems as they arise, as well as delivering the baby and providing postnatal care for the mother and newborn. Early identification of complications ensures early intervention by skilled medical providers to prevent maternal morbidity and mortality.

According to the World Health Organization, South Sudan "reports one of the highest maternal mortality rates globally, with 692 maternal deaths for every 100,000 live births. For newborns, the burden is equally severe, with about 40 deaths per 1000 live births. Many factors play a role, including a volatile context of humanitarian crises and climate-related health emergencies." [2]

The theme is significant in South Sudan, which has had perennial conflicts and displacements for many years. Midwives in these conditions are also the main providers of essential sexual and reproductive health services.

In their Op-Ed marking IDM, the South Sudan Ministry of Health (MoH) and UNFPA acknowledge the health system barriers hindering midwifery potential, including "chronic underinvestment [which] has left many health facilities with limited electricity, water, equipment, or medicines. Insecurity disrupts supply chains and endangers health workers." [3]

As the MoH aptly concluded, "the health and future of the women, girls, and newborns in South Sudan depend on them [midwives]."

Thus, the MoH should ensure the provision of funding, training, and supplies for midwives to enable them to provide critical services in every crisis and every birth.

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Citation: Kenyi. Midwives: Critical in every crisis. South Sudan Medical Journal 2025;18(2):58 DOI: https://dx.doi.org/10.4314/ssmj.v18i2.1

Reasons for underutilisation of antenatal care services amongst women coming for delivery at Juba Teaching Hospital, South Sudan

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Submitted: September 2024
Accepted: April 2025
Published: May 2025

ABSTRACT

Introduction: Antenatal care (ANC) is routine care provided for women during pregnancy to promote their overall health, that of their unborn babies, and to identify, prevent, and/or manage complications or problems as they arise. Its main components include risk assessment, health promotion and education, and therapeutic intervention. Although it has been found that 71% of pregnant women attend formal ANC clinics at least once, only 44% of them have four or more visits. This study aims to determine the reasons for underutilisation of ANC services amongst the women who came for labour and delivery services in the Department of Obstetrics and Gynaecology at Juba Teaching Hospital in Juba, South Sudan.

Method: This prospective study was conducted from March 1st to May 31st, 2024. It included pregnant women who came for labour and delivery services at the hospital and who had zero to three ANC visits during their pregnancy. Data were collected by trained data collectors through direct patient interviews using a structured and pretested questionnaire and analysed using SPSS software.

Results: The study interviewed 310 women, of whom 67 (21.6%) had no ANC visit, 165 (67.9%) had one, 43 (17.7%) had two, and 35 (14.4%) had three. The main reasons for discontinuing or not attending ANC were lack of finance (22.9%), long distance to health facilities (12.9%), high cost of service (11.3%), lack of transport (11%), and lack of family support (9.4%).

Conclusion: Although we observed that most of those coming for delivery services had exceeded our cut-off of four ANC visits, we would expect far fewer to have had eight visits, as recommended by WHO in 2016.

Key words: antenatal care attendance, delivery, Juba Teaching Hospital, maternal morbidity, maternal mortality

Citation: Gang et al. Reasons for underutilisation of antenatal care services amongst women coming for delivery at Juba Teaching Hospital, South Sudan. South Sudan Medical Journal, 2025;18(2):59-63
DOI: https://dx.doi.org/10.4314/ssmj.v18i2.2

Introduction

Antenatal care (ANC), also called prenatal care, is routine care provided for women during pregnancy to promote their overall health and that of their unborn babies and to identify, prevent, and/or manage complications or problems as they arise. Its major goal is to ensure birth of a healthy baby and minimise maternal risk:[1] Its main components include risk assessment, health promotion and education, and therapeutic intervention.[2] This care is provided through scheduled visits at which in every visit, specific physical examination, laboratory tests and radiologic examination are carried out in addition to prescription of some medicines such as folic acid and ferrous sulphate.

While "complications of pregnancy and childbirth remain the leading cause of morbidity and mortality in reproductive age women worldwide",[3] good ANC can prevent or lead to timely recognition and treatment of maternal and foetal complications and therefore, reduce the overall morbidity and mortality of both mothers and their babies. Because of its importance, the percentage of pregnant women who attend an ANC visit in their first trimester of pregnancy is one of the standard indicators used to assess the quality of maternal health services.[4] The World Health Organisation (WHO) recommends that women start follow-up as early as possible in the first trimester,[5] this is to ensure that they have sufficient ANC visits, which helps in the identification of potential complications and provision of effective management in early pregnancy.

Early initiation of ANC services utilisation also helps to establish gestational age (GA) and recording of maternal baseline characteristics, in addition to the provision of early social service support and intervention, when warranted.[4]

According to estimates from the WHO, 60% of pregnant women worldwide attended ANC follow-up before the 12th week of pregnancy. However, regional and income disparities were identified.[6] In the highest income countries, more than 80% of pregnant women received early ANC compared to 25% in the lowest income group. This late attendance for ANC services reduces the number of visits.[6] Generally, in sub-Saharan Africa, pregnant mothers do not reach the recommended number of ANC visits.[7,8] Although it has been found that 71% of pregnant women attend formal ANC clinics at least once, only 44% of them have four or more visits.[8] In South Sudan, data are limited on ANC attendance.

This study aims to determine the reasons for underutilisation of ANC services during pregancy amongst the women who came for labour and delivery services in the Department of Obstetrics and Gynaecology at Juba Teaching Hospital in Juba, South Sudan.

Method

This prospective study was conducted from March 1st to May 31st 2024. During this period, 2,020 pregnant women came to Juba Teaching Hospital seeking delivery services. Among these women, 1,710 had the recommended four or more ANC visits and were excluded. The study was on the remaining 310 who had zero to three visits. Informed consent was obtained from the participants prior to data collection. Those who declined were excluded from the study. Data were collected by trained data collectors through direct patient interview using a structured and pretested questionnaire. All information was kept confidential and privacy respected. Data were analysed using SPSS software.

Results

Almost half (47.4%) of the 310 mothers were aged 25 - 34 years, 89.7% of them had less than 5 deliveries and 93.5% had parity of 5 or less, 96.1% lived in urban areas, 93.2% were South Sudanese nationals, 27.4% had never attended formal education, 81.3% were married, 7.1% were Muslim, 24.3% had a family size between 5 and 10 (Table 1). Unplanned pregnancies accounted for 25.8%. Most (78.4%) attended ANC at least once. Of these, 53.2% attended once, 26.0% attended in the first trimester, and most (81.5%) attended services at government facilities (Table 2). The main reasons for not

Table 1. Demographic characteristics of the 310 women who underutilised antenatal care services

Variable		n (%)
Age	Up to 24 years	137 (44.2)
	25 - 34 years	147 (47.4)
	35 - 44 years	26 (8.4)
Gravidity	≤ 5	278 (89.7)
	> 5	32 (10.3)
Parity	≤ 5	290 (93.5)
	> 5	20 (6.5)

Number of living children (LC)	≤ 5	298 (96.1)
	> 5	12 (3.9)
Place of residence	Urban	289 (93.2)
	Rural	21 (6.8)
Nationality	National	303 (97.7)
	Foreigner	7 (2.3)
Mother educational level	None	85 (27.4)
	Primary	108 (34.8)
	High school	86 (27.7)
	University	31 (10.0)
Marital status	Single	51 (16.5)
	Married	252 (81.3)
	Divorced	2 (0.6)
	Widowed	5 (1.6)
Religion	Muslim	22 (7.1)
	Catholic	207 (66.8)
	Protestant	71 (22.9)
	Adventist	7 (2.3)
	Jehovah Witness	3 (1.0)
	None	63 (20.3)
Husband education	Primary	34 (11.0)
	High school	121 (39.0)
	University	67 (21.6)
	Others	25 (8.1)
Husband religion	Muslim	34 (11.0)
	Catholic	207 (66.8)
	Protestant	60 (19.4)
	Adventist	7 (2.3)
	Jehovah witness	2 (0.6)
Family size	less than 5	70 (22.6)
	5 -10	174 (56.1)
	More than 10	66 (21.3)

attending ANC services or discontinuing after accessing the services were lack of finance (22.9%), long distance to health facilities (12.9%), high services cost (11.3%), lack of transport (11.0%), and lack of family support (9.4%) (Table 3).

Table 2. Pregnancy-related characteristics of those who underutilised antenatal care (ANC) services

Variable		n (%)
Whether the pregnancy is planned or not	Planned pregnancy	230 (74.2)
	Unplanned pregnancy	80 (25.8)
Whether the participant attended ANC services or not	Attended	243 (78.4)
	Not attended at all	67 (21.6)
Number of ANC visits (for those who attended)	Once	165 (67.9)
	Twice	43 (17.7)
	Thrice	35 (14.4)
Time of the initial ANC visit (those who attended)	1st trimester	63 (26.0)
	2nd trimester	133 (54.7)
	3rd trimester	47 (19.3)
Type of health Facility first visited for ANC followup	Government facility	198 (81.5)
	Private facility	31 (12.7)
	Charity based facility	14 (5.8)
Whether a participant attended ANC services in the previous pregnancy / pregnancies	Attended	206 (66.5)
	Not attended	104 (33.5)
If attended ANC in previous pregnancy, where?	Within Juba	118 (57.3)
	Within South Sudan but outside Juba	84 (40.7)
	Outside South Sudan	4 (2.0)
Was there health education at the facility (previous pregnancy)?	Yes	101 (49.0)
	No	73 (35.4)
	Not sure	32 (15.5)
	More than 10	66 (21.3)

Table 3. Reasons for discontinuing/not attending ANC services

Variable	n (%)
Lack of finance	191 (61.6)
Long distance	132 (42.6)
High services cost	147 (47.4)
Lack of transport	176 (56.8)
Lack of family support	29 (9.4)
Previous bad experience	24 (7.7)
ANC not important	19 (6.1)
Not aware of ANC	17 (5.5)
Not permitted by culture	14 (4.5)
Others	27 (8.7)

Discussion

This study shows that utilisation of ANC services among women who came for delivery at Juba Teaching Hospital is good, as only 15.4% attended less than four times or had not utilized any ANC services, as previously recommended by the World Health Organization (WHO).[9,10] This is less than the findings of a previous study in South Sudan.[11] If we used the latest WHO recommendation (minimum of eight visits), [12] the recommended use of ANC services among these women would be lower.

While 67 (21.6%) of the 310 mothers were identified to have had no ANC visit, only 35 (11.3%) of them had three visits. Just over half (53.2%) came once for ANC services. Most attended late in the second trimester or in the third trimester. This is against the recommendation of early initiation of ANC follow-up.[13]

The main reasons for non-attendance and discontinuation of ANC included financially related issues, namely high service charges (47.4%, n = 147). and long distances to the health facility (42.6%, n=132). Other reasons reported were lack of transport, absence of family support, lack of awareness and poor knowledge about ANC and its importance, and culturally related issues. These factors are similar to the findings in Bangladesh and other 28 developing countries, and in Rumbek, South Sudan.[11, 14]

Another factor identified in this study is late initiation of an ANC visit. Similar findings were also reported elsewhere in Ethiopia, Kenya and South Africa. [15, 16, 17]

Most patients who underused ANC services (81.5%, n=198) had initially attended at the government facilities (hospitals and PHCCs). This may explain the high patients flow in the government facilities, making the waiting time longer. Lack of medicines and laboratory tests or staff behaviour towards patients might cause dissatisfaction among these mothers.

Conclusion

Although ANC service utilisation is high in our study, it be would lower if we used the WHO`s 2016 recommendation (minimum of eight visits).

We have found from this study that factors including financially related issues, long distances to the health facilities, lack of transport and absence of family support were among the top reasons why these mothers did not attend, or attended late or attended and then discontinued ANC services. We therefore, recommend improvement of ANC services at the government facilities besides implementation of health education programmes through direct health education at the services centres, radio and television talk shows, social media and health education campaigns in the residential areas. We also recommend to the government to increase the number of PHCCs within and outside Juba and create a programme that will support pregnant women with mama kits (clothing for both mother and the baby, diapers, baby blanket, baby soaps, powder and lotion). Further, larger and multicentre studies would add to our understanding of these issues in ANC.

Ethics approval: Permission to carry out this study was granted by the ethical committee, Faculty of Medicine and Health Sciences, Upper Nile University and Juba Teaching Hospital, Department of Obstetrics and Gynaecology.

Availability of data and materials: Data sets used and/or analysed during the current study are available from the corresponding author on request.

Funding: Nil.

Competing interests: Nil

Acknowledgment: We are grateful to all who supported this research and particularly the mothers involved.

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Research Article

Knowledge, attitudes and practices regarding complications of pregnancy and childbirth among women attending antenatal care in Maridi, South Sudan

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Submitted: February 2025
Accepted: April 2025
Published: May 2025

Citation: Gai and McIntosh. Knowledge, attitudes and practices regarding complications of pregnancy and childbirth among women attending antenatal care in Maridi, South Sudan. South Sudan Medical Journal, 2025;18(2):64-67 DOI: https://dx.doi.org/10.4314/ssmj.v18i2.3

ABSTRACT

Introduction: As South Sudan continues to address the various factors leading to peripartum mortality, the willingness of women to cooperate with steps to reduce maternal mortality is a vital concern. Experts recommend that facility-based delivery is a major factor in reducing peripartum mortality. This study aims to assess the knowledge, attitudes, and practices of pregnant women regarding complications during pregnancy and childbirth in Maridi County Hospital.

Method: This was a cross-sectional descriptive study. A questionnaire was administered to 54 women attending antenatal care (ANC) in Maridi County Hospital from the 1st to 5th July 2024 who consented. The questionnaire included both open and close ended questions which provided freedom to the respondents. It was prepared in English and translated into Juba Arabic. Data analysis was done using the statistical package for social sciences (SPSS version 23.0).

Results: All respondents had a favourable view of ANC and giving birth in a health facility. 85% had delivered their last child in a hospital or health care centre. Over 90% preferred the services of a midwife to that of a traditional birth attendant (TBA). Health care workers were identified as the major source of information regarding safe deliveries. The reasons for choosing skilled delivery were primarily for the health and safety of the mother and child. The major barriers to utilising skilled delivery were practical—distance, money, and transportation. Although 85% acknowledged that traditional and cultural pressures had negative effects on many women, they had little effect on the responders. While 38 responders considered attending ANC was the best means of ensuring a safe delivery, only 12 chose hospital delivery.

Conclusion: Despite the bias in data collection as all the responders were attendees at the ANC, the respondents showed more confidence in the medical system than in traditional methods, a great opportunity for increasing awareness of the potential dangers during delivery.

Keywords: peripartum mortality, antenatal care, hospital delivery, midwife, cultural pressures, South Sudan

Introduction

Globally, the estimated number of maternal deaths in 2010 was 529,000. These were predominantly in Africa (251,000) and Asia (253,000).[1] For every pregnant woman who dies, at least 30 suffer serious injuries and often permanent disability.[2] Maternal mortality/100,000 births was highest in Africa (830), followed by Asia (330). The average risk of dying from pregnancy-related causes in Africa is about 1 in 20, compared to 1 in 2000 in the more developed countries. South Sudan may be the leading country in Africa with a maternal mortality rate of 1,223 per 100,000 live births.[3] Experts recommend that facility-based delivery is a major factor in reducing peripartum mortality.[3]

This study aimed to assess the knowledge, attitudes, and practices of pregnant women regarding complications during pregnancy and childbirth in Maridi County Hospital.

Method

This was a cross-sectional descriptive study. A letter of introduction was obtained from Maridi Health Science Institute, permitting the research to be conducted. A questionnaire was administered to 54 women attending the antenatal care (ANC) in Maridi County Hospital, who consented. This served as the source for primary data collected from the 1st to 5th July 2024. Information from hospital records constituted the secondary data source. The questionnaire included both open and close ended questions which provided freedom to the respondents. The questionnaire was prepared in English and translated into Juba Arabic. Data analysis, using the statistical package for social sciences (SPSS version 23.0), and presentation was done on 16th and 17th July after it was fully processed.

Results

The median age of the 54 mothers was 30 years. All professed to be Christians, with 70.4% being married and 80% having 1-4 children. 44 of the respondents had had some formal education, although more than half stopped their education in primary school.

All the 54 women had sought antenatal care at least once during their previous pregnancies, suggesting a high level of awareness and access to ANC services.

When asked about the number of times pregnant women are supposed to attend ANC services, 48% believed that four times was ideal. 29.6% stated three times while only 7% said twice However, the fact that 15% were unsure about how many times to attend ANC indicates a gap in knowledge that could be addressed through education programmes in the health facilities and at the community level. (Figure 1).

Figure 2 shows that 29.6% of the mothers felt that one of the benefits of attending ANC was for education on the danger signs during pregnancy and childbirth, while 27.8% emphasised the importance of identifying these danger signs for early detection of complications. Additionally, 12 mothers or 22.2% valued the checking for foetal well-being, and 11 of them or 20.4% recognised the role of ANC in preventing mother-to-child transmission (PMTCT) of Human Immuno-deficiency Virus/Acquired Immuno-Deficiency Syndrome (HIV/AIDS).

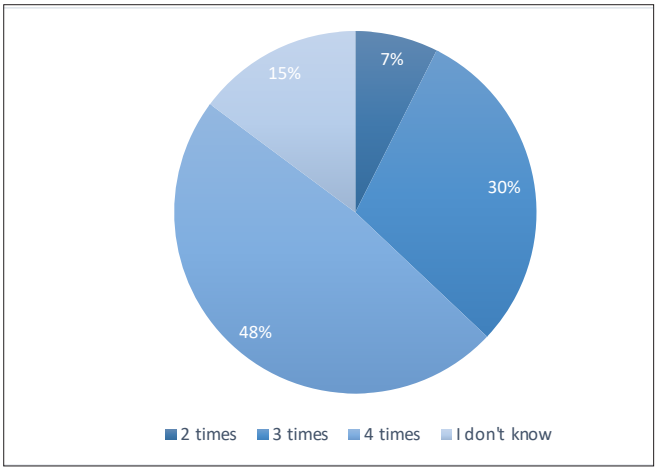

Figure 1. Mothers' responses to recommended frequency of ANC attendance

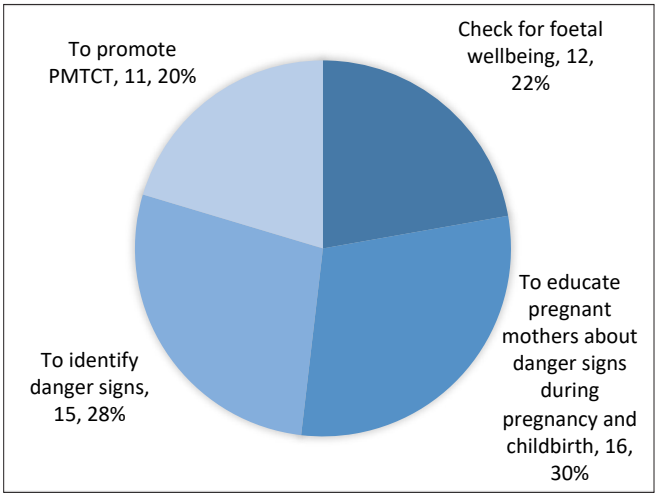

Figure 2. Benefits of attending ANC services

Almost all (93%) of the mothers were aware of potential complications indicating a strong awareness in the community about the risks associated with pregnancy.

Forty-six (85%) of the mothers reported that they learned about the risks of pregnancy and childbirth from health workers. Information obtained from friends and radio was significantly lower, each accounting for only 7% of the respondents. This suggests a reliance on professionals for credible information and an inadequate coverage of communication structures like television, or radio stations, thus reinforcing the importance of ongoing health education and community outreach programmes.

Half (51.9%) of the mothers interviewed, attributed complications to supernatural beliefs. Indicating a significant cultural or societal influence on perceptions of pregnancy health. 33.3% identified bewitchment as a factor contributing to complications, and 14.8%, pointed to the types of food consumed.

The responses to "How can pregnancy and childbirth complications be prevented" included 'routine antenatal care visits (70.4%)', 'hospital delivery (22.2%)', 'early detection of common signs and symptoms (3.7%)' and 'a balanced diet (3.7%)', suggesting that most mothers felt that regular medical check-ups are crucial for monitoring the health of both the mother and foetus.

Which traditional beliefs and practices influence you not to seek early medical help?

The data indicated that cultural taboos are the leading factor in influencing mothers not to seek early medical help, cited by 28 mothers. This highlights the significant impact of societal norms on maternal health decisions. Cultural stigma and negative experiences were reported as barriers by 33.3%, suggesting that past encounters with the healthcare system may deter women from future engagement. Misconceptions and fear, cited by 14.8% of the mothers, further illustrated the psychological and informational barriers that pregnant mothers face while accessing health care services.

Barriers to accessing skilled delivery included the long distance to healthcare facilities by 16 mothers, lack of money by 12, and transportation difficulties by 7, representing 29.6%, 22.2% and 13.0% of the respondents respectively. Additionally, the bad attitude of health workers and lack of partner support were mentioned as barriers for 13.0% of the women, while cultural and religious beliefs were noted by 9.3%.

Discussion

One of the major goals of the Ministry of Health (MoH) and various Non-Governmental Organisations (NGOs) is the reduction of maternal mortality in South Sudan. Although this was a targeted survey in a specific health facility and where skilled delivery is readily available, the results are encouraging. Cultural practices and taboos have been major obstacles of getting more women to deliver in the health facilities in the past. For example, a study by Ntambwe et al.[4] on the cultural beliefs and practices of pregnant mothers in South Sudan found that many pregnant mothers relied on traditional healers and herbal remedies for prenatal care, often leading to delays in seeking proper medical care when complications arose. This highlights the importance of addressing cultural beliefs and practices in improving maternal and child health outcomes in South Sudan.

However, in this study, although those forces were acknowledged, all the women had a favourable view of the hospital as a place for safe delivery. The reasons they were attending the ANC included monitoring foetal well-being, health education to mothers, identifying risk factors, promoting anti-retroviral therapy in mothers with HIV, among others.

Although the findings in Maridi may not generally reflect the attitudes in South Sudan at large, as the Equatorial States have traditionally had a higher rate of education, there are good reasons to be encouraged by the findings. The levels of education of the responders probably reflects most of the urban and suburban areas of South Sudan, with 80% having some education, but less than half of those reaching secondary or tertiary levels. That suggests to us that the primary schools in our nation could be vehicles of conveying the knowledge of the risks of pregnancy and the benefits of attending ANC and hospital delivery.

However, this study contrasts with others in East Africa. Studies conducted in Kenya,[5] Uganda[6] and Tanzania[7] found that pregnant mothers had a low knowledge level about complications during pregnancy and child delivery.

Although we acknowledge the strongly positive attitudes towards hospitals and health care workers may be a reflection upon the favourable impact that AMREF has had upon the Maridi community, these data suggest that the greatest barrier to the women in South Sudan delivering in health care facilities is the ability to access skilled deliveries rather than the attitude of the women. None of the women had a fatalistic view regarding birth

complications and all felt that those complications could be prevented. These data suggest that the presence of health care facilities and transportation to those facilities are the keys to reducing peripartum mortality in South Sudan. In addition, this study suggests that addressing issues of birth safety is important at the primary school level so that the attitudes we see in Maridi may become more widespread.

Conclusion

Tackling the tremendous challenge of reducing peripartum mortality for women and their babies will require commitment from the Government of South Sudan and the Ministry of Health, well directed funds from outside sources, and the cooperation of the community, particularly the pregnant women. The findings of this study indicate that the women, the most critical players, can be educated and persuaded to cooperate in reducing peripartum mortality if the facilities and trained personnel are present. Significant steps have been taken to train midwives in this country to address the issue. Infrastructure has improved to make transport to facilities capable of managing high risk pregnancies and deliveries more feasible. The women in Maridi are sending a strong message that they are ready to cooperate. With appropriate instruction through primary schools, these attitudes can spread throughout the country. Now we need more county hospitals with proper equipment and personnel to implement these goals.

Acknowledgements: The authors thank the World Health Organisation (WHO), the United Nation International Children's Fund (UNICEF), South Sudan Country offices and South Sudan National Bureau of Statistics (NBS) for providing the dataset. The main author (a medical student) appreciates the research supervisor Mr Justin Mangwi for his guidance and equipping him with essential research knowledge that enabled me to finish this research dissertation successfully. Furthermore, I thank my co-author, Dr Clarke McIntosh (Director of Medical Ward in Mary Immaculate Hospital) and SSMJ team for helping me to edit this paper. The contents (a summary of a student dissertation) are solely the responsibility of the authors and do not necessarily represent the official views of the supporting offices.

Conflicts of interest: None.

Funding: The small cost of the study was covered by South Sudan Government, through the school administration and research training programme.

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Research Article

Evaluating the adoption of a mobile application for quality-of-care assessments in South Sudan using Rogers' innovation diffusion theory

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Submitted: February 2025
Accepted: March 2025
Published: May 2025

Citation: Yugi et al. Evaluating the adoption of a mobile application for quality-of-care assessments in South Sudan using Rogers' innovation diffusion theory. South Sudan Medical Journal, 2025;18(2):68-72
DOI: https://dx.doi.org/10.4314/ssmj.v18i2.4

ABSTRACT

Introduction: The Health Pooled Fund (HPF) in South Sudan introduced the HPF Quality-of-Care (QoC) Application (App) in 2019 to improve healthcare quality monitoring and evaluation. The App allowed direct data entry at health facilities (HFs) and provided cloud storage for remote access and analysis. The App adoption can be understood through Everett Rogers' Innovations Diffusion Theory (IDT), which explains how new ideas and technologies spread through societies. This study evaluated the QoC App adoption in South Sudan, using Rogers' IDT to understand the factors influencing adoption, and identify successes and challenges in low-resource healthcare settings.

Method: This study analysed QoC assessment data from HPF-supported HFs from 2019 to 2021, using descriptive statistics and thematic analysis to identify the trends and factors influencing adoption, based on Rogers' IDT.

Results: The study found that QoC App adoption significantly increased the proportion of HFs assessed from 39% in the first quarter when it was introduced, to 92.2% seven quarters later. The adoption of this innovation aligned with Rogers' IDT.

Conclusion: The successful implementation of the HPF QoC App demonstrates the practical application of Rogers' IDT in a low-resource healthcare setting. The effective use of this App in South Sudan's healthcare system has demonstrated digital health potential for future public health innovations and technology adoption process.

Key words: quality-of-care, mobile technology, innovation, healthcare, South Sudan

Introduction

The Health Pooled Fund (HPF) in South Sudan introduced a mobile application, HPF Quality-of-Care (QoC) Application (App) in 2019 to address the inefficiencies of its paper-based assessment system.[1] This innovative digital health solution allowed for direct data entry at health facilities (HFs), with subsequent cloud storage for remote access and analysis.[2] The transition marked a significant improvement in the monitoring and evaluation of healthcare quality across HPF-supported HFs, enhancing both speed and accuracy of data collection, analysis and reporting.[2]

Before the App was developed, QoC assessments were paper based, with data entered manually into an Excel sheet afterwards. This method was time-consuming and error-prone, causing delays and inaccuracies in reporting and analysis. The App was designed to streamline this process by allowing direct data entry at the HFs level, thereby enhancing the speed and reliability of data collection.[2] The development and introduction of the HPF QoC App in 2019 marked a significant advance in the management of QoC data in the HPF programme in South Sudan.[2] This innovation targeted the healthcare professionals working with the MoH, implementing partners (IPs), and HPF, who were directly involved in the QoC assessments at various HFs.[1] The primary aim was to address the inefficiencies inherent in the then paper-based assessment system.[2]

When the App was developed, it was expected to be widely used by all involved. However, adoption of any new technology is a complex, social, and developmental process influenced by personal views, contextual, cognitive, and emotional issues.[1,3,4]

The adoption of this Mobile Application can be understood through the Rogers' Innovations Diffusion Theory (IDT), which provides a framework to understand how new ideas and technologies spread through societies. The theory explains how an innovation spreads over time in a social system, emphasising factors like perceived attributes, communication channels, time, and the nature of the social system.[3]

Everett Rogers' IDT explains how new ideas, practices, and products spread within a social system, and defines innovation as a new concept for adoption and diffusion as the process of communication.[3] Initially, according to this theory, few people accept new concepts, but their efforts eventually create a critical mass, causing the idea to spread and reach saturation. Rogers identified the following five groups of adopters.[5]

1. **Innovators:** The first small group to adopt.
2. **Early Adopters:** Socially forward and influential.
3. **Early Majority:** Adopt after seeing benefits.
4. **Late Majority:** Sceptical, adopt after most others.
5. **Laggards:** Resistant to change, last to adopt.

The purpose of this study was to evaluate the adoption of the QoC App introduced in 2019 by the HPF across HFs in South Sudan. The study employed Rogers' IDT to understand the factors influencing the adoption of this technology and to identify the successes and challenges encountered during its implementation in low-resource settings.

Method

This study examined the QoC assessment data extracted from the HPF-supported HFs for the period 2019 to 2021. Descriptive statistics and thematic analysis were used to identify trends and factors influencing adoption, based on Rogers' IDT. Data were obtained from the HPF QoC database and project reports from July 2019 to March 2021. Both quantitative and qualitative analyses were employed to understand the implementation and adoption of the HPF QoC App.

This study did not require ethical approval as it was based on publicly available reports and secondary data from the HPF project, all of which did not include any personal or sensitive information. In addition, this case study complies with ethical guidelines, and informed consent was obtained from the HPF senior management.

Results

As of July 2019, when the utilisation of the QoC App was introduced, the HPF programme was supporting 797 HFs consisting of 25 hospitals, 195 Primary Health Care Centres (PHCCs), and 577 Primary Health Care Units (PHCUs). Quality of care assessments were carried out in these HFs and the assessment data were analysed quarterly.[2] As presented in Figure 1, the number and proportion of HFs assessed progressively increased from 39% in the first quarter when the App was introduced (July – September 2019), to 92.2% six quarters later (January – March 2021). The App experienced slowdown due to increased data, necessitating the development of a web-based interface for direct web access to the backed-up assessment data.[2]

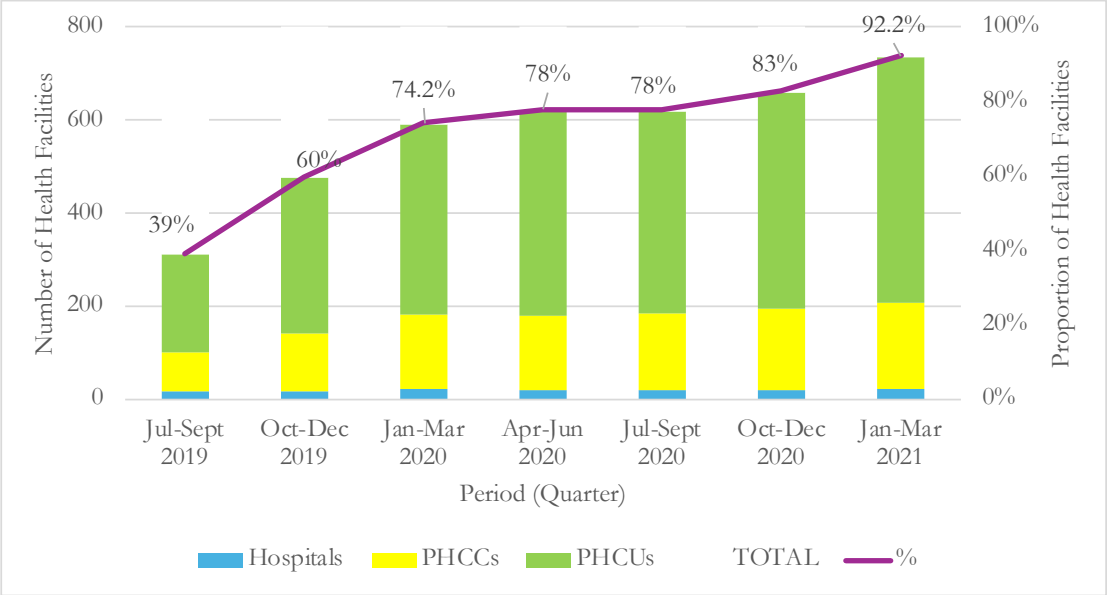

Figure 1. Number and proportion of health facilities assessed

Discussion

The HPF's QoC App improved the QoC assessments' efficiency through direct data entry, cloud storage, and versatility across various healthcare facilities (HFs) in South Sudan, ensuring data security and accessibility for remote analysis (2021b). To ensure seamless adoption, the programme conducted Training of Trainers (ToT) sessions in May and June 2019. These trainers subsequently trained users at the county level, enabling them to commence QoC assessments using the App by July 2019.[1]

The App was piloted with users who provided valuable feedback, leading to the adjustments in the application and recognizing them as innovators according to the IDT.[5]

During the introduction quarter, QoC assessments were conducted in 39% of the HPF-supported HFs across South Sudan. The staff who carried out these assessments, according to the IDT, are regarded as the Early Adopters.

Quarterly updates on the performance were provided by the HPF. These quarterly performance updates confirmed users' adoption decisions and demonstrated improvements in efficiency and accuracy.[1,6] Effective communication, support, and continuous improvement were key for the successful adoption of this new digital health technology.[1,6] These led to a huge accumulation of data in the database which subsequently slowed down the App and necessitated the development of the QoC web interface.[2] The web interface improved the App's functionality by enabling direct access to the QoC server and remote access to QoC assessment data and reports.[2]

The proportion of HFs assessed using the App reached 78% by the fourth quarter after the introduction, which was maintained in the subsequent quarter, an indication that the level of saturation had been reached. This is attributed to the early majority phase of the IDT.[5,6]

In 2020, the programme introduced key performance indicators (KPI) in which the IPs would incur a penalty if a certain threshold was not met.[6] The KPI was a motivator that drove the performance to 92% by the seventh quarter after the App's introduction. Penalties compelled the cost-conscious Late Majority to use the platform in order to avoid the fines.[5]

The Laggards are the staff who joined after the App was implemented or were assigned late by their organisations to use the QoC App as the paper-based tool was obsolete, yet they had to meet their KPIs.

Other theories that may explain the adoption of the HPF QoC App include the Technology Acceptance Model (TAM) and the Uses and Gratification Theory (UGT). According to Davis (1989), TAM has three key concepts: behavioural intention, perceived usefulness, and perceived ease of use. Behavioural intention is the motivation to use a technology. Perceived usefulness impacts a person's willingness to accept the technology, while perceived ease of use refers to the simplicity of using the technology.

Social influence, external factors like peer opinions, and individual differences like age and gender can also significantly influence an individual's perception of a technology.[7] On the other hand, UGT emphasises that people seek out what they hope will get them some benefit. [8] It can be used to explain human behaviour, preferences, and decision-making based on the gratification which they are seeking.[8]

This study demonstrates the successful introduction of the HPF QoC App in South Sudan, which improved QoC assessments, and the application of Rogers' IDT. The limitations from previous studies included a small sample size, which restricts generalisability of the findings, the use of a cross-sectional design that does not allow for examination of changes over time. Additionally, the studies relied on self-reported data, which could lead to biases, and their foci were limited to the TAM and IDT frameworks.[9] This study also has limitations due to its dependence on self-reported data and its narrow focus, as evaluations were conducted solely by users in the HPF-supported HFs.

Future research should investigate its long-term impact on healthcare quality, compare it with similar applications, explore user experience and satisfaction, conduct a cost-benefit analysis, and examine its integration with other health systems.

Discussion

The HPF QoC App's ability to collect, store, and analyse quality-of-care assessment data has proven invaluable, highlighting its potential for wider application beyond HPF-supported HFs, potentially at a national level by the Ministry of Health in South Sudan. Its introduction successfully aligns with Rogers' Innovation Diffusion Theory (IDT). Initially, a small number of staff members adopted the App, but its use gradually increased, eventually reaching widespread saturation. Early engagement with end-users and performance-based incentives were critical in promoting adoption and integrating the App into routine activities. Furthermore, other adoption theories such as TAM and UGT, provided additional insights into user behaviour and technology integration.

This study emphasises the importance of implementing innovations in healthcare settings using the innovation diffusion model, addressing user needs and systemic requirements, to ensure successful implementation and initial acceptance.

Acknowledgement: We acknowledge the Foreign, Commonwealth, and Development Office (FCDO) and the South Sudan Ministry of Health (MoH) who contributed technically during the development of the HPF QoC monitoring system and the HPF QoC App.

Funding: None. The views expressed in this article are entirely those of the authors.

Conflict of interest: JOY and JAD participated in quality care assessments and initiatives before the study. However, the authors believe there is no significant conflict, as this paper was written after the programme ended. The authors declare no competing interests.

Authors' contributions

JOY conceptualized the study, developed the concept note, conducted a comprehensive literature review, analysed the data, and wrote the first draft of the manuscript. VAO and JO meticulously reviewed the work and ensured that the innovation diffusion theory was correctly applied throughout the study. JAD played a crucial role in capturing the unique South Sudan context within the article. GWL provided overall quality assurance, ensuring that the manuscript was of high quality and publishable. Each author reviewed the manuscript, offering critical revisions and valuable content. All authors read and approved the final version of the manuscript.

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Strategic Development of SAMA's Presence in Europe

Following a recent leadership meeting with SAMA's European stakeholders, we are moving forward with plans to establish an independent, nonprofit organization in Europe by 2026. This entity will remain aligned with SAMA's values of excellence, integrity, and kindness while focusing on humanitarian relief, post-war rebuilding, and educational initiatives for Sudan.

Key Objectives:

- Strengthen humanitarian and educational initiatives in Sudan.
- Establish an official presence to facilitate SAMA-aligned efforts in Europe.

To ensure an inclusive and collaborative approach, we are inviting those interested in contributing to this vision to join the SAMA Europe WhatsApp group. This will serve as a platform for engagement, updates, and discussions as we shape the future of SAMA's work in Europe.

If you would like to be part of this initiative, please join our WhatsApp group through the link below.

Your support and insights will be invaluable as we take this important step forward.

Looking forward to building this journey together!

Best regards,

Mohamed Almahal

Executive Director

Sudanese American Medical Association

Join the WhatsApp group here

Reconstruction of mandibular "chop-off" defects resulting from gunshot injuries at University Maiduguri Teaching Hospital, Nigeria: A retrospective study

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Submitted: January 2025
Accepted: March 2025
Published: May 2025

Citation: Abdullahi et al. Reconstruction of mandibular "chop-off" defects resulting from gunshot injuries at University Maiduguri Teaching Hospital, Nigeria: A retrospective study. South Sudan Medical Journal, 2025;18(1):73-77 DOI: https://dx.doi.org/10.4314/ssmj.v18i2.4

ABSTRACT

Introduction: Mandibular injuries resulting from high-velocity projectiles often lead to extensive destruction of hard and soft tissues, a phenomenon typically described as "chop-off" wounds. These injuries pose unique challenges in presentation, emergency management, and definitive treatment due to complex anatomy and mechanisms. This study evaluates our clinical experience in managing such injuries at the University of Maiduguri Teaching Hospital (UMTH) Oral and Maxillofacial Surgery Department, which functions within a resource-limited setting.

Method: This retrospective study was a case series conducted at UMTH Borno State, during the peak of Boko Haram insurgency from January 2016 to January 2022. The sample included patients with mandibular "chopped off" gunshot injuries, defined as severe lower jaw tissue damage with loss of mandibular bone continuity. Patient files were reviewed for demographic data, wound characteristics, emergency airway management, diagnostic findings, treatment types, follow-up duration, and complications. Data were analyzed using the statistical software SPSS version 20.

Results: From January 2016 to January 1, 2022, 117 patients with Gunshot Injuries (GSI) were treated, with 13 sustaining "chop-off" gunshot injuries. The final analysis included the 12 survivors out of 13 initial patients. The mean defect size widest diameter was 4.7 ± 1.1 cm (range 3-6 cm). Seven patients (58.3%) had complete 'chop-off' injuries, while five (41.7%) had incomplete injuries. The tongue was involved in two patients (16.6%) with avulsion of the anterior one-third. Five patients (41.7%) required tongue traction for immediate airway management, and seven (58.3%) underwent tracheostomy. Reconstruction plate extrusion with mucosa breakdown occurred in two patients (16.7%), and four (33.3%) had donor site complications.

Conclusion: The reconstruction of severe mandibular gunshot injuries is complex. However, regional flaps combined with skeletal stabilization can yield acceptable results in the absence of free tissue transfer.

Keywords: mandibular reconstruction, chop-off injury, gunshot injuries, resource-limited setting.

Introduction

Severe mandibular injuries resulting from high energy/velocity gunshot to the face often lead to substantial loss of both hard and soft tissues.[1,2] The term "chop off" describes these injuries to the mandible due to their distinct characteristic presentation.[2] The mechanism of injury involves a perpendicular transection of tissues across the mandible with the severity of damage determined by the amount of kinetic energy transferred.[2] These injuries are life-threatening and when seen at presentation the Advanced Trauma Life Support protocol must be followed starting with the primary survey: Catastrophic bleeding, Airway, Breathing, Circulation, and Disability (CABCD).[2,5] They present challenges for emergency care, and definitive treatment due to the mechanism of injury and the complex anatomy and function of the affected structures. Shakur et al. proposed incorporating chop-off injury into the classification of ballistic wounds, which currently includes penetration, perforation, and avulsion. [2,3]

Management of mandibular chop-off injuries requires a multidisciplinary approach to treatment involving a staged approach, beginning with initial stabilization and debridement, followed by careful planning and execution of reconstructive procedures to restore both form and function.[2] The extensive tissue loss often necessitates complex reconstruction techniques in highly specialized centres.[2,3]

This study looks at our clinical experience at the Oral and Maxillofacial Surgery Department of the University of Maiduguri Teaching Hospital, a resource-constrained setting in the management of mandibular chop-off gunshot injuries after primary stabilization including antibiotic cover and tetanus prophylaxis by doctors in conflict zones of the state. It highlights the challenges and outcomes of surgical interventions employed during this period of insurgency in the state.

Method

This retrospective study was carried out at the Department of Oral and Maxillofacial Surgery, University of Maiduguri Teaching Hospital (UMTH), Borno State, the epicentre of the Boko Haram insurgency period in northeastern Nigeria, over six years from January 2016 to January 2022. The sample was chosen from the hospital case records of patients with mandibular chop-off gunshot injuries, who presented to this tertiary hospital.

Mandibular chop-off injury was defined as massive lower jaw tissue injuries with some loss of hard and soft tissue mandibular bone continuity that had avulsed or chopped-off of the mandible. Usually, this involves a significant amount of avulsed mandibular bone, from the parasymphyseal or body regions. It may extend either unilaterally or bilaterally up to the angle or ramus level with varying degrees of soft and hard tissue preservation. Chop-off was categorized as incomplete, where teeth were present and can be used to stabilize the mandible or complete, when no teeth are left, and all are part of the avulsed mandible.

Patients' files were reviewed for demographic characteristics, wound characteristics, emergency airway management, diagnostic findings, type of treatment provided, follow-up duration, and complications. Ethical approval for the study was waived for this retrospective study. However, written consent for the use of clinical photographs was obtained from the patients whose images were featured.

Data were entered in Microsoft Excel (20 version) and cleaned of errors. Statistical analyses were performed using statistical software SPSS version 20.0 for Windows (SPSS Inc.).

Results

Between January 2016 and January 1, 2022, 117 Gunshot Injury (GSI) patients received treatment, among whom 13 had sustained 'chop-off' gunshot injuries. Of these, 12 patients were included in the final analysis, as one did not survive the injuries sustained on the day of emergency presentation.

The mean defect size was 4.7 ± 1.1 cm, with a 3 to 6 cm range. Seven patients (58.3%) sustained a complete 'chop-off' injury, while five (41.7%) experienced an incomplete 'chop-off' injury. We recorded tongue involvement in two patients (16.6%) with avulsion of the anterior one-third of the tongue.

Concerning immediate airway management, five patients (41.7%) required tongue traction to maintain airway patency, and seven patients (58.3%) underwent tracheostomy. All 12 patients (100%) had conservative serial debridement and wound dressing . Additionally, six patients (50%) received initial fracture stabilization. All patients (100%) underwent delayed reconstruction of hard and soft tissues. Regarding subsequent interventions, six patients (50%) received residual deformity reconstruction and oral rehabilitation to address remaining deformities and enhance oral function. Finally, three patients (25%) participated in physical therapy post-surgery for recovery,

Table 1. Wound characteristics, treatment, and complications N=12

Variable		n (%)
Type of orofacial defect	Complete mandible body "chop off" injury	7 (58.3)
	Incomplete mandible body "chop off" injury	5 (41.7)
Tongue involvement	Not injured	10 (83.4)
	Avulsed anterior 1/3	2 (16.6)
Initial Airway management	Tongue traction	5 (41.7)
	Tracheostomy	7 (58.3)
Wound management	Conservative debridement	12 (100.0)
	Fracture stabilization	6 (50.0)
	Delayed reconstruction	12 (100.0)
	Deltopectoral flap	11 (91.7)
	Pectoralis major myocutaneous flap	1 (8.3)
	Residual deformity reconstruction and oral rehabilitation	6 (50.0)
	Postoperative physiotherapy	3 (25.0)
	Psychosocial assistance	2 (16.7)
Complications	Microstomia	10 (83.3)
	Partial flap necrosis	4 (33.3)
	Infection that needed surgical intervention	3 (25.0)
	Incision dehiscence	4 (33.3)
	Oral incontinence	4 (33.3)
	Hardware extrusion	2 (16.7)
	Fistula	2 (16.7)
	Donor site-related morbidity	4 (33.3)

and two patients (16.7%) required psychiatric assistance to manage the psychological impact of their injuries (Table 1).

Four patients (33.3%) experienced partial flap necrosis, necessitating revision surgery. No patient suffered from total flap necrosis. Ten patients (83.3%) had microstomia. Additionally, three patients (25%) developed infections that required further surgical intervention. Dehiscence occurred in four patients (33.3%), and an equal number of patients encountered issues with saliva drooling and oral incompetence. Hardware extrusion was noted in two patients (16.7%), and four patients (33.3%) experienced donor site complications (Table 1).

Discussion

In this study, the authors observed delayed reconstruction across all participants. Mandibular GSI studies from UK and US mostly report securing the airway and reconstructing the mandible as the first stage.[7,8] GSI involves significant tissue destruction, characterized by extensive bone loss, soft tissue avulsion, and contamination from foreign materials. Such wounds in the craniofacial region necessitate complex, multi-stage surgical interventions, including initial stabilization and subsequent reconstruction with vascularized or non-vascularized tissue transfer.[4,5] Additionally, infection control, wound healing, maintaining airway patency, and expertise are critical variables that can significantly affect outcomes, especially when immediate or delayed reconstruction options are considered.[13]

For mandibular reconstruction, we used a reconstruction plate for all patients to stabilize the segments of the mandible, which is the commonest used. However, the

Figure 1. Patient with chop-off mandibular GSI with spared tongue before and after reconstruction with a deltopectoral flap. CT scan shows mandibular bone loss. (Credit- Mohammed Adam Sheikh Abdullahi)

Figure 2. Patient with chop-off mandibular GSI with sparing of the tongue before and after reconstruction with deltopectoral flap. (Credit- Mohammed Adam Sheikh Abdullahi)

use of Kirshner wires has been reported.[2,4] The deltopectoral flap was used in almost all cases. (Figures 1 and 2) The deltopectoral flap has been traditionally utilized for reconstruction in the head and neck region.[9] Although its popularity has waned in favour of free flaps it remains a reliable option due to its technical simplicity and consistent vascular supply.[9,10] This flap represents a valuable choice for reconstructing gunshot wounds, backed by a well-documented complex head and neck reconstructions.[7,9,10]

Microvascular surgery has been shown to significantly improve mandibular reconstruction, enabling the transplantation of vascularized bone and soft tissue with high success rates.[11] This treatment modality is commonly regarded as the preferred approach when available skills and resources permit.[11] Four of the patients had partial flap necrosis and required surgical intervention. Two cases had a reconstruction plate removed. In cases where inadequate bone or soft tissue repair following a chop-off occurs, the patient may exhibit a complication resembling the "Andy Gump deformity," characterised by an absent chin, a retracted lower lip, and a significantly retrognathic lower jaw.[12] This complication has not been extensively studied and needs further research.

In this study, the involvement of the tongue in chop-off wounds was observed in two patients (16.6%), with the anterior one-third being completely avulsed (Figure 3). However, a study by Shuker et al.[2] reported that the tongue remained intact in all their cases despite significant mandibular soft tissue loss. They attributed this occurrence to the dislodgement of the weak genioglossus muscle origin and its insertion on the hyoid bone. This dislodgement results from maximum stretching, which can occur without severing the muscle's bulk. Consequently, the tongue's primary mass can remain intact despite significant injury.[2] However, while this mechanism is plausible, it is not universally applicable, as evidenced by our findings.

In our study, 58.3% (n=7) of patients had a tracheostomy, while the remaining patients had tongue traction sutures placed as airway management prior to definitive treatment. Tracheostomy has been the mainstay of airway management in other mandibular chop-off GSI studies.[2] Airway management is a lifesaving procedure in mandibular chop-off wounds, given that the detachment of the tongue musculature can cause the tongue to fall back, occluding the pharynx and leading to airway obstruction.[2,5] Tracheostomy represents a frequently performed intervention for airway stabilization in patients presenting with multisystem trauma, particularly those afflicted by craniomaxillofacial injuries.[5,6] It is acknowledged as a safe and effective

Figure 3. Patient with chop-off mandibular GSI with avulsed anterior one-third of the tongue before and after reconstruction with a deltopectoral flap

method for managing airway complications in critical clinical scenarios.[6]

Conclusion

The main learning point from this study is that there is a critical need for comprehensive initial management and a tailored surgical plan that considers both patient and environment-specific factors such as available skill, manpower and resources. A multidisciplinary approach is essential to achieving successful outcomes in mandibular reconstruction following "chopped off" injuries of the mandible due to gunshot injuries, especially in resource constrained settings.

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Research Article

Underdeveloped but essential: Findings from a survey of private pharmaceutical firms in South Sudan

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Submitted: January 2025
Accepted: February 2025
Published: May 2025

Citation: Dut.. Underdeveloped but essential: Findings from a survey of private pharmaceutical firms in South Sudan. South Sudan Medical Journal, 2025;18(2):78-83
DOI: https://dx.doi.org/10.4314/ssmj.v18i2.5

ABSTRACT

Introduction: Private pharmaceutical firms are important for access to essential medicines. Unreliable access to medicines contributes to avoidable deaths and was most evident during the COVID-19 pandemic in South Sudan. A better understanding of the private pharmaceutical sector would help inform approaches to health systems strengthening in South Sudan.

Method: A survey was conducted of private, for-profit pharmaceutical firms in South Sudan, adopting the World Bank Enterprise Survey 2014. Outcomes of interest included firm characteristics that impact innovation – such as firm's age, size, employees' skillset, manager's gender, ownership, and quality certification. Comparators were drawn from all private firms in South Sudan and firms across sub-Saharan Africa.

Results: Nineteen firms were included in the analysis, with the average private pharmaceutical firm proving older than a private sector comparator in South Sudan. However, firms were smaller than the average for the country and sub-Saharan Africa. Ten times more pharmaceutical firms had quality certification, compared with other firms in South Sudan, but they had less foreign ownership and fewer skilled personnel. None of the pharmaceutical firms manufactures, and medium-sized pharmaceutical firms had female majority ownership, even though none had a female top manager.

Conclusion: Findings reflect evidence in the literature. They reveal the need for supportive regulations and investments for a sustainable pharmaceutical sector in South Sudan.

Keywords: South Sudan, pharmaceutical firm, healthcare effectiveness, health services planning, essential medicines.

Introduction

Private pharmaceutical firms comprise an essential capability. Shortages of pharmaceuticals, overstocking and wastages are prevalent in South Sudan,[1,2] with availability of medicines averaging 50.4% in Juba.[3] This deficiency was pronounced during the COVID-19 pandemic and contributes to ineffective

healthcare, which is responsible for five million deaths annually in low and middle-income countries.[4] Although prices are marked up at 215% in private pharmacies in Juba,[3] global evidence suggests 35% of over-pricing is attributable to stockouts in public facilities.[5] This underscores the complementary role of the private pharmaceutical sector.

In recent times, capabilities in the private sector have been reflected in the COVID-19 pandemic response. Australia, for instance, enlisted local logistics firms and mobilised the workforce across private health services.[6] In India, the steel industry repurposed industrial oxygen for medical supply.[7] Similarly, domestic firms in Kenya supported disease screening and monitoring, information management, vaccines storage, and delivery.[8] The lack of similarly established firms limited South Sudan's response.[9] Private pharmaceutical firms are a microcosm of private health sector capabilities. So, limited evidence on these firms impairs policy decisions.[10] Previous studies on pharmaceuticals in South Sudan have focused on both public and private suppliers,[3] public facilities,[1] or areas supplied by donor agencies.[11]

This study presents characteristics of private pharmaceutical firms in South Sudan. A firm's formality or informality is a continuum and lacks a universal definition.[12] However, self-reported formality or informality maps to varied levels of productivity and innovation and varies with firm's age and size.[13] This study uses specifications in the literature for a firm's formality and potential for innovation, including a firm's size (number of employees), age (years), and entrepreneur's sex, as well as manager's education level and workforce.[14]

Method

Study Sample

This study surveyed private, for-profit pharmaceutical firms in South Sudan. A simple random sample was surveyed through the Pharmaceutical Society of South Sudan. There were 21 respondents which comprised 58% of all registered private pharmaceutical firms (n = 36) (Personal communication). This excludes private, not-for-profit pharmaceutical firms, such as humanitarian or faith-based organisations. Respondents were identified through the Pharmaceutical Society of South Sudan.

Survey

This study administered the World Bank's Enterprise Survey (WBES) 2014 (https://doi.org/10.48529/363k-gc79)[15] via an online survey tool (Qualtrics), between July and September 2021. This comprised 54 questions previously used for studying private firms in South Sudan, allowing for comparison with the private sector in South Sudan and sub-Saharan Africa. It required informed consent and explored ten categories, including workforce (5 questions), innovation (5 questions), finance (7 questions), firm performance (5 questions), infrastructure (7 questions), other constraints (3 questions), other firm characteristics (7 questions), ownership status (4 questions), legal and export status (8 questions), and sectors in which the firm operates (3 questions). This article presents data on workforce, finance, other firm characteristics, legal and export status, and sectors in which firms operate.

Outcome

Firms were characterised by age, size (number of employees), skillset among employees, manager's gender, ownership (domestic and foreign), and quality (internationally-recognised quality certificate). Percentage comparators were drawn for the private sector in South Sudan and sub-Saharan Africa, based on findings from the WBES 2014.

Analysis

Three out of 19 respondents included in the analysis omitted one question each: a question on employee training, one on investment in research and development, and a question on a product or service that was new to the firm's main market. Descriptive statistics were used for characterisation.

In South Sudan, firm size is categorised by the Directorate of Private Sector Development within the Ministry of Justice and Constitutional Affairs. This reserves 31% ownership for South Sudanese in majority foreign-owned medium-sized or large firms.[16] Analysis in this study adopts categories used in the WBES 2014: small-sized firms were those with 1-19 employees, medium-sized firms had 20-99 employees, and large firms were those with >99 employees.[15]

Results

Descriptive statistics and comparators are presented in Table 1. The average pharmaceutical firm was older than the average firm in South Sudan. But they were smaller than the average other type of firm in South Sudan or an average firm in sub-Saharan Africa. Similarly, there were

Table 1. Characteristics of private pharmaceutical firms in South Sudan and comparators

Firm characteristic	Private pharmaceutical firms in South Sudan† (n = 19)	All other firms in South Sudan‡ (n = 738)	Firms in sub-Saharan Africa‡ (multi-year regional comparator)
Age (years), *m*	13.6	4.2	15.1
Size (number of workers), *m*	10.3	12.3	32.1
Purchased fixed assets (% of firms)	57.9	38.1	38.1
Internationally-recognized quality certification (% of firms)	26.3	2.6	9.8
Skilled workers (% of all production workers)	53.3	69.8	77.4
Firms with formal training to employees (% of firms)	16.7	17.1	27.5
Firms with female top managers (% of firms)	10.5	9.5	16.2
Foreign ownership (% of firms)	38.9	42.7	16
Sole proprietorship (% of firms)	10.5	37.7	58.2

Source: †Author's own. ‡World Bank (2015).

Note: m: mean.

ten times more pharmaceutical firms with internationally recognised quality certificates, compared with other firms in South Sudan. However, there was less foreign ownership of the pharmaceutical firms (Table 1).

The proportion of skilled workforce employed by the pharmaceutical firms (53.3%) was lower than for average firms in South Sudan and sub-Saharan Africa. However, pharmaceutical firms were similar to other firms in offering formal training to employees and purchasing fixed assets (Table 1).

Overall, there were limited capabilities in manufacturing: none of the private pharmaceutical firms engaged in manufacturing, while only 11% offered retail services and none exports. In addition, the majority of these firms were partnerships (84.4%), especially limited partnerships (79%) with firms that traded shares comprising 68.4% (Table 2).

Figure 1 presents workforce characteristics of the pharmaceutical firms by firm-size. There were no large firms (>99 employees). There were fourteen small-sized firms (1-19 employees) and five medium-sized firms (20-99 employees). Small-sized firms employed the majority (66.7%), representing 130 out of 195 employees. The rest of the workforce (65 employees) were employed

Table 2. Legal status and sectors in which the private pharmaceutical firms operate

Legal status (n = 19)	Total n (%)
Sole proprietorship	2 (10.5)
Shareholding company with traded shares	13 (68.4)
Shareholding company with non-traded shares	2 (10.5)
Partnerships	16 (84.4)
Limited partnerships	15 (79)
Other type of company	1 (5.3)
Sectors (n = 19)	
Exports	0 (0)
Manufacturing	0 (0)
Retail	2 (10.5)
Other services	8 (42.1)

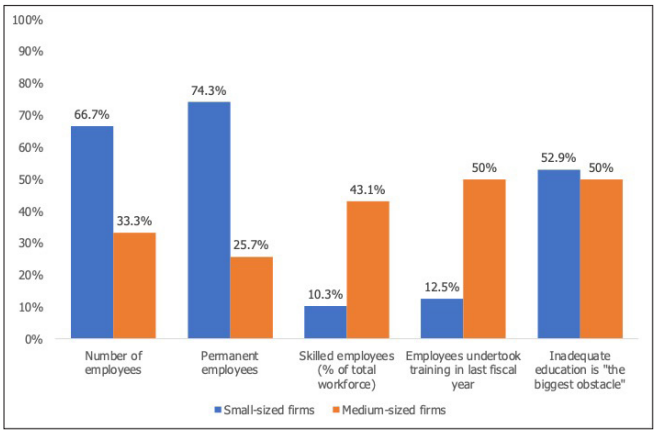

Figure 1. Workforce characteristics by firm size.

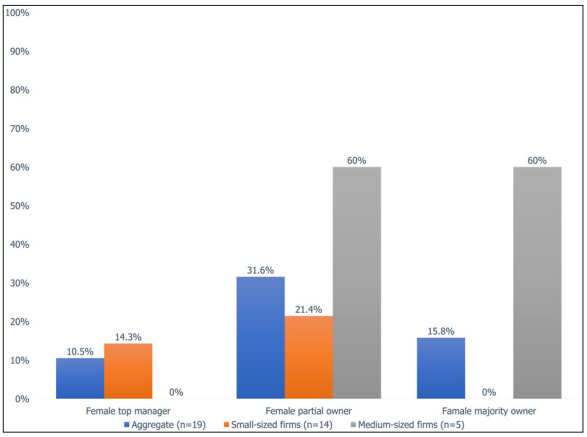

Figure 2. Female management and ownership by firm size

by medium-size firms. Small-sized firms also had a greater proportion (74.3%) of permanent staff (101 employees), compared with medium-sized firms (25.7%) which employed 35 permanent staff. However, a greater proportion of the skilled workforce (43.1%) was employed by medium-sized firms (84 employees), with small-sized firms employing only 20 skilled personnel. Likewise, few of those employed by small-sized firms (12.5%) had undertaken training in the preceding fiscal year. This is compounded by inadequate education, with 52.9% of small-sized firms reporting inadequate education as the biggest obstacle.

Firms also varied in their composition of female owners and top managers. Although medium-sized firms had greater proportions of female majority owners (60%) or female partial owners (60%), none of the medium-sized firms had female top managers. Conversely, 14.3% of small-sized firms had female top managers, which is above the average of 10.5%, even though only 21.4% of small-sized firms had female partial owners, which is below the average of 31.6% for private pharmaceutical firms with female partial owner (Figure 2).

Discussion

Findings in this study generally reflect those in the literature. Although this study included 19 private pharmaceutical firms, a smaller cohort by regional and global standards, it is representative of the private pharmaceutical sector in South Sudan. For instance, a study by Deng and colleagues,[3] included 18 private pharmacies in Juba County, the most populous. Moreover, the older age but small size of an average pharmaceutical firm suggests undercapitalisation despite early investor interest. This may reflect capital flight due to fragility.[17]

Structural constraints appear greater for private pharmaceutical firms. They were more limited in skilled workforce and formally-trained employees, relative to other types of private firms in South Sudan. In addition, predominance of small-sized firms threatens sustainability in this sector. Larger firms can leverage cluster scale and pool negotiating power for favourable outcomes, or transact among themselves, thereby supporting firm-level innovation.[14]

Moreover, a smaller proportion of foreign ownership and sole proprietorship suggest limited domestic capital and foreign direct investment. Fragile and conflict-affected states like South Sudan experience capital flight, low foreign direct investments and lack economies of scale.[17] However, it is unclear how foreign investment is impacted by the legally-mandated 31% domestic ownership[16] and South Sudan's 2017 Labour Act which prioritises South Sudanese for managerial jobs.[18]

Firms must innovate to survive the foregoing constraints. Evidence in the literature suggests gender and firm-size, among other factors, impact innovation.[13] The slightly higher proportion of female entrepreneurs among pharmaceutical firms, compared with other private firms in South Sudan, is promising for innovation and sustainability. However, the generally low proportion of female top managers confirms similar findings in the literature on sub-Saharan Africa.[19] In this study, paucity of small-sized firms with female majority owners, and

the lack of female top managers among medium-sized firms, may also suggest inequity in a sector where female ownership appears greater among small-sized firms. In addition, a higher proportion of international quality certification among pharmaceutical firms suggests they could advance the quality frontier in the health sector. Cost is often a concern with private services. However, settings with mixed health systems – whereby healthcare is provided by public and private services – benefit from improvements in both private and public capabilities.[20]

This study has limitations. Large firms (>99 employees) were absent, and a larger sample would have allowed for category-specific analysis and strengthen comparison between firms. Nonetheless, this study included a broad range of variables on individual firms and highlights a sector that remains understudied in South Sudan.

Conclusion

This study examined private pharmaceutical firms as potential vehicles for health systems strengthening in South Sudan. Further studies aimed at a greater understanding of constraints would inform sector-specific policies. Considering the dominance of international donors in South Sudan, thriving local firms may be a sustainable path to a reliable pharmaceutical sector.

Declarations

Ethics approval and consent to participate: Ethics approval for the survey was granted by the Australian National University (Protocol: 2021/272). Additional approval was obtained from South Sudan's Ministry of Health (Protocol: *32/07/2021 – MOH/RERB/AF/33/2021*). Participation was voluntary and anonymous, and no personally identifying information was collected. Except for the informed consent, respondents could skip questions and submit a partially completed survey. This offered flexibility while preserving anonymity.

Competing interests: None.

Funding: None.

Acknowledgements: The author acknowledges Buchay Othom Rago and Rita Tulba who facilitated correspondence with Pharmaceutical Society of South Sudan, and thanks members of the society. The author is also grateful to Professor Sir Paul Collier, Professor of Economics and Public Policy at the University of Oxford, for his feedback on an earlier draft.

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Short Communication

The importance of scientific conferences in improving medical services in South Sudan

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Submitted: January 2025
Accepted: January 2025
Published: May 2025

ABSTRACT

Scientific conferences play a vital role in enhancing the quality of medical services in South Sudan by fostering knowledge sharing, collaboration, and capacity building among healthcare professionals. These events provide a platform for clinicians, researchers, and policymakers to exchange ideas, discuss challenges, and explore innovations tailored to the country`s unique healthcare needs.

This short communication highlights the significance of such conferences in addressing gaps in medical education, improving clinical practices, and fostering partnerships essential for advancing healthcare delivery in South Sudan, focusing on practical solutions and emphasizing collaboration.

Keywords: scientific conferences, medical services, healthcare improvement, South Sudan, knowledge sharing

Introduction

South Sudan faces significant challenges in delivering quality healthcare services due to limited infrastructure, insufficient training opportunities, and a lack of access to the latest medical knowledge.[1,2] Scientific conferences offer a critical platform to address these gaps by providing opportunities for continuing professional development, networking, and collaboration.[3]

This concise article explores how these events contribute to improving medical services and strengthening the healthcare system in South Sudan.

The role of scientific conferences

Scientific conferences play a vital role in improving medical services through:

1. Knowledge sharing and capacity building

Conferences allow medical professionals to access the latest research findings, treatment guidelines, technological advancements and innovations. This is particularly valuable in a developing country like South Sudan, where access to updated medical information is limited.[1,2] Presentations, workshops, and discussions help clinicians improve their skills and apply evidence-based practices.[3]

Citation: Gang. Importance of scientific conferences in improving medical services in South Sudan. South Sudan Medical Journal, 2025;18(1):84-85 DOI: https://dx.doi.org/10.4314/ssmj.v18i2.6

2. Networking and collaboration

Bringing together local and international experts fosters collaboration, enabling knowledge transfer and the establishment of partnerships.[1,3,4] Such collaborations can lead to research projects, resource sharing, and mentorship programmes that enhance medical training and service delivery.

3. Advancing medical education

Conferences offer opportunities for continuing medical education through lectures, hands-on training, and case discussions.[3,4] This is crucial in South Sudan, where many healthcare professionals lack access to formal postgraduate training.

4. Policy advocacy

Scientific conferences serve as platforms for engaging policymakers, emphasizing the need for investments in healthcare infrastructure, workforce development, and research funding,[3,4] which are all essential for strengthening health system in South Sudan.

5. Promoting research

Encouraging local research is vital for developing evidence-based practices suited to the particular challenges faced in South Sudan. Conferences can inspire health professionals to engage in research initiatives that address local health issues, thereby leading to improved health outcomes.[3,4]

6. Cultural exchange

Scientific conferences can facilitate cultural exchanges where different health practices and beliefs are shared. This may lead to integrated approaches in healthcare that respect local traditions while promoting modern medical practices.[2]

7. Addressing health challenges

Conferences often focus on pressing health issues, such as infectious diseases, maternal and child health, and nutrition.[3] By gathering diverse expertise on these topics, they can generate targeted solutions relevant to South Sudan's context.

8. Enhancing public awareness

Conferences can also serve as a platform for raising public awareness about health issues, encouraging community engagement in healthcare initiatives and emphasizing the importance of preventive measures.

Challenges and Recommendations

Despite their benefits, organizing scientific conferences in South Sudan faces challenges such as funding constraints, limited local expertise, and logistical issues. To overcome these hurdles, partnerships with international organizations, donor support including pharmaceutical companies, and virtual conferencing options should be explored.

Conclusion

Scientific conferences are indispensable tools for improving medical services in South Sudan. By fostering knowledge exchange, professional development, and collaboration, these events play a pivotal role in addressing the country's healthcare challenges. Continued support and investment in such initiatives are essential for building a robust and sustainable healthcare system.

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News from South Sudan

Gordon Memorial College Trust Fund Grant Awards to South Sudanese Applicants 2025-2026

The Gordon Memorial College Trust Fund (GMCTF) is a UK registered charity (no. 314141). It is administered by a group of Trustees and an Executive Committee. The primary objective of the charity is to promote educational development in South Sudan and Sudan.

Once a year, GMCTF awards a small number of grants to individuals that are undertaking postgraduate study that will ultimately benefit life in Sudan/South Sudan.

At the last annual meeting GMCTF in London on 11th April 2025, the following grants were awarded by the Executive Committee on a competitive basis to South Sudanese postgraduate students via two funding programmes:

1. Individuals Programme (Women) – 19 funding requests were received from South Sudanese women seeking grants towards the cost of studies that would enable the individuals to contribute to the skills base of their country on their return. 16 applicants were awarded grants totalling USD $52,150 (averaging $3,259 per individual) to fund various study courses (predominantly Masters Degrees and specialty certificates) in the following fields:

- Obstetrics and Gynaecology x 5
- Internal medicine x 1
- Paediatrics x 4
- Psychiatry x 1
- General surgery x 3
- Dermatology and Venereology x 1
- Ophthalmology x 1

» 15 (94%) grant recipients are undertaking their studies in Ethiopia at various institutions including St Paul's Millennium College, Bahir Dar University College, Yakatit 12 Hospital Medical College, University of Gondar, Jimma University and Addis Ababa University. One grant recipient is studying at Makerere University in Kampala, Uganda.

» A further 5 grants were awarded to Sudanese applicants.

2. Continuation Funding – Six South Sudanese medics (5 male, 1 female) who had previously received grants from GMCTF requested further funding to complete their studies. The Executive Committee agreed continuation funding to all 6 requests with awards totalling USD $17,195 (average $2,866 per individual).

- Five of the grantees are currently studying in Ethiopia (at Wolaita Sodo, Gondar, Jimma and Bahirdar University hospitals) and one in Uganda (Mbarara University).
- Four are studying in Obstetrics and Gynaecology, one in General Surgery and one in Ophthalmology.

The 2025 programme has now closed. New funding opportunities are typically announced on the charity's website (www.gmctf.org) at the beginning of December and applicants are invited to submit requests up to the end of February of the following year. Applications can ONLY be made via the website in the timeframe specified and MUST be accompanied by two references. Eligibility criteria and full application details will be published when further funding opportunities are announced.

Dr Eluzai Abe Hakim, FRCP Edin, FRCP

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www.southsudanmedicaljournal.com

Expanding the utility of MUAC tapes

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Dear Editor

MUAC (mid-upper arm circumference) has been used for years in malnutrition. Its most practical use in South Sudan has been determining which children or mothers will qualify for nutritional supplementation through groups like WFP and UNICEF. The tapes are cheap, instructions in their use are simple and quickly mastered. Emmanuel Gai and I have raised the question of what the appropriate cutoffs for children are,[1] particularly those aged 3-5 years, which I continue to believe are among the most vulnerable years for malnutrition and have the potential for the greatest impact in education and development if the malnutrition is not appreciated and addressed.

However, we are missing a lot if those tapes are only relegated to the nutrition and antenatal clinics. In the Medical Ward at Mary Immaculate Hospital in Mapuordit, we use MUAC on rounds daily. I firmly believe measuring the MUAC should be part of the routine physical examination, even if informally. When I circle my thumb to the third finger around an arm, it comes out around 17.5 cm. I think that all clinicians should know roughly how large their circle is. From there, it does not take much extrapolation to guess the patient's MUAC. If the patient has a smaller than normal MUAC, then there is a likelihood of a wasting disease underlying his current condition, and so should raise our suspicion. Often, patients present with symptoms of an acute common illness, such as malaria but a more serious underlying condition may be missed. Here we have the opportunity to diagnose and prevent another disease becoming advanced. There are three conditions where I think MUAC is vitally helpful in adult medicine.

First is the suspicion of HIV (human immunodeficiency virus). South Sudan is one of the leading countries in the world for the incidence of HIV.[2] Though there are those suffering from HIV who have a normal MUAC (for women, I use 23.5 cm, drawn from the inclusion criteria in WFP grants, and in men, I use 24 cm), when I examine a patient with a chronic cough or chronic diarrhoea , and they

have a MUAC less than the above, my antennae go up. Of course, we test all pregnant women who come to us in antenatal clinics (ANC), but our experience suggests there is a shortage of proper testing kits in South Sudan, so we need to be a bit selective. If a patient comes with diarrhoea of more than two weeks duration and the MUAC is low, I am thinking of Cryptosporidium, and I send the patient for HIV testing, even repeating it if I remain unconvinced. Cryptosporidium will not respond to the usual antibiotics used to treat prolonged diarrhoea; it requires a high dose of Co-trimoxazole.

The second is evaluating the patient with a chronic cough. In the patient with a normal MUAC and no localizing signs (the findings are diffuse in the lungs), I feel comfortable diagnosing asthma. If the patient has a low MUAC, I become more suspicious. Though the adequacy of our data reporting is suspect, it is clear that South Sudan continues to be one of the world leaders in the incidence of Mycobacterium tuberculosis (TB).[2] If the patient has a low MUAC and the cough has been present for over two weeks, I listen for signs of TB, and I order a complete Blood count (CBC) with ESR (erythrocyte sedimentation rate), sputum for AFB, and often a CXR. Positive sputum makes the diagnosis simple, but the combination of the low MUAC, high ESR, and abnormal CXR, particularly if the abnormalities are not limited to one lobe, is generally sufficient to make a presumptive diagnosis. The presence of HIV adds to the certainty.

The third area is diabetes mellitus (DM). Frequent nocturnal urination is another common complaint we clinicians hear. If the complaint is for a short period, we should think of urinary tract infection (UTI) or prostatitis in older men, but prolonged frequent (> 3/night) urination should cause us to think of DM and order a blood glucose level. When I was in medical school in the late 1970's, diabetes mellitus was classified as Juvenile Onset or Maturity Onset. Much has changed since those days. Though there are other groups (gestational diabetes, diabetes from chronic pancreatitis), the two major groups now are IDDM (insulin-dependent DM) and T2DM (Type 2 DM). In the US, close to 95% of the patients with DM are T2DM.[3] That is not the case in South Sudan.

Although I cannot get any reliable statistics on this question, my observations are that about 70% of DM patients in the Lakes State have IDDM and probably more than 50% in Central Equatoria State. Both types of DM respond to insulin, but only T2DM patients respond to oral hypoglycaemic drugs, such as metformin.[4] Again, the MUAC helps differentiate the two distinct disorders with the same name. It is my conviction that the vast majority, if not all, T2DM are obese. IDDM patients may be obese, but the majority are not. If an adult has hyperglycaemia and a MUAC above 26 cm, my working diagnosis is T2DM. If the MUAC is under 24 cm, the patient will likely be IDDM. If the patient does not have dangerously high levels of glucose (above 30 mm/dl), a trial with metformin may be justified, even in a patient with a low MUAC. Still, I have seen several patients with IDDM continue on metformin as they waste away.

If you choose to make the trial of metformin in a patient with a low MUAC, you should look for objective signs of improvement, such as a significant reduction in night time urination and random glucose measurements, before settling on the diagnosis of T2DM. If there is no significant improvement, particularly if the MUAC is < 24 cm, consider the probability that this patient has IDDM. Either give him a trial of insulin (we use Mixtard Insulin) or refer him to a centre that can supply the insulin.

The utility of MUAC comes up in other areas, such as fever of unknown origin (chronic fevers) and chronic anaemia (could this be an underlying malignancy?). The tapes are cheap and easy to use. And your fingers are always with you. MUAC is also helpful in following the patient's response to therapy. MUAC is the gold standard in nutrition, but it should become part of the astute clinician's usual examination.

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Reply to the Sudanese American Medical Association's letter to the editor about simulation-based education amid conflict

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Dear Editor,

Mohamed Almahal's letter (SSMJ 2025:18(1):50-1) regarding the experience of the Sudanese American Medical Association - Institute of Health (SAMA-IH) with "simulation-based education" for clinicians is interesting and relevant, particularly for medical educators in South Sudan and other countries that face recurring disruptions due to cycles of conflict. However, the significance of this initiative can only be fully appreciated when one considers the context: dysfunctional hospital services, a shortage of qualified clinicians on site due to displacement, low patient numbers, and a lack of diversity in patients—all of which serve as barriers to acquiring adequate clinical skills. Consequently, most health training programmes, both pre-service and in-service, ultimately fail to deliver effective training, as they primarily rely on classroom-based learning, predominantly using didactic methods, which are very limited in building clinical skills among learners.

The letter suggests that simulation-based learning is a viable alternative to traditional teaching methods. Various approaches to simulation are currently employed globally, such as mannequin-based computer simulations in skills labs, which have recently been extensively utilised and proven effective. They provide the added benefit of equipping learners with physical examination and testing skills. However, they are costly, require space and a reliable electrical supply, and are challenging to maintain, not to mention the need for replacements. SAMA-IH opted for a digital medical simulation platform called "Full-code." This platform offers numerous common case scenarios that a doctor might encounter, including options to obtain a detailed history, a summary of the requested physical examinations and vital signs, stabilising the patient, requesting investigations including blood tests and imaging (results being made available instantly), and encouraging the learner to make a diagnosis and select the appropriate medical or surgical intervention. It finally analyses performance and provides Continuing Medical Education (CME) support. While I recognise it has the potential to enhance learning significantly, as suggested by the student feedback, it is also crucial to acknowledge some of its limitations, especially in the African context.

I will begin by posing a few questions to the authors. (1) Does using the digital platform require reliable internet access, or can it operate offline? I ask this because internet access is poor in many conflict-affected countries, and it is inconsistent and exceedingly costly, particularly when satellite internet is utilised. (2) What devices did the students use to access the cases – laptops, tablets, or Android phones? Were these provided through a computer laboratory or library? Our experience indicates a need for a computer lab with a stable electrical supply. Although students have smartphones in South Sudan, a significant barrier is the cost and quality of mobile internet. Most health science institutes in South Sudan lack computer labs, which is a worthwhile investment for enhancing medical education.

Having been involved in pre-service and in-service medical education in South Sudan for over a decade, I recognise that utilising a digital learning platform with a self-directed approach presents unique challenges and requires substantial tutor assistance. This is primarily due to the scenarios modelled on standard emergency room environments in the developed world, including access to various monitoring devices, blood tests, imaging, etc. However, 90% of these resources are unavailable, even in many regional hospitals in South Sudan. Consequently, tutors with clinical experience must assist students in applying their newly acquired knowledge to the local context. These simulations should not foster a reluctance to intervene based solely on clinical diagnosis (waiting for investigation results may be fatal), often leading to delays and poor outcomes. Rather than adhering to standard treatment guidelines, discussions should focus on the best possible intervention. The case scenarios would be best to be customised to the local context.

Additionally, the treatment guidelines need to be based on the medicines available locally and include considerations of cost-effectiveness, as most medicines may need to be purchased from local pharmacies at exorbitant rates. I must again emphasise the critical skill of physical examination to pick up the proper findings, which is essential for the correct diagnosis. It may even be as basic as measuring the pulse rate, respiratory rate, and blood pressure. The inability to impart these clinical skills is one of the major weaknesses of these digital case-based simulations.

Can a similar learning experience be provided without a 3D digital case simulation? We have employed role-playing, co-learner-centred methods (using actors), and case discussions utilising videos, photographs, or verbal case presentations based on real-life local scenarios. These can be delivered via offline digital learning platforms such as 'Articulate' and/or Moodle (an open-access learning platform). At the Jonglei Health Sciences Institute, we have been experimenting with a Remote Access Community Hotspot for Education & Learning (RACHEL), which uses a local area network (LAN) to bypass the barrier of poor internet access. Unfortunately, all these methods remain tutor-dependent, one of the chief barriers to establishing effective clinical training. However, it is vital that tutors' training programmes, such as the one taught at the College of Physicians and Surgeons in Juba under the Ministry of Health, Republic of South Sudan, include courses on digital learning methods for teaching clinical skills. Introducing these innovative digital learning tools offers solutions to overcome resource constraints and can improve the quality of medical education in conflict-affected countries.

Reference

1. Details of the Articulate Learning Platform can be accessed from www.articulate.com
2. Details of RACHEL can be obtained from https://hundred.org/en/innovations/rachel-remote-area-community-hotspot-for-education-learning

Dr John Antipas Ayiei Monythoi

Dr John Dual Antipas Ayiei Monythoi passed away peacefully on the morning of 7 March, 2025, at the Aga Khan Hospital in Nairobi, Kenya, following a brief health decline due to a heart attack. He was surrounded by his loving family.

Born on 1 January, 1970, in Malakal, Upper Nile State, Dr John was the beloved son of Mr Antipas Ayiei Monythoi and Mrs Akuany Ayom. He hailed from the Thoi community and was the fifth child of his mother. As a naturally gifted leader and elder sibling, Dr John embraced his role with pride—always protecting, guiding, and caring for his brothers and sisters, some of whom preceded him in death.

Dr John began his academic journey in Western Equatoria, attending primary school in Nzara, Western Equatoria State. He later transferred to Doleib Hill Primary School in Malakal. His secondary education included Amaria Intermediate School and Al-Sheikh Lotfi Boys Secondary School, where he completed his studies between 1988 and 1990.

He went on to pursue higher education at the University of Khartoum, earning a Bachelor of Pharmacy (B. Pharm.) from 1993 to 2000. He further enhanced his expertise by obtaining a Certificate in Effective Drug Management from the Center for Effective Drug Management and Policy in Nairobi (2003), and a Certificate in Pharmaceutical Economics from the University of Science Malaysia in 2005.

Dr John was a distinguished pharmacist, visionary leader, and statesman whose contributions had lasting impacts on public health and education in South Sudan and beyond.

From 2000 to 2002, Dr Antipas served as the Chief Pharmacist, Gadarif State Hospital, Sudan, where he oversaw drug distribution to health facilities, conducted stock-out data analysis, and supervised medical staff, contributing to improved pharmaceutical services. He also worked as the Director of Central Supplies, Kassala, North Sudan from 2002–2005, managing drug procurement and distribution across hospitals and PHCCs and led teams to ensure proper supervision and stock monitoring.

During his time as the State Minister of Education, Jonglei State (2005–2009), he developed the Strategic Education Plan (2007–2011), resulting in the establishment of 89 primary schools, and founded the Dr John Garang Institute of Science and Technology, along with regional training centres in Panyagor and Makuac for teacher development.

As the State Advisor for Health and Environment, Jonglei State (2010–2011), he played a critical advisory role in shaping public health and environmental policies in the state. His counsel contributed to improvements in health sector planning, environmental awareness, and institutional coordination across health and sanitation programmes.

In 2010, Dr John founded Antipas Pharmacy, a cornerstone of pharmaceutical services in the region. He later established Antipas Pharma Company in 2019, where he served as CEO. His company became a trusted supplier of medical supplies to Paloch Hospital, Petroleum Companies, SPLA, and the Disarmament, Demobilization and Reintegration (DDR) programme.

Dr John was admired as a man of peace and a champion for nation-building. He inspired many through his integrity, hard work, and unshakable commitment to quality healthcare and education. His mentorship and vision impacted countless professionals in the pharmaceutical and public service sectors.

Dr John's legacy lives on through his children, community, and the countless lives he uplifted. His work in public health, education, and entrepreneurship left an indelible mark on South Sudan's development. Although he is no longer with us, the values he embodied—service, leadership, and compassion—will endure for generations.

Dr John was a devoted husband and father. He is survived by his three wives and nine children.

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