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Cancer Registry for South Sudan

- Cross-contamination among food handlers
- Profiles of children with convulsive status epilepticus
- Anaesthesia techniques for extraction of mandibular molar teeth
- Effectiveness of dolutegravir-based regimens in children
- Quality of immediate postnatal care practices
- Universal newborn hearing screening among pregnant women
- Dual clinical practice in healthcare delivery systems
- Prevalence of hearing loss in children
- Liver abscess in a child
- Climate-related disruptions of health facility
- Building a sustainable financing model for primary health care

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FRONT COVER IMAGE: Ribbons showing the colours for different cancers.

A population-based cancer registry launched in South Sudan

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In Sudan, the first national cancer registry started in 1967 with a grant from the International Union against Cancer (IUAC) but was discontinued in the early 1980s. Since then, the main sources of cancer data have been the Department of Pathology in the Faculty of Medicine, University of Khartoum, and the Stack Medical Research Laboratory. With funding from the Ministry of Health, a population-based National Cancer Registry (NCR) was established in Khartoum in 2009.[1] It is unclear how much data were received from Southern Sudan.

In contrast, since independence, the cancer burden in South Sudan has been based on modeled estimates from neighboring countries in the region, which, in many cases, severely underrepresent the actual burden.[2] For example, the International Agency for Research on Cancer (IARC) estimated over 8,000 new cases and over 5,000 deaths in 2024.

South Sudan needed a cancer registry to collect, store, and manage data to provide more accurate estimates.

With support from the World Health Organization (WHO) and IARC, the Ministry of Health and the South Sudan Cancer Network inaugurated the first population-based cancer registry in South Sudan at the Juba Teaching Hospital on November 5, 2026.[3]

This registry is an important step in understanding the true burden of cancer. The population-based registry will depend on the actual collection and refinement of the data from hospitals, private clinics, histopathology laboratories, and even postmortem reports.

A population-based registries are designed to:[2]

- determine cancer patterns among various populations or sub-populations
- monitor cancer trends over time
- guide planning and evaluation of cancer control efforts
- help prioritize health resource allocations
- advance clinical, epidemiological, and health services research

The usefulness of the data generated from the registry will depend on the accuracy, veracity, and rigor of data refinement and cleaning. The adage, "garbage in, garbage out," may otherwise define the results.

South Sudan should seize this opportunity to train a committed team to handle all aspects of the registry. The Ministry of Health should sensitize the medical professionals to support the teams tasked with collecting data, ensuring cooperation and coordination.

Now that the registry is live, let us all get to work.

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Factors associated with cross-contamination among food handlers at Munuki Payam, Juba, South Sudan

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ABSTRACT

Introduction: Cross-contamination is a major contributor to foodborne illnesses, particularly in rapidly growing urban areas such as Munuki Payam in Juba. This cross-sectional study examined the human factors associated with cross-contamination among food handlers in this setting.

Method: Data were gathered from 50 randomly selected food handlers in Munuki Payam using structured questionnaires, between 1 February and 28 February 2024. We randomly selected 50 restaurants from two zones in Munuki Payam. Within each selected restaurant, all eligible food handlers were invited to participate voluntarily, and one was selected for the study. The restaurant manager gave permission before data collection, and all participants provided informed consent. Respondents were assured of confidentiality and that the data would be used only for academic research.

Results: Of the 50 participants, most were aged between 31 and 40 years and had been living in Munuki for 6 – 10 years. Common practices that respondents said contributed to cross-contamination of food included using cutting boards for raw and cooked food without washing, reported by 19 (38.0%) of participants; not washing fruits and vegetables, reported by 14 (28.0%); and not keeping kitchen surfaces clean, reported by 13 (26.0%). Two (4.0%) participants attributed cross-contamination to not cooking foods thoroughly, especially meat, poultry, and eggs, and not storing food at the correct temperature. Half of respondents said proper handwashing is the best way to prevent cross-contamination in food service settings, while a quarter said cleaning and sanitizing surfaces. When asked about the best methods for educating and training food handlers, 19 (38.0%) respondents said being supervised by trained professionals, 17 (34.0%) opted for regular evaluation of food handler education, and 10 (20.0%) opted for providing training on food safety practices.

Conclusion: Many food handlers in Munuki Payam had limited knowledge regarding proper food handling and sanitation procedures. Despite this, some demonstrated satisfactory knowledge of personal hygiene and proper food storage practices during food preparation.

Keywords: cross-contamination, food handlers, food hygiene, food safety practices, hand hygiene, Juba.

Introduction

Cross-contamination refers to the transfer of harmful microorganisms, such as bacteria, viruses, and other pathogens, from one surface, object, or substance to another, particularly when food is involved. This transfer may occur through contact with contaminated hands, utensils, equipment, countertops, cutting boards, other foods, or even people.[1] Contaminants associated with cross-contamination can be classified as physical, chemical, or biological.[1]

Cross-contamination often results from improper food handling and poor hygiene practices, posing major food safety risks and increasing the likelihood of foodborne diseases, which often begin with diarrhoeal illnesses and may progress to more serious health conditions. The term also describes the movement of harmful substances, including chemicals, allergens, and toxins, between different environments or food products. The accidental presence or transfer of allergens into food products where they are not intended is also considered a form of cross-contamination.[2,3] As a result, pathogens in raw ingredients can transfer to cooked food, causing contamination.[4] Cross- contamination can occur at any point along the food supply chain. It may begin with the improper handling of raw foods, which often contain high levels of bacteria. Knowing which contaminants pose the greatest risk to food, along with proper food-handling practices, is essential to addressing this concern. Cross-contamination can be effectively prevented through appropriate training and education of food handlers.[5]

The Government of South Sudan has published guidelines for controlling food safety, including the "National Food Safety Control Systems in South Sudan, 2020."[6]

Method

The study was done in Munuki Payam, Juba City, which is divided into four zones. The study selected two zones, Nyokuron and Munuki. The study area has 410 licensed restaurants, from which 50 were randomly selected. Data were collected from one food handler in each selected restaurant.

These restaurants are small informal or semi-formal food establishments, including street food stalls, that prepare and serve ready-to-eat meals and beverages in the market with limited infrastructure, including poor access to water, electricity, and sanitation. Refrigeration facilities were limited and mainly used for storing beverages, resulting in inadequate storage of perishable foods. These establishments employed several workers who prepared food, served customers, and cleaned. Disposable gloves were used inconsistently, and cleaning primarily used water and detergent, with limited use of disinfectants.

Prior to data collection, participants were informed about the purpose of the study and provided consent for their responses to be used for research purposes. The 50 selected participants completed structured, closed-ended questionnaires in English. The collected data were analyzed to identify key themes and patterns.

Results

Of the 50 participants, 21 (42.0%) were male, and 29 (58.0%) were female. Of these, 17 (34.0%) had no formal education, 13 (26.0%) had primary education, 15 (30.0%) had secondary education, and 5 (10.0%) had tertiary education. Most respondents understood and responded effectively to the questionnaires.

Two-thirds of respondents (32; 64.0%) had heard about food cross-contamination, while 10 (20.0%) were not sure and 8 (16.0%) reported they had not heard about it.

Figure 1 shows that most respondents, 30 (60.0%), reported health workers as their source of information about food cross-contamination; 3(6.0%) reported obtaining information from radio or friends, while 14 (28.0%) cited other sources of information. Three (6.0 %) respondents did not provide a response.

Table 1 shows the main sources of food cross-contamination reported by respondents. When asked how food safety could be improved, 22 (44.0%) chose learning to wash hands thoroughly before handling food as the most important measure, 17 (34.0%) opted for regular training and education on food safety procedures, and 11 (22.0%) said maintaining a safe food environment.

Respondents were asked to select, from the options in Figure 2, the common practices that contribute to food

Table 1. Main source of cross-contamination in food (N=50)

Variables	n (%)
Unwashed hands and surfaces	30 (60.0)
Handling raw meat improperly	10 (20.0)
Storing raw meat improperly	10 (20.0)

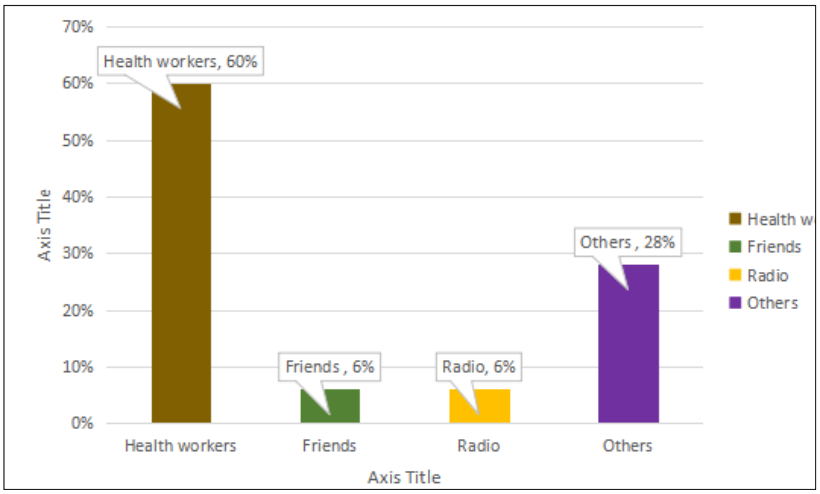


Figure 1. Respondents' sources of information on cross-contamination.

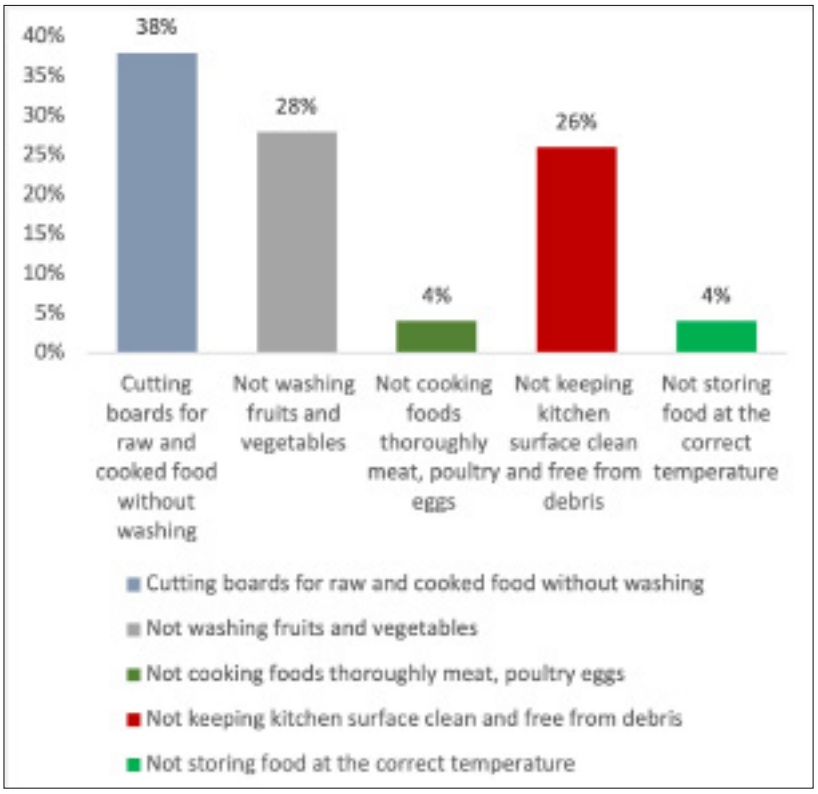


Figure 2. Common practices contributing to cross-contamination of food

cross-contamination. Figure 2 shows that 19 (38.0%) cited using the same cutting boards for raw and cooked foods without washing them as the most common practice contributing to cross-contamination. Fourteen (28.0%) identified not washing fruits and vegetables, while 13 (26.0%) reported not keeping kitchen surfaces clean and free from debris. Two (4.0%) identified inadequate cooking of foods, particularly meat, poultry, and eggs, and another 2 (4.0%) reported improper food storage at incorrect temperatures.

When asked how cross-contamination affects food hygiene and safety, 20 (40.0%) respondents reported that it can cause food spoilage, 19 (38.0%) indicated that it can spread foodborne illnesses, and 11 (22.0%) stated that it can result in hospitalization or even death.

When asked to select, from a given list, the pathogen most commonly transmitted through cross-contamination, 33 (66.0%) respondents identified *Escherichia coli* (E.coli), 8 (16.0%) identified *Campylobacter*, 5 (10.0%) identified pathogens causing hepatitis and 4 (8.0%) identified *Salmonella*.

The majority of the respondents, 25 (50%), identified proper handwashing as the best way to prevent cross-contamination in food service settings. Twelve (24.0%) selected cleaning and sanitizing surfaces, 8 (16.0%) said regular maintenance of the food environment, 3 (6.0%) identified cleaning and sanitizing equipment, and 2 (4.0%) opted for separating raw and cooked foods.

When asked the best methods for educating and training food handlers, 19 (38.0%) respondents identified supervision by trained professionals, 17 (34.0%) selected regular evaluation of food handlers' knowledge and practices, and 10 (20.0%) opted for providing training on food safety practices, and 4 (8.0%) selected posters and signs in the workplace as reminders of food safety practices. (Figure 3)

Discussion

Respondents reported that unwashed hands and surfaces were the major factors contributing to food cross-contamination. Data on previous training in food hygiene were not collected. However, the findings suggest that,

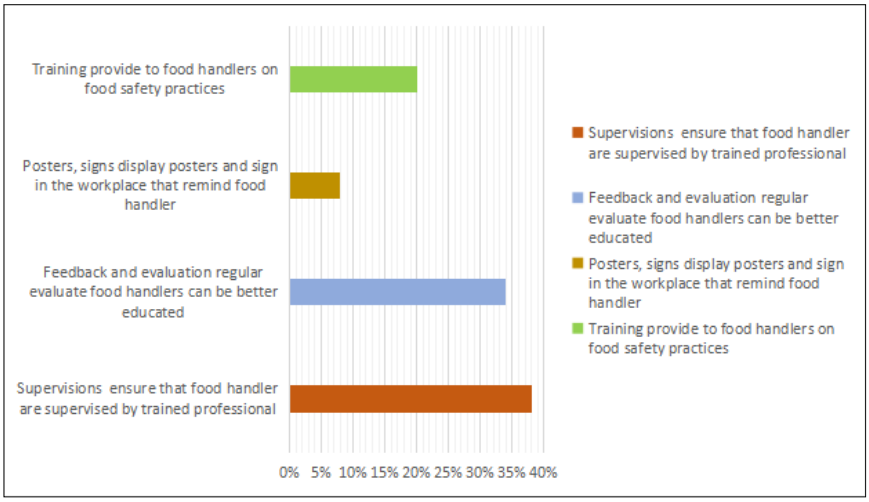


Figure 3. Best methods for educating and training food handlers

even in the absence of formal food safety and hygiene training, food handlers may have applied food safety practices based on knowledge acquired at home or through observing others.[7]

Food handlers frequently prepare food using water from unsafe sources, largely due to the location of their restaurants and limited access to safe water infrastructure.[8] In resource-limited settings, inadequate access to safe water supplies may increase the risk of food contamination and the transmission of foodborne diseases among consumers.[9] Although this study did not assess previous food safety training, some participants demonstrated awareness of basic food hygiene practices. Similar studies show that food handlers' knowledge and practices may be influenced by their education, training, and prior food preparation experience.[10,11]

Studies conducted in Greece and Lebanon have demonstrated that inadequate food safety knowledge and poor food-handling practices among food handlers are associated with an increased risk of foodborne illness.[12,13] These findings highlight the importance of targeted food safety education, regular training programmes, and improved hygiene practices among food handlers.[14,15]

Recommendations

To improve food safety and hygiene practices in food establishments within Munuki Payam, it is recommended that:

1. Food handlers are encouraged to wash their hands regularly with soap and clean water before and after handling food, after using the toilet, and after contact with raw meat, fish, or poultry.

2. Utensils, cutting boards, dishes, and countertops are cleaned and sanitized regularly to minimize the risk of contamination.

3. Fruits and vegetables are thoroughly washed before preparation and consumption using water from a reliable source.

4. There are continuous training programmes on food hygiene and safe food handling practices for all food handlers.[4]

5. Hazard Analysis and Critical Control Points (HACCP) principles are implemented to assist food establishments in identifying, monitoring, and controlling potential contamination risks.[14]

6. Store raw meat and dairy products separately from ready-to-eat foods such as fruits and vegetables.

7. During food preparation, workers wear clean aprons, hair coverings and, where practical, disposable gloves, to reduce contamination risks. Workers should change gloves when handling different foods.

The South Sudan government has published guidelines for controlling food safety.[6] Public health awareness campaigns and food safety training programmes for food handlers should be promoted. Additionally, collaboration among the government, non-governmental organizations (NGOs), and other stakeholders is necessary to improve sanitation facilities and strengthen food safety systems in Munuki Payam, in line with the recommendations from the World Health Organization (2022) and the Food and Agriculture Organization.[4,14]

Limitations

The study had several limitations. The small sample size (N = 50) may limit the generalizability of the findings. The cross-sectional design did not establish causal relationships, and the study covered only selected areas of Munuki Payam. Limited time and resources may also have affected data collection and observation.

Conclusion

Many food handlers in Munuki Payam had limited knowledge of proper food handling and sanitation procedures. However, some demonstrated satisfactory knowledge of personal hygiene and proper food storage practices during food preparation.

There is a need to strengthen food safety training programmes, improve awareness among food handlers, and enforce food safety regulations to minimize the risk of cross-contamination and protect public health in Munuki Payam.

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Research Article

Clinical profiles of children presenting with convulsive status epilepticus at Moi Teaching and Referral Hospital, Kenya

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ABSTRACT

Introduction: Convulsive status epilepticus (CSE) remains a major global neurological health emergency associated with significant morbidity and mortality in children. Data from low-resource settings like Kenya remain limited despite its clinical burden. This study assessed the clinical profile of children presenting with status epilepticus at the Moi Teaching and Referral Hospital (MTRH).

Method: A hospital-based observational study was conducted between January and December 2025 at the paediatric sick child clinic and paediatric wards. Children aged one month to 14 years with confirmed CSE were consecutively recruited. Clinical data were collected using a structured tool and analysed using descriptive statistics.

Results: A total of 51 children aged one month to 14 years who presented with CSE between January 1, 2025, and December 31, 2025, were included in the study. The median age was 3.0 years (IQR 1.0–6.0), with 45.1% aged 1–<5 years and a male predominance (54.9%). 58.9% were known epileptics. All children presented with seizures lasting 5–30 minutes, with 56.9% classified as stage I CSE. Generalized seizures by semiology were most common (76.5%). Remote symptomatic causes formed the largest clinical category (43.1%), followed by acute symptomatic (35.3%), febrile (17.7%), and idiopathic (3.9%). Electroencephalography was performed in 70.6% of children, with 77.8% showing abnormalities, mainly focal patterns.

Discussion: MTRH should strengthen early clinical recognition and structured evaluation of children presenting with seizures, particularly among children under five years, with emphasis on detailed seizure characterization, history assessment, and increased access to electroencephalogram for accurate clinical profiling.

Conclusion: The clinical profile of paediatric CSE was characterized by early childhood, male preponderance, generalized seizure presentation, and frequent abnormal electroencephalogram findings, with remote symptomatic cases forming the largest proportion.

Keywords: convulsive status epilepticus, semiology, clinical profile; children, EEG abnormalities, Kenya.

Introduction

Convulsive status epilepticus (CSE) is a neurological emergency defined by continuous convulsive seizures lasting at least five minutes or recurrent seizures without recovery of consciousness between episodes.[1] It contributes significantly to childhood morbidity and mortality, particularly in low- and middle-income countries where delayed healthcare access and infectious diseases are common. Children with CSE frequently present with generalized seizures, impaired consciousness, fever, respiratory compromise, and metabolic disturbances, all of which may adversely affect clinical outcomes.[2] The greatest burden of CSE occurs among children under five years of age due to increased susceptibility to infections and heightened vulnerability of the developing brain.[3]

Epilepsy affects approximately 50 million people globally, with nearly 5 million new cases reported annually.[4] The incidence and clinical profile of paediatric CSE vary across regions, with lower incidence rates reported in high-income countries and higher rates observed in sub-Saharan Africa.[5] Common aetiologies include febrile illnesses, acute symptomatic conditions, neuroinfections, metabolic disorders, and pre-existing epilepsy.[6] CSE predominantly affects males and children younger than five years and commonly presents with prolonged seizures, altered consciousness, and respiratory distress, factors associated with poor outcomes such as neurological impairment and mortality.[7]

In Kenya, there is limited published data regarding the clinical characteristics of children presenting with CSE despite epilepsy being one of the most common paediatric neurological disorders. At Moi Teaching and Referral Hospital, epilepsy has previously been identified as a major neurological diagnosis among admitted children However, specific information on the clinical profile of paediatric CSE remains scarce. Profiling children presenting with CSE at this tertiary referral hospital is important for identifying common demographic characteristics, seizure patterns, associated aetiologies, and clinical manifestations that influence patient outcomes. This information may help clinicians improve early recognition, risk stratification, and management strategies for children affected by CSE in resource-limited settings.

Method

This hospital-based descriptive longitudinal study at Moi Teaching and Referral Hospital (MTRH) between January and December 2025. The hospital is a major tertiary referral and teaching facility with a paediatric neurology clinic managing a wide range of neurological disorders. The study included children aged 1 month to 14 years with clinically confirmed CSE, defined as continuous convulsive seizures lasting at least five minutes or recurrent seizures without recovery of consciousness. Children admitted to the Intensive Care Unit (ICU), those with refractory or super-refractory status epilepticus, unaccompanied minors, and those without consent were excluded. Using Fisher's formula, the minimum sample size was 35, but consecutive enrolment of all eligible cases yielded 51 participants. After stabilization, informed consent from the parent or guardian and assent (where appropriate) were obtained. Investigations that had been requested by the clinician according to the suspected underlying aetiology were noted down, including renal function tests, electrolytes, blood glucose, full haemogram, CSF analysis, electroencephalogram (EEG) and brain imaging (either CT scan or MRI). We followed participants from admission to discharge or up to 30 days post-discharge to assess short-term outcomes, including hospital stay, discharge status, neurological sequelae, and mortality. Data were analysed descriptively using SPSS version 25. The Moi University and MTRH Institutional Research and Ethics Committee (FAN:0004883) approved the study, and the National Commission for Science, Technology and Innovation (NACOSTI/P/25/417407) issued a research license. This study had certain limitations. This single-centre observational study relied partly on guardian recall, introducing potential recall bias. The small sample size limited statistical power to detect significant associations.

Results

Sociodemographic characteristics

Table 1 presents the sociodemographic characteristics of the recruited children.

Fifty-one children with CSE were included in the study. The median age was 3.0 years (IQR 1.0 – 6.0), with 45.1% aged 1 to <5 years. Males slightly outnumbered females, accounting for 54.9% of the cohort. The median weight was 11.8kg (IQR 7.9 18.0). Most children were accompanied by one parent (66.7%), while 29.4% were accompanied by both parents.

Seizure Characteristics

Table 2 presents the seizure characteristics of children treated for convulsive status epilepticus (CSE).

Table 1. Demographic characteristics of children with convulsive status epilepticus (N=51)

Characteristic	Frequency (%) or median (IQR)
Age (Median, IQR) years:	**3.0 (1.0-6.0)**
Below 1 year	13 (25.5)
1 year to <5	23 (45.1)
5 to < 10	11 (21.6)
>10	4 (7.8)
Weight (Median, IQR) kg	**11.8 (7.9-18.0)**
Range	4.2 - 44.0
Sex:	
Male	28 (54.9)
Female	23 (45.1)
Caregiver:	
Both parents	15 (29.4)
One parent	34 (66.7)
Guardian	2 (3.9)

Table 2. Seizure characteristics

Variable	Frequency n (%)
Seizure duration at presentation	
5–30 minutes	51 (100)
Stage of convulsive status epilepticus	
Stage I (5–10 minutes)	29 (56.9)
Stage II (10–15 minutes)	22 (43.1)
Seizure aetiology	
Acute symptomatic	18 (35.3)
Remote symptomatic	22 (43.1)
Febrile	9 (17.7)
Idiopathic	2 (3.9)
Seizure semiology	
Generalized seizures	39 (76.5)
Focal onset seizures	12 (23.5)
EEG status	
EEG not done	15 (29.4)
EEG done	36 (70.6)
EEG findings among those tested	
Normal EEG	8 (22.2)
Abnormal EEG	28 (77.8)
Focal abnormalities	17 (60.7)
Generalized abnormalities	8 (28.6)
Unspecified abnormalities	3 (10.7)

Past medical history

Figure 1 shows the distribution of past medical history among children with CSE. Children known to have epilepsy but with poor medication adherence were 31%, while 27% were known epileptic children who were adherent to treatment. 24% presented with a first seizure without a previous diagnosis of epilepsy, while 18% were non-epileptic children presenting with a recurrent episode.

Discussion

The predominance of younger children in this study is consistent with reports from the United States, India, and Uganda, where most paediatric patients with CSE were below five years of age.[7] Researchers attribute this vulnerability to immature inhibitory neuronal pathways and increased excitatory susceptibility in the developing brain, which lowers the threshold for sustained seizure activity. Additionally, children in this age group have greater exposure to seizure-provoking conditions such as febrile illnesses and infections.[8] The lower mean age observed in the present study than in studies conducted in Canada, Turkey, and Australia, where the mean age ranged from 5 to 7 years, may reflect differences in study inclusion criteria, particularly the inclusion of adolescents up to 18 years in some studies.[9]

Similarly, the male predominance observed in this study matches findings reported in Uganda, South Africa, Canada, Australia, Scotland, Turkey, and the United States.[6,9] This pattern may reflect sex-linked neurobiological susceptibility and differential childhood exposure to seizure-provoking conditions.[8] However, the literature has not yet described a definitive causal explanation, although biological and environmental factors may contribute. Also, the relatively small sample size means we could not rule out chance variation.[8]

All children in this study presented with seizures lasting between 5 and 30 minutes, findings that are consistent with previous studies[10,11] but shorter than reports from Turkey where most seizure episodes exceeded 30 minutes.[12] Remote symptomatic causes were the most common aetiologies identified, followed by acute symptomatic causes. Infectious diseases were common causes of CSE. However, because the study was purely observational, we only recorded investigations requested by the clinician based on the suspected aetiology. Malaria is also common in the western part of Kenya, but MTRH serves children from all over the country, and although malaria tests were done where suspected, the study did not focus on malaria.

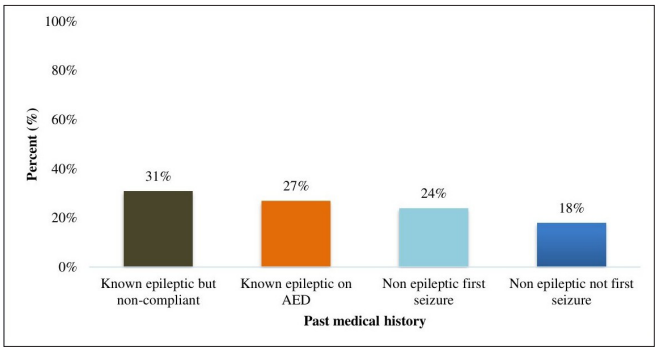


Figure 1. Past medical history/underlying diagnosis (AED: Anti-epileptic drugs)

This differs from findings in India where acute symptomatic aetiologies predominated,[11,8] while idiopathic cases in the present study were relatively uncommon compared to reports from Egypt.[10,11] More than three-quarters of the participants presented with generalized seizures, similar to findings reported in Tunisia and Taiwan,[12] but differing from studies conducted in Turkey, where focal seizures were more prevalent.[10] EEG abnormalities were frequently observed, predominantly focal patterns despite generalized clinical seizure manifestations.

These findings are consistent with reports from South Africa suggesting focal seizure onset with secondary generalization.[5] The facility has EEG, CT, and MRI, but this study was purely observational. CT scan of the head is, however, a priority in the event that lumbar puncture (LP) for CSF was needed if there was a suspicion of meningitis. An LP in the presence of raised intracranial pressure is potentially dangerous.

About one-third of children with CSE (31%) were known epileptics with poor medication adherence, while 27% were known epileptics who adhered to treatment. These findings highlight non-adherence as a significant challenge in paediatric epilepsy management. Similar patterns have been reported in studies conducted in the United States, Iran, and China, where adherence levels varied considerably and were influenced by socioeconomic factors, parental education, and clinical characteristics such as seizure type and treatment complexity.[11,12]

Limitations

Exclusion of children admitted to the ICU and those with refractory or super-refractory status epilepticus may have introduced selection bias and therefore, resulted in under-representation of children with more severe CSE. The single-centre design at a tertiary teaching and referral hospital may limit the generalizability of the findings, as the patient population at MTRH may differ from that seen in periphery or primary healthcare facilities. Finally, the relatively small sample size limited the ability to perform more detailed statistical analysis or identify associations between clinical characteristics and outcomes.

Recommendations

MTRH should strengthen clinical assessment of paediatric CSE through early recognition in children under five years, detailed seizure characterization, epilepsy history review, and expanded EEG use, reflecting the predominance of generalized seizures, remote symptomatic cases, abnormal EEG findings, and prior epilepsy history.

Conclusion

Children with CSE at Moi Teaching and Referral Hospital were predominantly young, with a slight male predominance, and presented with generalized seizures lasting 5–30 minutes. Remote symptomatic causes were most common, followed by acute symptomatic and febrile causes. EEG often showed abnormalities, mainly focal patterns, despite generalized clinical presentation. Many had prior epilepsy, with reported medication non-adherence being common. Further multicentre studies including children admitted to the ICU and those with refractory or super-refractory status epilepticus are needed to better characterize the clinical and aetiological profile of paediatric CSE in Kenya.

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Comparative assessment of the efficacy of conventional, Vazirani Akinosi, and Gow-Gates anaesthesia techniques for intra-alveolar extraction of mandibular molar teeth

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ABSTRACT

Introduction: Pain control during dental extraction is achieved with local anaesthesia. The impact of anaesthesia can be affected by the technique used in its administration. Dentists commonly use a conventional inferior alveolar nerve block (IANB) to administer anaesthesia to the mandible. However, alternatives like Gow-Gates (G-G) and Vazirani-Akinosi (V-A) techniques have been developed, and their level of efficacy as anaesthesia has yet to be determined. This study compared the efficacy of anaesthesia between these three local anaesthetic injection techniques during the intra-alveolar extraction of mandibular molars.

Method: Subjects who met the inclusion criteria were randomly allocated to a test group and a control group, using the balloting technique. The test group received local anaesthesia using the G-G and V-A techniques, and the control group received local anaesthesia using the conventional IANB. Time of onset of action, intra-injection pain, and depth of anaesthesia were assessed and compared among these three techniques. Data were analysed using the Statistical Package for Social Sciences (SPSS) version 24.

Results: 180 participants (60 in each group) were included in the study and analysed. The highest efficacy was the G-G technique, with the shortest time of onset (113.88±57.8 seconds, p=0.001), the least intra-injection pain (median score of 3.0, p=0.001), and the best depth of anaesthesia (median intraoperative pain score of 3.0, p=0.001). There was no statistically significant difference in the mean onset between V-A technique and IANB (p=0.994). However, there was a statistically significant difference in the intra-injection pain (p=0.025) and depth of anaesthesia (p=0.005).

Conclusion: This study determined that the G-G technique has a higher success rate than the V-A and IANB techniques during intra-alveolar extraction of mandibular molar teeth.

Keywords: efficacy, anaesthesia techniques, extraction, molar, Nigeria

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Introduction

Pain control is a vital part of dental extraction, which is achieved through the use of local anaesthesia.[1] The impact of anaesthesia can be affected by the technique used in the administration of the anaesthesia.[2] Dentists commonly use a conventional inferior alveolar nerve block (IANB) to administer anaesthesia to the mandible during dental procedures.[3]

However, alternatives like Gow-Gates (G-G) and Vazirani-Akinosi (V-A) techniques have been developed, and their level of efficacy as anaesthesia has yet to be definitely determined.[4] In the IANB technique, the nerve is approached from the premolars on the contralateral side.[4] The G-G technique was developed by George A. E. Gow-Gates. It is briefly described as follows: the needle is aimed at the level of the neck of the condyle, which is situated just under the insertion point of the lateral pterygoid muscle. This technique is used for more extensive anaesthesia or in cases where the IANB has not been successful.[5]

The V-A technique was invented by Sunder J. Vazirani in 1960 and later re-introduced in 1977 by Akinosi. This is a closed-mouth technique commonly used in patients with limitation in mouth opening or who cannot open wide enough for the IANB technique.[5]

This study compared the efficacy of anaesthesia between these three local anaesthetic injection techniques (IANB, G-G, and V-A) during the intra-alveolar extraction of mandibular molars.

Method

Patients aged 18 years and above were recruited and who presented to the Oral and Maxillofacial Surgery clinic, Lagos State University Teaching Hospital (LASUTH), Ikeja, Lagos, Nigeria, with indications for intra-alveolar extraction of at least one mandibular molar and who met the inclusion criteria. Eligibility criteria included adult subjects (18 years and above) with at least one mandibular molar indicated for intra-alveolar extraction and a completed consent form.

However, patients with dentoalveolar abscess, fascial space infection, reduced mouth opening, on contraceptives, steroids, tobacco, alcohol ingestion, with debilitating medical conditions, mobile mandibular teeth, impacted teeth, and pregnant patients were all excluded.

Patients were randomly assigned by balloting into three groups: A, B, and C, corresponding to IANB, V-A, and G-G, respectively.

The control group were subjects who received the conventional IANB prior to intra-alveolar extraction of the mandibular molar. The test groups received local anaesthesia using the G–G technique or the V-A technique.

Time of onset of action, intra-injection pain, and depth of anaesthesia were assessed and compared among these three techniques.

Data from all patients were analysed using Statistical Package for Social Sciences (SPSS) version 24, and there were no dropouts.

Results

We selected 180 patients undergoing intra-alveolar extraction of mandibular molar teeth who met the inclusion criteria. 60 patients were randomly assigned to each of the three groups.

The age range was 18 to 60 years, with the 31-40 age group being the most frequent. A total of 71.1% (128/180) of patients were female, with a male-to-female ratio of 1:2.5.

The onset of action of local anaesthesia across the three groups

The G-G group had 23.3% (14/60) of patients with an onset of action less than or equal to 60 seconds, with the highest percentage (36.7% (22/60)) of patients with an onset time between 121-180 seconds. In the IANB group, no participants had an onset of action less than or equal to 60 seconds, while the highest percentage (36.7% [22/60]) had an onset time between 121 and 180 seconds. In the V-A group, 6.7% (4/60) had an onset of action of less than or equal to 60 sec, with both onsets of action at 61-120 seconds and 181 -241 seconds having the highest numbers of patients, 30% (18/60) in each group. The G-G group had the fastest onset of action among the three groups, and this was statistically significantly different (Fisher's exact value = 30.134, $p < 0.001$) (Table 2).

Comparing efficacy using intra-injection pain across the three groups

18.6% (11/60) of patients in the V-A group had mild intra-injection pain, and 40% of patients had severe intra-injection pain. However, in the G-G group, 76.7% (46/60) of patients had mild intra-injection pain, with only 5% (5/60) of patients having severe intra-injection pain. Also, in the IANB group, 41.7% (25/60) of patients had mild intra-injection pain, with only 3.3% (2/60) of

Table 1. Age distribution among participants

Age group in Years	V-A (%)	GG (%)	IANB (%)	Total	X^2	p-value
≤20	7(11.7)	8(13.3)	6(10.0)	21(11.7)	2.811	0.946
21-30	14(23.3)	14(23.3)	13(21.7)	41(22.8)		
31-40	22(36.7)	19(31.7)	25(41.7)	66(36.7)		
41-50	10(16.7)	12(20.0)	7(15.0)	29(16.1)		
51-60	7(11.7)	7(11.7)	9(11.7)	23(12.8)		
Mean±SD	31.85±13.1	34.75±14	35.65±12.0		F=1.333	0.266

X^2: Chi-square; F=Analysis of Variance (ANOVA)

Table 2. Onset of action of local anaesthesia among patients

Onset of local anaesthesia (Sec)	V-Akinosi n (%)	Gow-Gates n (%)	IANB n (%)
≤60	4(6.7)	14(23.3)	0(0.0)
61-120	18(30.0)	19(31.7)	18(30.0)
121-180	16(26.7)	22(36.7)	22(36.7
181-240	18(30.0)	5(8.3)	17(28.3)
241-300	4(6.7)	0(0.0)	3(5.0)

Fischer exact value=30.134, p<0.001*

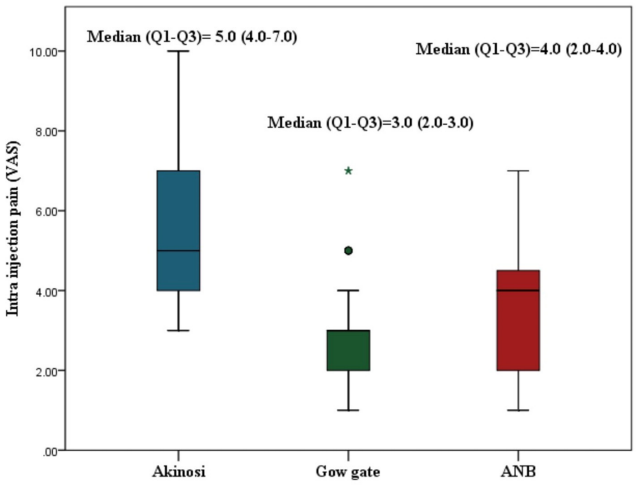


Figure 1. Median comparison of intra-injection pain across all three groups

Table 3. Intra-injection pain level among patients

Intra-injection pain	V-Akinosi n (%)	Gow-Gate n (%)	IANB n (%)	F	p-value
Mild	11(18.3)	46(76.7)	25(41.7)	65.421	**<0.001***
Moderate	25(41.7)	1(18.3)	33(55.0)		
Severe	24(40.0)	5(5.0)	2(3.3)		

F = Fisher's exact value

Table 4. Intraoperative pain levels among participants

Intraoperative pain	Akinosi n (%)	Gow-Gates n (%)	IANB n (%)	F	p-value
Mild	11(18.3)	39(65.0)	14(23.3)	42.349	**<0.001***
Moderate	34(56.7)	12(20.0)	20(33.3)		
Severe	15(25.0)	9(15.0)	26(43.4)		

F = Fisher's exact value

Table 5. Need for supplementary anaesthesia across the three groups

Need for supplementary anaesthesia	V-A (%)	G-G (%)	IANB (%)	X^2	p-value
Yes	15(25.0)	9(15.0)	26(43.3)		
No	45(75.0)	51(85.0)	34(56.7)	12.351	0.002

patients having severe intra-injection pain. There was a statistically significant difference in intra-injection pain across all three groups (Fisher's exact value=65.421, p<0.001) (Table 3).

The V-A group had a maximum Visual Analog Scale score of 9, a minimum of 3, and a median of 5 (interquartile range, 4-7). The G-G group had a maximum score of 7, a minimum of 1, and a median of 3 (interquartile range, 2-3). Also, the IANB group had a maximum VAS score of 7, a minimum score of 1, and a median score of 4, with an interquartile range of 2-4. In addition, across all three groups, there is a statistically significant difference in the median intra-injection pain (Kruskal-Wallis value 50.335, p=0.001<0.05) (Figure 1).

Measuring the depth of anaesthesia using intraoperative pain across the three groups

18.3% (11/60) of patients in the V-A group had mild intraoperative pain, and 25% (15/60) had severe intraoperative pain. However, in the G-G group, 65% (39/60) of patients had mild intraoperative pain, with only 15% (9/60) having severe intraoperative pain. On the other hand, 23.3% (14/60) of patients in the IANB group had mild intraoperative pain, while 43.4% (26/60) had severe intraoperative pain. Also, in the V-A and IANB groups, more patients reported moderate-to-severe intraoperative pain than in the G-G group, whereas the G-G group reported more mild intraoperative pain than the V-A and IANB groups. There was a statistically significant difference in intraoperative pain among all three groups (Fisher's exact test, p=0.042, p<0.001) (Table 4).

Need for supplementary anaesthesia across the three groups.

43.3% of the patients required supplementary anaesthesia

in the IANB group, 25% of the patients in the V-A group, and 15% of the patients in the G-G group. There was a statistically significant difference across the three groups (X2=12.351, p=0.002) (Table 5).

Discusion

Pain control is an essential part of dental surgical procedures, and local anaesthesia is the most commonly used method of ensuring pain control.[5] Traditionally, IANB has been used to anaesthetise mandibular teeth compared to G-G and V-A. However, there have been contradictory reports on its success rate, and the other two techniques are considered alternatives.[4] Over the years, conflicting results have been reported on the most effective anaesthetic injection technique for the intra-alveolar extraction of mandibular molars. This study compared the efficacy of the conventional IANB, G-G, and V-A during such extractions.

Regarding the onset of action, the G-G group had the fastest onset compared with the V-A and IANB groups, and this difference was statistically significant among the three groups. The rapid onset of action of G-G and the slowest onset of IANB in this study corroborate the findings of Haghighat et al.[6] and Wang et al.[7] This may be due to the use of constant landmarks (e.g., intertragic notch) for the G-G technique, which guide the placement and insertion of the local anaesthetic needle, compared with the V-A and IANB. In contrast, the IANB lacks reliable landmarks (e.g., the pterygomandibular raphe), and the needle insertion site is far from the inferior alveolar nerve.[6] In addition, the slow onset of action of the IANB may also be due to the diverse anatomies of patients' mandibular foramina.[5,6,7] These findings are in contrast to the findings of Yucel and Hutchison[8] and Goldberg et al.,[9] who reported a faster time of onset in the IANB group.

The intra-injection pain level in this study was highest in the V-A group, with an average score of 5, and lowest in the G-G group, with an average score of 3. Intra-injection pain differed significantly among the three groups. This is similar to the study by Goldberg et al.,[9] who also reported that the G-G technique had lower intra-injection pain than the V-A and IANB techniques. The lower intra-injection pain of the G-G group in this current study may be because the mucosa in the more superior position where needle penetration is performed in the G-G technique may be less sensitive and less resistant to the needle, possibly due to thinner musculofascial bands in the areas opposite to the more inferior point of insertion of the IANB technique, which penetrates through thicker muscle fibres and is more sensitive.[10] However, these findings contrast with those of Mishra et al.[11] and Donkor et al.,[12] who reported lower intra-injection pain in the V-A group. In Mishra et al., a smaller-bore injection needle (26-gauge) was used for the V-A technique, and they attributed the lower intra-injection pain in the V-A group to this. However, in the current study, an even smaller-bore (27-gauge) injection needle was used across the three groups, yet the V-A group still had the highest intra-injection pain compared to IANB and G-G.

Regarding the depth of anaesthesia, this study used intraoperative pain and the need for supplementary anaesthesia to assess it and found that the G-G technique was more effective than the IANB and V-A groups. No patients reported a score of zero, and none reported a score of 10. The implication of this is that all participants felt some degree of intraoperative pain, but none felt extreme intraoperative pain. It is intriguing that despite the role of anaesthesia (which is to provide complete loss of sensation to pain),[13] all the patients felt some degree of intraoperative pain, and no patient felt zero pain. One possible reason is the subjectivity of pain perception as any event resembling pain, e.g., pressure or discomfort, can be interpreted as pain by different individuals. In addition, these pain-like events cannot be evaluated with a pain assessment tool. The VAS is a valid, reliable, and arguably the best pain measurement scale used in research.[14] However, its inability to measure events such as pressure and discomfort that resemble pain could make it a less objective tool for measuring pain. In addition, one could argue that another possible reason for the lack of zero intraoperative pain among all patients in this study could be the inability of the solution to achieve absolute anaesthesia. This suggests that anaesthesia may not be a complete removal of pain sensation but rather a reduction in it.

In this study, the highest percentage of patients with severe intraoperative pain was in the IANB group, while the G-G group had the lowest percentage of individuals with severe intraoperative pain. For the above reason, the need for supplementary anaesthesia was highest in the IANB group. Intraoperative pain differed significantly among the three groups. This satisfactory depth of anaesthesia of the G-G group in this study is consistent with a study by Aggarwal et al.[15] The reason for this may be that the G-G injection involves the deposition of an anaesthesia near the pterygoid fovea adjacent to the head of the condyle.

The point of solution deposition is higher than in IANB. Because of gravity, the solution diffuses inferiorly, filling the pterygomandibular space and extending as far forward as the buccinator muscle.[15] Thus, all oral sensory branches of the mandibular nerve, including the nerve to mylohyoid, are exposed to anaesthesia. The length of nerve exposed to anaesthesia is significantly greater than in IANB, thus increasing the number of voltage-gated channels exposed to local anaesthesia.[14,15] In addition, the more satisfactory depth of anaesthesia of the V-A group when compared to the IANB is also consistent with the study by Aggrawal et al.[15] The reason for this could also be the point of deposition of the anaesthesia in this technique. With the V-A technique, the solution is deposited higher than in the IANB technique, thus increasing the length of the nerve exposed to the anaesthesia.[9,16,17]

Conclusion

The results suggest that the G-G technique has a higher success rate than the V-A and IANB techniques during intra-alveolar extraction of mandibular molar teeth.

Declarations

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Conflict of interest: None

Authors' contributions: All authors made substantial contributions to the conception and design of the study, data acquisition, analysis, and interpretation. They participated in drafting and critically revising the manuscript for important intellectual content, approved the final version for publication, and agree to be accountable for all aspects of the work.

Ethical approval: All procedures involving human participants in this study followed the ethical standards of the Health Research and Ethics Committee of the Lagos State University Teaching Hospital. Reference number: LREC/06/10/1240

Consent to participate: Informed consent was obtained from all individual participants included in the study.

Consent for publication: Informed consent was obtained from all individual participants for publication.

Availability of data and material: Documentation of data and material for the study are available on request.

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The KINSHASA/BUNIA/NEW YORK, 24 November 2026 – Nearly 6 in 10 women and adolescent girls aged 15 and above surveyed in Ituri in the Democratic Republic of the Congo (DRC) reported an increase or emergence of violence and abuse in their lives since the Ebola outbreak began.

Findings show a worsening parallel crisis for women and girls, including emotional and psychological abuse, controlling behaviour, and physical and sexual violence

Drawn from the first ever real-time surveillance of violence against women and girls during an infectious disease outbreak – led by UNICEF with the women-led organization SOFEPADI and Washington University in St. Louis – the findings point to how the outbreak is affecting women's and adolescent girls' safety at home and in their communities.

"Women and girls are facing a growing threat of violence and abuse on top of a deadly disease outbreak and continued conflict in eastern DRC," said UNICEF Executive Director Catherine Russell. "Too often, in the most impacted areas, there are no protective spaces outside the home that they can safely access."

Based on 1,062 interviews with women and adolescent girls between 28 August and 15 October, the findings point to an increase or emergence of at least one form of violence and abuse. More than a third of those surveyed reported growing control over where they could go, their money, and their phones, as well as emotional and psychological abuse. Physical and sexual violence were also reported.

According to the findings, 7 in 10 respondents state they live in households that have experienced at least one public health response measure, such as isolation, quarantine, or contact tracing. Of those that also reported an increase in violence and abuse, 9 in 10 named stress and fear brought on by the outbreak as contributing factors.

Almost half of the women and adolescent girls who tried to access care and support services could not. Frontline workers reported that some women and girls are limiting their own movements to avoid infection, while others are being kept close to home by family members or others. Some of the centres and services they once relied on have closed or been repurposed. Respondents also cited shame, fear of the perpetrator, and lack of trust.

https://www.unicef.org.uk/press-releases/nearly-6-in-10-women-and-adolescent-girls-surveyed-in-ebola-hit-ituri-report-increase-in-violence-and-abuse/

Research Article

Effectiveness of dolutegravir-based regimens in treating children and adolescents living with HIV at Al-Sabbah Children's Hospital, Juba, South Sudan

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ABSTRACT

Introduction: South Sudan has an HIV epidemic with a prevalence of 2.3% and an estimated 180,000 adults and children living with HIV. The country transitioned from lopinavir/ritonavir (LPV/r)-based regimens to optimized dolutegravir (DTG)-based regimens for the treatment of HIV in children and adolescents in 2022. This study aimed to assess the effectiveness and efficacy of DTG in children and adolescents living with HIV, measured by a 6-month follow-up of HIV-RNA viral load, at Al-Sabbah Children's Hospital, among those aged 6 weeks to 19 years who were transitioned to a DTG-based regimen from October 2022 to April 2023.

Method: This retrospective observational cohort study was conducted from September 2024 to February 2025 using a structured questionnaire with 28 questions. We analyzed the data using the Statistical Package for the Social Sciences (SPSS).

Results: One hundred medical records of children and adolescents living with HIV were reviewed for both clinical and laboratory outcomes after transition to the DTG regimen. The study population comprised 62% males and 38% females. The most frequent age group was 5-9 years (62%). Six months after transition, 86% of clients achieved HIV viral suppression; 14% had high viral load. Dolutegravir was more effective than lopinavir/ritonavir in achieving HIV viral load suppression in the study population (p-value 0.045). Common DTG side effects reported were increased appetite and weight gain (58%), gastrointestinal and psychiatric symptoms (12.8%), and musculoskeletal symptoms (7%).

Conclusion: DTG-based regimens show greater effectiveness than LPV/r-based regimens in our study population, all children and adolescents living with HIV, with good adherence, achieving HIV viral load suppression within six months after transition to DTG, with minimal side effects.

Keywords: HIV, children, adolescents, dolutegravir side effects, treatment outcome, South Sudan

Introduction

Human Immunodeficiency Virus (HIV) infection remains a major international public health concern. There were an estimated 39.9 million people living with HIV at the end of 2023, and approximately 1.7 million children aged 0-14 years living with HIV worldwide.[1,2] The Republic of South Sudan is considered a low HIV burden country, with a prevalence of 2.3%.[2] Antiretroviral Therapy (ART) for people living with HIV was introduced in 2008.[3] South Sudan transitioned from a lopinavir/ritonavir-based regimen to an optimized dolutegravir (DTG) based regimen for the treatment of HIV in children and adolescents in 2022.[3]

DTG is a second-generation potent integrase strand transfer inhibitor (INSTI). It inhibits DNA strand transfer into the host cell genome and thus prevents HIV viral integration[4,5] without conferringresistance to other ART classes.[6,7,8]

DTG is a preferred first- and second-line regimen in children aged over four weeks or weighing more than four kilograms, and adolescents living with HIV.[9,10] Since treatment is life-long, optimizing therapeutic regimens to maximize effectiveness and tolerability is important. [4,11,12]

Since the transition, no single study has been done to assess the effectiveness and safety of the DTG-based regimens on HIV viral load suppression in children and adolescents living with HIV in South Sudan. The study aims to assess the effectiveness and efficacy of DTG in children and adolescents living with HIV, aged six weeks to 19 years, measured through a six-month follow-up of HIV-RNA viral load, at Al-Sabbah Children's Hospital.

Method

This observational retrospective cohort study used secondary data from medical records of children and adolescents living with HIV aged six weeks to 19 years and who were transitioned to the DTG-based regimens from the period of October 2022 through April 2023.

The sample size was calculated using Slovin's formula (https://statcalc.net/slovins-formula-calculator/)

n = N / (1 + Ne2)

n= Sample size N= total population

e= sampling error (5% assumed)

Confidence interval =95%

n= 134 / (1 + 134 * 0.05 2) = 100.37

The study used a structured questionnaire to collect data, consisting of 28 questions and divided into three parts. The first part covered demographic information, the second covered health and past medical history, and the third covered DTG adherence and side effects.

After data collection, we checked the data for completeness, consistency, and accuracy. We analyzed the data using the Statistical Package for the Social Sciences (SPSS).

The study obtained ethical approval from the National Ministry of Health Research Ethics and Review Board.

Results

The study population comprised 62% males and 38% females. The most frequent age group was 5-9 years (62%).

Table 1 shows the age-group breakdown.

Table 2 shows the last ART regimen before transition to DTG, which was lopinavir-based.

Six months after transition to the DTG-based regimen,

Table 1. HIV client age group

Age group	n (%)
Less than 5 Years	16 (16.0)
5 - 9 years	62 (62.0)
10 - 15 Years	17 (17.0)
16 Years above	5 (5.0)
Total	**100 (100.0)**

Table 2. Last ART regimen before transition to DTG-based regimen: Current Viral Load Status Cross-tabulation

Count		Current Viral Load Status		Total n (%)
		BDL	HVL	
Last ART regimen before transition to DTG-based regimen	4c	7	4	11 (11.0)
	4i	79	10	89 (89.0)
Total		**86**	**14**	**100 (100.0)**

BDL (Below Detection Level) HVL (High Viral Load)

Table 3. DTG side effects

DTG side effects	Responses n (%)
Signs of Renal System Diseases	2 (2.3)
Signs and Symptoms of Musculo-skeletal Diseases	6 (7.0)
Signs and Symptoms of Central Nervous System Diseases	2 (2.3)
Signs and Symptoms of GIT Diseases	11(12.8)
Signs and Symptoms of Haematologic Diseases	4 (4.7)
Signs and Symptoms of Psychiatric diseases	11 (12.8)
Others (weight gain, increased appetite)	50 (58.1)
Total	**86 (100)**

Table 4. Chi-Square Test - The effectiveness of DTG

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.834[a]	2	.012
Likelihood Ratio	6.223	2	.045
No of Valid Cases	100		

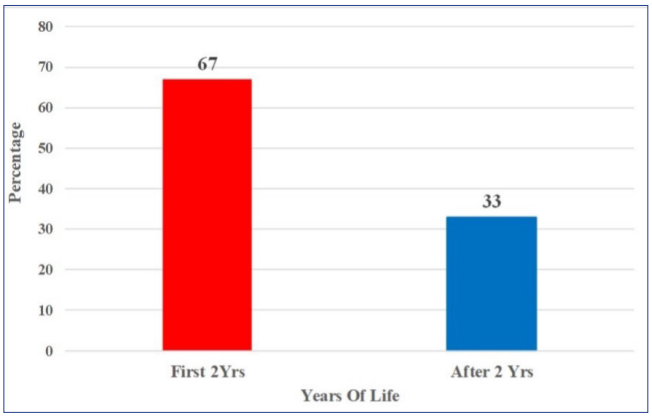


Figure 1. Time of acquiring HIV infection

86% of children and adolescents achieved HIV viral suppression, and 14% had high viral load.

Common DTG side effects reported were increased appetite and weight gain (58.1%) and gastrointestinal and psychiatric symptoms 12.8% each (Table 3).

Table 4 shows the DTG Chi-Square Test results, and Figure 1 shows the age at which HIV is acquired.

Discussion

DTG is more effective than LPV/r in achieving HIV viral load suppression in our study population (p-value 0.045; Table 4).

The findings were similar to those of the study done by Townsend et al.,[9] where the DTG-based regimen showed effectiveness in treating children and adolescents living with HIV.

Common DTG side effects reported were increased appetite and weight gain (58.1%) and gastrointestinal and psychiatric symptoms (12.8% each) (Table 4). Moreover, Failla reported similar findings on DTG's neuropsychiatric effects.[13]

Findings on the effectiveness of the DTG-based regimen as a preferred first-line treatment were consistent with those of a randomized clinical trial conducted by White et al.;[14] the only difference was the study duration which was almost two years

Most of our study population acquired HIV infection during the first twenty-four months of life. Out of 100 children and adolescents, 67% acquired HIV during the birth and breastfeeding period, and 33% acquired HIV infection after that period (Figure 1). The findings were similar to those reported by Giorgi et al.,[15] where most HIV infections occurred early and during the breastfeeding period, while Prendergast et al., [16] linked the high rate of HIV vertical transmission to the duration of breastfeeding. Moreover, Webb et al.[17] reported similar findings on timely early infant diagnosis (EID) in HIV-exposed Infants (HEI) in preventing new HIV infection.

Conclusion

DTG-based regimens show effectiveness over LPV/r-based regimens in our study population, with good adherence, achieving HIV viral load suppression within six months after transition to DTG, with minimal side effects. These results align with the World Health Organization recommendation for the use of dolutegravir-based

regimens as first-line treatment in children and adolescents living with HIV.

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Conflict of interest: None.

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VIDEO: The Story of Ebola

Global Health Media Project has produced an ebola animation to help inform local communities during ebola outbreaks. It is in English, French, Lingala, and Swahili - and downloadable on our website.

https://globalhealthmedia.org/video/the-story-of-ebola-english/

This animation — produced in collaboration with International Federation of Red Cross and Red Crescent Societies, UNICEF, and Yoni Goodman — brings to life key messages that help people see and understand how Ebola spreads and how to protect themselves

Deborah Van Dyke, Director

Comments on the video: Excellent, very descriptive and easy to understand video. Well done animation and I really like the fact that a child was used as the narrator, this should help with communication.

Assessment of the quality of immediate postnatal care practices in three referral hospitals in Juba, South Sudan

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ABSTRACT

Introduction: The immediate postnatal period, particularly the first 24 hours after childbirth, is critical for preventing maternal and neonatal morbidity and mortality. Despite global efforts to improve maternal and newborn health, postnatal care remains one of the most neglected components of healthcare in many low-resource settings, including South Sudan.

Method: We conducted an institution-based descriptive cross-sectional study of postnatal women across three hospitals. Participants were selected using a proportionate sampling method based on patient flow. Data collection involved a structured questionnaire administered at discharge and during follow-up visits; analysis used SPSS version 27 and included descriptive statistics, Chi-square tests, and association measures, with significance at $p < 0.05$.

Results: 384 postnatal women participated. Coverage of essential immediate postnatal care interventions was generally high, including maternal bleeding assessment (92.4%), uterine contraction assessment (96.9%), pulse monitoring (99.7%), newborn temperature assessment (99.5%), and newborn examination (95.3%). Early initiation of breastfeeding within one hour was reported by 61.5% of mothers, while 49.7% experienced immediate skin-to-skin contact. Significant differences between facilities were observed in maternal bleeding assessment ($p < 0.001$), counselling on postnatal visits ($p < 0.001$), umbilical cord care counselling ($p = 0.002$), newborn examinations ($p = 0.001$), and BCG vaccination counselling ($p = 0.002$). Knowledge of chlorhexidine cord care was high (89.6%), although knowledge of maternal and neonatal danger signs remained inadequate. Maternal satisfaction with respectful care differed significantly across facilities ($p < 0.001$). Neonatal infections were reported in 46.4% of newborns and varied significantly by facility.

Conclusion: Although immediate postnatal care coverage was generally high across the three facilities, significant variations existed in the quality of care, counselling services, maternal knowledge, and maternal and neonatal outcomes. Strengthening standardized postnatal care practices, particularly at lower-level facilities, is essential for improving maternal and newborn health outcomes in South Sudan.

Keywords: immediate postnatal care, maternal outcomes, neonatal outcomes, postnatal counselling, South Sudan

Introduction

The postnatal period begins immediately after the delivery of the placenta and extends to six weeks postpartum. The first 24 hours after childbirth represent the most critical period for both mothers and newborns, as the majority of maternal and neonatal deaths occur during this time. Immediate postnatal care involves the assessment, monitoring, and management of mothers and newborns to detect complications early and promote healthy recovery.[1]

Globally, substantial progress has been made in improving maternal and newborn survival. However, postnatal care remains one of the weakest components of maternal health services, particularly in low- and middle-income countries.[2] According to the World Health Organization (WHO), less than half of women in sub-Saharan Africa receive adequate postnatal care within the first two days after childbirth.[3]

South Sudan continues to experience high maternal and neonatal mortality rates despite efforts to improve reproductive, maternal, newborn, and child health services. Limited evidence exists regarding the provision and quality of immediate postnatal care services within the country. Understanding the provision of immediate postnatal care and associated maternal and neonatal outcomes is critical for informed policy and improving service delivery.[4] The quality of immediate postnatal care is not determined solely by whether individual interventions are provided, but also by their timeliness, completeness, continuity, and the ability of health workers to communicate essential information to mothers.[5]

WHO recommendations emphasize that postnatal care should include systematic assessment of the mother and newborn, early initiation of breastfeeding, thermal care and skin-to-skin contact, identification of danger signs, counselling, and appropriate follow-up after discharge.[6,7] In settings with limited health-system resources, gaps in any of these components may delay recognition and management of maternal or neonatal complications.[8] Furthermore, differences in facility level, staffing, workload, availability of essential supplies, provider competencies, and adherence to standardized protocols may influence the quality and consistency of care.[9,10] However, there is limited facility-level evidence from South Sudan comparing the actual provision of immediate postnatal care and associated maternal and neonatal outcomes across different levels and types of health facilities. This study therefore provides important evidence on both the coverage and variation of immediate postnatal care practices in major referral facilities in Juba, helping to identify specific areas for quality improvement and standardization.

Method

This descriptive, institution-based cross-sectional study assessed the provision and quality of immediate postnatal care among women who had recently delivered in selected health facilities in Juba, South Sudan.

The study was conducted in three major hospitals: Juba Teaching Hospital (JTH), Juba Military Referral Hospital (JMRH), and St. Kizito Hospital. The three facilities were selected because they provide essential maternity and postnatal care services and serve as important referral centres within Juba.

The study population comprised all postnatal women who delivered at the selected health facilities and returned for postnatal follow-up visits during the study period.

Women were included if they had delivered in one of the selected health facilities within the previous 24 hours or were attending an early postnatal follow-up visit within 7 days of delivery and had provided informed consent to participate. They were excluded if they were critically ill and unable to participate in the interview or declined to provide consent.

The sample size was calculated using Cochran's formula for estimating proportions in an infinite population, with parameters: 95% confidence interval, prevalence 50%, and precision 5%.[11] The calculated sample size was 384 participants.

A proportionate sampling technique was used to distribute the total sample size across the three facilities based on their average patient flow to ensure adequate representation.

The allocation was as follows: Juba Teaching Hospital 41% (157), Juba Military Referral Hospital 37.2% (143), St. Kizito Hospital 21.8% (84), making a total of 384. Participants were recruited consecutively at discharge points and during postnatal clinic visits until the required sample size was reached.

Data were collected using a structured interviewer-administered questionnaire. Interviews were conducted by trained research assistants conducted interviews at discharge and during postnatal follow-up visits.

Data were entered, cleaned, and analysed using Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics were summarized using frequencies, percentages,

means, and standard deviations. Chi-square tests were used to assess associations between health facilities and study variables. Phi coefficients were used to measure the strength of associations. Statistical significance was considered at $p < 0.05$.

Ethical approval was obtained from the University of Juba. Permission to conduct the study was obtained from the participating hospitals. We obtained written informed consent from all participants. Confidentiality was maintained using unique identification codes and secure data storage.

Results

Characteristics of Study Participants

384 women participated in the study. Significant differences were observed across facilities regarding maternal age ($p = 0.016$), education level ($p < 0.001$), number of antenatal care visits ($p < 0.001$), mode of delivery ($p = 0.004$), and time of discharge ($p < 0.001$) (Table 1).

Provision of Immediate Postnatal Care

Most mothers received essential immediate postnatal care interventions. Maternal bleeding was assessed in 92.4% of mothers, blood pressure in 96.1%, uterine contractions in 96.9%, and pulse in 99.7%. Nearly half of newborns (49.7%) experienced immediate skin-to-skin contact, while 61.5% initiated breastfeeding within one hour of birth. Statistically significant differences were observed between facilities in: Maternal bleeding assessment ($p < 0.001$), counselling on postnatal visit importance ($p < 0.001$), umbilical cord care counselling ($p = 0.002$), Newborn cord examination ($p = 0.001$), general newborn examination ($p = 0.001$), BCG vaccination counselling ($p = 0.002$) - Tables 2 and 3.

Table 1. Demographic characteristics of women giving birth at the health facilities

	Health Facility			Total	p-value
	Juba Teaching Hospital	Juba Military Referral Hospital	St Kizito Hospital		
	n (%)	n (%)	n (%)	n (%)	
Age group					0.016
18-24 years	58 (43.6)	53 (39.8)	22 (16.5)	133 (34.6)	
25-29 years	58 (35.2)	58 (35.2)	49 (29.7)	165 (43)	
30-40 years	42 (48.8)	32 (37.2)	12 (14)	86 (22.4)	
Education level					<0.001
None	13 (19.1)	23 (33.8)	32 (47.1)	68 (17.7)	
Primary	94 (51.6)	77 (42.3)	11 (6.0)	182 (47.4)	
Secondary and above	51 (38.1)	43 (32.1)	40 (29.9)	134 (34.9)	
Number of antenatal care visits during this pregnancy					<0.001
2 visits	27 (55.1)	20 (40.8)	2 (4.1)	49 (12.8)	
4 visits	44 (35.5)	50 (40.3)	30 (24.2)	124 (32.3)	
6 visits	64 (53.8)	53 (44.5)	2 (1.7)	119 (31)	
8 visits	23 (25.0)	20 (21.7)	49 (53.3)	92 (24)	
Mode of delivery					0.004
Spontaneous	77 (36.5)	74 (35.1)	60 (28.4)	211 (54.9)	
C section	5 (41.7)	7 (58.3)	0 (0.0)	12 (3.1)	
Assisted	76 (47.2)	62 (38.5)	23 (14.3)	161 (41.9)	
Time of discharge					<0.001
<24 hours	61 (42.7)	52 (36.4)	30 (21)	143 (37.2)	
24-48 hours	75 (50.7)	70 (47.3)	3 (2.0)	148 (38.5)	
>48 hours	22 (23.7)	21 (22.6)	50 (53.8)	93 (24.2)	
Total	**158 (41.1)**	**143 (37.2)**	**83 (21.6)**	**384 (100)**	

Table 2: Immediate postnatal maternal and newborn care practices across three health facilities (N = 384)

	Health Facility				
	Juba Teaching Hospital n (%)	Juba Military Referral Hospital n (%)	St Kizito Hospital n (%)	Total n (%)	p-value
1. How soon after birth was the baby placed skin-to-skin against you?					0.295
< 1 hour	75 (39.3)	66 (34.6)	50 (26.2)	191 (49.7)	
1-24 hours	60 (42.9)	57 (40.7)	23 (16.4)	140 (36.5)	
>24 hours	23 (43.4)	20 (37.7)	10 (18.9)	53 (13.8)	
2. How soon after birth was the baby did you begin breastfeeding?					0.103
< 1 hour	93 (39.4)	82 (34.7)	61 (25.8)	236 (61.5)	
1-24 hours	55 (42.3)	55 (42.3)	20 (15.4)	130 (33.9)	
>24 hours	10 (55.6)	6 (33.3)	2 (11.1)	18 (4.7)	
3. Did a health provider check your bleeding within the first hour of delivery?					<0.001
Yes	145 (40.8)	137 (38.6)	73 (20.6)	355 (92.4)	
No	1 (9.1)	0 (0.0)	10 (90.9)	11 (2.9)	
Don't know	12 (66.7)	6 (33.3)	0 (0.0)	18 (4.7)	
5. Was the maternal body temperature checked by health worker after delivery?					0.132
Yes	140 (39.8)	131 (37.2)	81 (23.0)	352 (91.7)	
No	6 (50.0)	6 (50.0)	0 (0.0)	12 (3.1)	
Don't know	12 (60.0)	6 (30.0)	2 (10.0)	20 (5.2)	
6. Was the uterine contraction checked?					0.137
Yes	149 (40.1)	140 (37.6)	83 (22.3)	372 (96.9)	
No	1 (100.0)	0 (0.0)	0 (0.0)	1 (0.3)	
Don't know	8 (72.7)	3 (27.3)	0 (0.0)	11 (2.9)	
7. Was your pulse checked within first hour of delivery?					0.488
Yes	157 (41)	143 (37.3)	83 (21.7)	383 (99.7)	
No	1 (100)	0 (0.0)	0 (0.0)	1 (0.3)	
8. During your stay, did a nurse/ midwife counsel you on neonatal danger signs of illness in your baby (e.g. yellow skin, fast breathing, poor feeding)?					0.488
Yes	157 (41)	143 (37.3)	83 (21.7)	383 (99.7)	
No	1 (100)	0 (0.0)	0 (0.0)	1 (0.3)	
9. During your stay, did a nurse/ midwife counsel you on immediate breastfeeding: how and when to start breastfeeding your baby right after birth?					0.058
Yes	157 (41.5)	138 (36.5)	83 (22)	378 (98.4)	
No	1 (16.7)	5 (83.3)	0 (0.0)	6 (1.6)	
10. Was your baby's temperature taken before you were moved to the ward?					0.237
Yes	156 (40.8)	143 (37.4)	83 (21.7)	382 (99.5)	
No	2 (100)	0 (0.0)	0 (0.0)	2 (0.5)	
11. Did the nurse or midwife check the baby's cord for bleeding?					0.001
Yes	157 (42.9)	135 (36.9)	74 (20.2)	366 (95.3)	
No	1 (5.6)	8 (44.4)	9 (50.0)	18 (4.7)	
12. Was eye care provided with eye drop/ointment?					
Yes	158 (41.1)	143 (37.2)	83 (21.6)	384 (100)	
Total	158 (41.1)	143 (37.2)	83 (21.6)	384 (100.0)	

Table 3: Assessing elements of maternal and newborn postnatal health education and counselling across three health facilities (N = 384)

	Health Facility				
	Juba Teaching Hospital	Juba Military Referral Hospital	St Kizito Hospital	Total	p-value
	n (%)	n (%)	n (%)	n (%)	
1. Was the maternal blood pressure checked before discharge?					0.304
Yes	149 (40.4)	137 (37.1)	83 (22.5)	369 (96.1)	
No	7 (58.3)	5 (41.7)	0 (0.0)	12 (3.1)	
Don't know	2 (66.7)	1 (33.3)	0 (0.0)	3 (0.8)	
2. During your stay, did a nurse/ midwife counsel you on maternal danger sign: signs of illness in yourself (e.g. Heavy bleeding, severe headache or fever)?					0.488
Yes	157 (41)	143 (37.3)	83 (21.7)	383 (99.7)	
No	1 (100)	0 (0)	0 (0.0)	1 (0.3)	
3. During your stay, did a nurse/ midwife counsel you on immediate postpartum family planning: options for spacing your next pregnancy before leaving the hospital?					0.488
Yes	157 (41)	143 (37.3)	83 (21.7)	383 (99.7)	
No	1 (100)	0 (0.0)	0 (0.0)	1 (0.3)	
4. During your stay, did a nurse/ midwife counsel you on self-hygiene: how to care for your body and wound (if any) to prevent infection?					0.488
Yes	157 (41)	143 (37.3)	83 (21.7)	383 (99.7)	
No	1 (100)	0 (0.0)	0 (0.0)	1 (0.3)	
5. During your stay, did a nurse/ midwife counsel you on postnatal visit schedule: specifically, when and where you should return for your first check-up?					0.488
Yes	157 (41)	143 (37.3)	83 (21.7)	383 (99.7)	
No	1 (100)	0 (0.0)	0 (0.0)	1 (0.3)	
6. During your stay, did a nurse/ midwife counsel you on importance of postnatal visits: Why it is critical for you and your baby to return for follow-up care?					<0.001
Yes	156 (41.9)	143 (38.4)	73 (19.6)	372 (96.9)	
No	2 (16.7)	0 (0.0)	10 (83.3)	12 (3.1)	
7. During your stay, did a nurse/ midwife counsel you on care for umbilical cord cleanliness?					0.002
Yes	157 (43)	134 (36.7)	74 (20.3)	365 (95.1)	
No	1 (5.3)	9 (47.4)	9 (47.4)	19 (4.9)	
8. Was the baby general well-being assessed by the health worker from head to toe?					0.001
Yes	157 (42.9)	135 (36.9)	74 (20.2)	366 (95.3)	
No	1 (5.6)	8 (44.4)	9 (50.0)	18 (4.7)	
9. Was vaccination with BCG done for newborn or counselled on before discharge?					0.002
Yes	136 (39.2)	128 (36.9)	83 (23.9)	347 (90.4)	
No	22 (59.5)	15 (40.5)	0 (0.0)	37 (9.6)	
Total	158 (41.1)	143 (37.2)	83 (21.6)	384 (100.0)	

Maternal knowledge

Most women (89.6%) identified chlorhexidine as the recommended substance for umbilical cord care. Knowledge of neonatal danger signs was limited, with only 54.7% identifying convulsions as a danger sign. Similarly, only 52.9% correctly identified excessive vaginal bleeding as a maternal danger sign.

Approximately one-third of respondents could not identify any maternal or neonatal danger signs (Table 4).

Maternal and neonatal outcomes

More than half of mothers (53.4%) reported experiencing sadness, anxiety, or low mood after childbirth. Overall, 61.7% reported being very satisfied with the respect and dignity shown by healthcare providers. Financial barriers affected access to care for 64.3% of mothers. Neonatal complications included: infection (46.4%), breathing difficulties (8.6%), feeding difficulties (6.5%), significant differences in neonatal outcomes were observed across facilities ($p < 0.001$) (Table 5).

Discussion

This study demonstrated significant differences in immediate postnatal care provision, maternal knowledge, and maternal-newborn outcomes between tertiary referral hospitals (Juba Teaching Hospital and Juba Military Referral Hospital) and the secondary-level subsidized private hospital (St. Kizito Hospital).

Although overall coverage of immediate postnatal care interventions was high, tertiary hospitals generally performed better in critical clinical assessments such as

Table 4. Assessing knowledge of women giving birth at the health facilities

	Health Facility				
	Juba Teaching Hospital	Juba Military Referral Hospital	St Kizito PHCC	Total	p-value
	n (%)	n (%)	n (%)	n (%)	
What should be applied to the umbilical cord stump?					0.003
Chlorhexidine	140 (40.7)	131 (38.1)	73 (21.2)	344 (89.6)	
Nothing	4 (23.5)	3 (17.6)	10 (58.8)	17 (4.4)	
Dry care	4 (57.1)	3 (42.9)	0 (0.0)	7 (1.8)	
Application of ash for cord care	2 (100)	0 (0.0)	0 (0.0))	2 (0.5)	
Others	8 (57.1)	6 (42.9)	0 (0.0)	14 (3.6)	
Which of these are danger signs in a newborn?					<0.001
Convulsion /fits	41 (19.5)	89 (42.4)	80 (38.1)	210 (54.7)	
Difficulty breathing	16 (66.7)	8 (33.3)	0 (0.0)	24 (6.3)	
Yellowing of skin	4 (57.1)	3 (42.9)	0 (0.0)	7 (1.8)	
Fever or cold to touch	7 (53.8)	6 (46.2)	0 (0.0)	13 (3.4)	
None	90 (69.2)	37 (28.5)	3 (2.3)	130 (33.9)	
Which of these are maternal danger signs?					<0.001
Excessive vaginal bleeding	41 (20.2)	81 (39.9)	81 (39.9)	203 (52.9)	
Severe headache	38 (71.7)	15 (28.3)	0 (0.0)	53 (13.8)	
Vaginal foul-smelling	4 (50.0)	4 (50)	0 (0.0)	8 (2.1)	
Severe abdominal pain	0 (0.0)	2 (50.0)	2 (50.0)	4 (1.0)	
None	74 (64.3)	41 (35.7)	0 (0.0)	115 (29.9)	
Total	**158 (41.1)**	**143 (37.2)**	**83 (21.6)**	**384 (100.0)**	

maternal bleeding monitoring, newborn examinations, and comprehensive postnatal counselling. This finding is consistent with evidence indicating that tertiary hospitals benefit from greater specialist capacity, stronger supervision systems, and better availability of equipment and trained personnel.[12]

Despite being a secondary-level facility, St. Kizito Hospital demonstrated strengths in selected preventive maternal and newborn care practices, particularly antenatal care attendance and BCG vaccination counselling. This pattern may reflect contextual advantages such as continuity of care, closer provider–client interactions, and community engagement that can support uptake of preventive services.[13] Nevertheless, performance was lower in several components of immediate postnatal care, including maternal bleeding assessment, counselling on postnatal follow-up and umbilical cord care, and newborn examination. These findings suggest that strengths in preventive service delivery do not necessarily translate into consistent performance across all components of immediate postnatal care. The observed gaps may reflect differences in staffing, provider training, workload, availability of clinical resources, supervision, and adherence to standard postnatal care protocols.[14,15] However, because these factors were not directly assessed in the present study, these explanations should be considered hypotheses and warrant further investigation.

Knowledge of maternal and neonatal danger signs remained suboptimal across all facilities. Despite high levels of facility-based delivery and postnatal counselling, a considerable proportion of women could not identify key warning signs requiring urgent medical attention.[16] These findings suggest that the quality and effectiveness of counselling require strengthening across all levels of care.[17] Maternal satisfaction varied significantly across facilities. Juba Teaching Hospital reported the highest levels of satisfaction with respectful maternity care, while dissatisfaction was highest among mothers delivering at St.

Table 5. Determining maternal outcomes following immediate postnatal care giving birth at the health facilities

	Health Facility				
	Juba Teaching Hospital	Juba Military Referral Hospital	St Kizito PHCC	Total	p-value
	n (%)	n (%)	n (%)	n (%)	
Since the birth of your child, have you felt consistently sad, anxious, or down?					<0.001
Yes	54 (26.3)	79 (38.5)	72 (35.1)	205 (53.4)	
No	104 (58.1)	64 (35.8)	11 (6.1)	179 (46.6)	
On a scale of 1 to 5, how satisfied are you with the respect and dignity to you by the midwives?					<0.001
Very dissatisfied	1 (0.7)	63 (42.9)	83 (56.5)	147 (38.3)	
Very satisfied	157 (66.2)	80 (33.8)	0 (0.0)	237 (61.7)	
Did the cost of services or supplies prevent you from receiving any part of your care?					<0.001
Yes	74 (30.0)	92 (37.2)	81 (32.8)	247 (64.3)	
No	84 (61.3)	51 (37.2)	2 (1.5)	137 (35.7)	
Has the baby experienced any of the following since birth?					<0.001
Infection	22 (12.4)	75 (42.1)	81 (45.5)	178 (46.4)	
Breathing issue	23 (69.7)	8 (24.2)	2 (6.1)	33 (8.6)	
Feeding difficulties	14 (56.0)	11 (44.0)	0 (0.0)	25 (6.5)	
None	99 (66.9)	49 (33.1)	0 (0.0)	148 (38.5)	
Total	**158 (41.1)**	**143 (37.2)**	**83 (21.6)**	**384 (100)**	

Kizito Hospital. These differences may reflect variations in staffing levels, workload, expectations of care, and provider-patient interactions.[18]

Neonatal infections were more frequently reported among mothers delivering at St. Kizito Hospital and Juba Military Referral Hospital than among those delivering at Juba Teaching Hospital. Better neonatal outcomes at Juba Teaching Hospital may reflect stronger infection prevention measures, more experienced healthcare providers, and greater access to specialized neonatal services.[19,20]

Overall, the findings indicate that tertiary facilities provided more comprehensive immediate postnatal care and achieved better maternal and neonatal outcomes than the secondary-level facility. Nevertheless, St. Kizito Hospital demonstrated strengths in preventive services that can be leveraged to improve overall quality of care.[21] The findings also highlight an important distinction between coverage of individual interventions and the overall quality of postnatal care. Although several routine assessments were reported at very high levels, important preventive and supportive interventions, particularly immediate skin-to-skin contact and breastfeeding within the first hour, were substantially less common. This pattern suggests that high reported coverage of selected clinical assessments does not necessarily indicate comprehensive adherence to the full package of recommended immediate postnatal care.[22,23] WHO guidance emphasizes that maternal and newborn care should be integrated, respectful, timely, and continuous from birth through the postnatal period.[24] The differences observed between facilities therefore warrant attention not only to the availability of services but also to how consistently the complete package is delivered. Standardized checklists, routine clinical audits, supportive supervision, competency-based refresher training, and strengthened discharge counselling could help reduce variation between facilities.[25,26] In addition, the relatively high proportion of mothers reporting neonatal infections and maternal emotional symptoms underscores the importance of strengthening postnatal follow-up beyond the immediate facility stay, including early identification of maternal and newborn complications and clear referral pathways.[27,28]

Conclusion

Immediate postnatal care services were widely provided across tertiary and secondary health facilities in Juba. However, significant differences existed in service quality, maternal knowledge, counselling practices, and maternal and neonatal outcomes.

Tertiary referral facilities generally demonstrated better performance in clinical care and maternal-newborn outcomes, while the secondary-level subsidized private facility showed strengths in preventive and community-oriented services. Strengthening postnatal care quality, counselling, infection prevention practices, and maternal education across all facility levels is essential to improve maternal and newborn health outcomes in South Sudan.

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Limitations: Because this study was conducted in selected health facilities in Juba, the findings may not be fully generalizable to women and newborns in rural areas or other parts of South Sudan where access to postnatal services and health-system conditions may differ. Additionally, some information was obtained through participant interviews and may therefore be affected by recall and social desirability bias.

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Knowledge, attitudes, and acceptance of Universal Newborn Hearing Screening among pregnant women attending an antenatal clinic in Tanzania

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ABSTRACT

Introduction: Congenital hearing loss profoundly impairs speech, language, and cognitive development. The Universal Newborn Hearing Screening (UNHS) programme advocates screening by one month, diagnosis by three months, and intervention by six months to mitigate these consequences. Maternal awareness and acceptance are critical to the successful implementation of screening programmes. This study assessed the knowledge, attitudes, and acceptance of newborn hearing screening (NHS) among pregnant women attending an antenatal clinic at a tertiary hospital in Tanzania.

Method: This cross-sectional study used simple random sampling to recruit 130 pregnant women. Data were collected using a validated structured questionnaire covering sociodemographic characteristics, nine knowledge items (good mastery threshold ≥ 6/10), and nine Likert-scale attitude items (positive baseline threshold ≥ 32/45).

Results: Of the 130 participants (mean age: 31.78 years), 36.9% (n=48) had good overall knowledge of NHS, and 83.8% could not identify objective testing methods. A positive attitude was observed in 73.8% (n=96) of participants, and 85.4% (n=111) accepted screening for their infants. Higher education level and employment were associated with higher knowledge scores (p=0.001; p=0.017), positive attitudes (p<0.001; p=0.007), and screening acceptance (p<0.001; p=0.006). Higher knowledge levels were associated with positive attitudes (p=0.007). Positive attitudes correlated with higher screening acceptance (p<0.001), but knowledge level did not statistically influence final acceptance (p=0.121).

Conclusion: Behavioural acceptance and positive attitudes toward infant hearing screening are high, but health literacy regarding objective testing methods remains low. Implementing universal screening is feasible but requires antenatal educational campaigns to prevent diagnostic loss to follow-up.

Keywords: knowledge, attitude, acceptance, newborn hearing screening, Tanzania

Introduction

Hearing loss represents one of the most prevalent sensory impairments affecting children globally. The World Health Organization (WHO) estimates that 34 million children worldwide have disabling hearing loss, and the majority reside in low- and middle-income countries (LMICs).[1] Congenital hearing loss severely impairs speech, language development and academic performance.[2]

Accordingly, Universal Newborn Hearing Screening (UNHS) programmes have been established in many high-income countries, and a few LMICs, to facilitate early diagnosis and intervention.[3,4] UNHS programmes follow the "1-3-6" benchmarks which involve screening by one month, diagnosis by three months, and intervention by six months to mitigate hearing loss consequences.[5] Otoacoustic Emissions (OAE) and Auditory Brainstem Response (ABR), objective screening tools, provide the technical foundation for the screening programme by offering high-sensitivity and specificity results.[3,5]

The implementation of UNHS remains limited across many LMICs, including those in sub-Saharan Africa. Key barriers include inadequate diagnostic infrastructure, a lack of national health policies, prohibitive equipment costs, low public awareness, and significant out-of-pocket expenses for parents.[6] Maternal knowledge, attitudes and acceptance are critical to programme success,[7–12] but regional data remain sparse. This study assessed the knowledge, attitudes, and acceptance of newborn hearing screening among pregnant women in a major national antenatal clinic.

Method

Study design and setting

This hospital-based, descriptive cross-sectional study was conducted at Muhimbili National Hospital (MNH), Tanzania's primary referral and teaching hospital. The study assessed knowledge, attitudes, and acceptance of UNHS among pregnant women attending the antenatal clinic between February and March 2025.

Study population, sample size and sampling technique

Using simple random sampling, 130 pregnant women were prospectively recruited. This sample size was calculated using Cochran's formula for cross-sectional studies, incorporating an expected population proportion (p) of 91.7 % derived from prior literature.[8] Based on a 95% confidence level (Z = 1.96) and a 5% margin of error (e = 0.05), a minimum sample size of 117 was determined. This was adjusted to 130 to account for an anticipated 10% non-response rate. Eligible participants included pregnant women aged 18 years or older who provided written informed consent. Women who were severely ill or lacked the cognitive capacity to participate in the interview were excluded.

Data collection instrument

A structured questionnaire was adapted from the literature to suit regional socioeconomic contexts. The instrument was developed in English, translated into Swahili, and validated for face and content validity by a panel of otorhinolaryngologists and audiologists. A pilot study was subsequently conducted with a convenience sample of 10 participants to evaluate the clarity of the Swahili version prior to deployment.

The questionnaire collected demographic data and assessed knowledge, attitude, and acceptance of NHS among study participants. A total of nine questions with a maximum score of ten were used to assess Knowledge. Eight questions were single-choice items worth one point each, and one question had two correct selections, with each correct selection scored one point; incorrect or 'I don't know' responses scored zero. A good knowledge level threshold score was ≥ 6 (60%), representing baseline mastery of essential newborn hearing concepts.

Attitude was assessed using nine items on a five-point Likert scale with a maximum score of 45. Based on modified Bloom's cut-off point, a positive attitude threshold score of ≥ 32(71.1%) was used. This criterion threshold was used instead of the standard median split or neutral midpoint threshold (27/45) to minimize central tendency bias and ensure classification reflected positive responses rather than neutral scores. Acceptance of NHS was evaluated with a single binary 'Yes/No' question.

Data analysis

Data were tabulated and analysed using Statistical Package for the Social Sciences (SPSS) Version 26.0. Categorical variables were described using absolute frequencies and percentages. Associations between demographic variables, knowledge level, attitude categories, and final binary acceptance outcomes were determined using Chi-square or Fisher's exact tests. Statistical significance was defined as a p-value < 0.05.

Ethical considerations

Ethical clearance was obtained from Muhimbili University of Health and Allied Sciences (MUHAS) (No. DA282/298/02L/444) and institutional permission from MNH (No. MNH/CRTCU/PERM/2025/017). Written informed consent was obtained from all participants. Confidentiality was maintained throughout, and data was used solely for research purposes.

Results

Participant characteristics

The study included 130 participants; 40.8% were aged 30-34 years, 52.3% had attained college or university education, 78.5% were married, 86.2% were employed or self-employed, and 43.1% had two or more children (Table 1).

Participants' knowledge of NHS

Only 36.9% (n=48) of the pregnant women had good knowledge, while 63.1% (n=82) had poor scores. Regarding screening intent, 86.2% of participants knew that all neonates require hearing tests, and 80.8% knew testing must precede speech development. However, 83.8% (n=109) were unable to identify valid objective screening methods (OAE/ABR), and 66.9%(n=87) reported the misconception that NHS is physically painful (Table 2).

Table 1. Participant characteristics (N=130)

Variable	Frequency n (%)
Age group (years) Mean: 31.78 ± 5.08	
20-24	11 (8.5)
25-29	31 (23.8)
30-34	53 (40.8)
35-39	25 (19.2)
40-44	10 (7.7)
Level of education	
None/Primary	23 (17.7)
Secondary	39 (30.0)
College/University	68 (52.3)
Occupational status	
Unemployed	18 (13.8)
Employed/ Self employed	112 (86.2)
Marital status	
Single/Others	28 (21.5)
Married	102 (78.5)
Parity (Number of children)	
None (First pregnancy)	30 (23.1)
One	44 (33.8)
Two or more	56 (43.1)

Table 2. Response to knowledge statements/questions regarding NHS (N=130)

Statement/Question	Correct Response n (%)	Incorrect / Don't Know n (%)
All newborns are required to have hearing screening.	112 (86.2)	18 (13.8)
Screening should occur within the first months of life. *	88 (67.7)	42 (32.3)
NHS minimizes delays in cognitive/educational milestones.	104 (80.0)	26 (20.0)
NHS detects hearing loss before speech development.	105 (80.8)	25 (19.2)
Initial NHS alone is NOT enough to confirm deafness.	81 (62.3)	49 (37.7)
NHS requires clinical follow-up (not a one-time test).	86 (66.2)	44 (33.8)
NHS is a non-painful clinical procedure.	43 (33.1)	87 (66.9)
NHS does not require an infant to be awake.	46 (35.4)	84 (64.6)
Known screening methods (OAE or ABR).	21 (16.2)	109 (83.8)

*Note: For timing, 'After speech development' = 28 (21.5%); 'At school age' = 14 (10.8%). Correct response = within first months of life.

Table 3. Distribution of participants' attitudes regarding NHS (N=130)

Attitude Statement	Disagree/Strongly Disagree n (%)	Neutral n (%)	Agree/Strongly Agree n (%)
Early detection allows effective clinical management.	4 (3.0)	10 (7.7)	116 (89.2)
NHS is an essential component of newborn care.	3 (2.3)	20 (15.4)	107 (82.3)
Screening must occur before hospital discharge.	20 (15.4)	31 (23.8)	79 (60.8)
NHS avoids long-term complications of hearing loss.	14 (10.8)	18 (13.8)	98 (75.4)
All infants should be screened regardless of risk status.	14 (10.8)	19 (14.6)	97 (74.6)
Hearing screening procedures are safe for my infant.	18 (13.8)	18 (13.8)	94 (72.3)
I would recommend NHS to other new mothers.	12 (9.2)	24 (18.5)	94 (72.3)
I support mandatory hearing screening for all newborns.	16 (12.3)	15 (11.5)	99 (76.2)
I am willing to pay out-of-pocket for NHS.	24 (18.4)	23 (17.7)	83 (63.8)

*Responses based on a 5-point Likert scale: 1 = Strongly Disagree to 5 = Strongly Agree.

Participants' attitudes toward NHS

A positive attitude was observed in 73.8% (n=96) of respondents. The value of early management was recognised by 89.2% (n=116) of participants. Willingness to pay out of pocket for screening services was supported by 63.8% (n=83) while 18.4% (n=24) explicitly disagreed with self-funding (Table 3).

Behavioural NHS acceptance and demographic associations

The acceptance rate for routine clinical screening was 85.4% (n=111). The primary motivation for screening was the benefit of early identification (62.2%). For the 14.6% (n=19) who rejected screening, the most identified barrier was a lack of sufficient information about the NHS (94.7%).

Higher education levels and employment were associated with greater knowledge (p=0.001; p=0.017) and positive attitudes (p<0.001; p=0.007). Higher knowledge levels were associated with positive attitudes (p=0.007). Acceptance of the screening was associated with education level (p<0.001), employment (p=0.006), and positive attitudes (p<0.001). However, knowledge levels had no statistical association with screening acceptance (p=0.121).

Discussion

This study shows a pronounced divergence between high acceptance of infant screening and low fundamental knowledge of objective testing methodologies in Tanzania. The good knowledge score (36.9%) observed in our study is lower than scores reported in the literature, where health literacy frequently exceeds 50%.[10,12] The difference observed could be due to the absence of national NHS protocols, inadequate infrastructure and lack of community health promotion campaigns on ear and hearing care.

Most pregnant women recognized the importance of early NHS to mitigate delays in speech development. Also, initial screening failure does not constitute definitive diagnosis deafness and acknowledged the necessity for diagnostic follow- up. The differentiation between screening and diagnosis from this cohort is incongruent with findings from Hong Kong, where approximately 80% of mothers assumed an initial 'pass' during screening guaranteed normal hearing. This increases the risk of loss to follow-up for late-onset hearing loss.[13]

In this study, over two-thirds of the participants thought that the objective screening tools cause pain and requires infant to be awake. This reflects a misconception about the physical nature of NHS and highlights the need for clinical education explaining that OAE and ABR tests are safe, rapid, non-invasive, and best performed during natural infant sleep.

The overall positive attitude rate (73.8%) and behavioural acceptance rate (85.4%) observed in this cohort are lower

than the 90% thresholds reported in the studies done in Saudi Arabia, Solomon Islands, South Africa and Nigeria.[8–10,12] The variation observed could be due to limited public exposure to audiological services.

The finding that 81.7% of participants with poor baseline knowledge accepted hearing screening for their newborns indicates that trust in clinical systems, and positive social influences, drive screening acceptance independently of clinical understanding. However, relying on unguided acceptance poses risks as without procedural knowledge, families may skip the diagnostic verification steps required if an infant fails the initial screening.

In this study, 63.8% of participants expressed willingness to pay out-of-pocket for NHS but this figure is lower compared to findings from Albania where self-funding willingness was 100%.[14] Because out-of-pocket costs present a barrier in resource-limited settings like Tanzania, universal tracking policies should integrate screening into standard, subsidized public perinatal care packages.

Study Limitation

The primary limitation of this study is its single-centre design at a national referral hospital, which likely over-represent urban and highly educated population relative to rural Tanzanian demographics. Therefore, the observed baseline knowledge, attitude and acceptance rates may not generalize to remote or primary healthcare settings. Multi-centre studies across diverse regional and rural facilities are needed to establish a comprehensive national baseline.

Conclusion

Acceptance and positive attitudes toward newborn hearing screening are high among the evaluated population, suggesting feasibility for the implementation of universal newborn screening programmes. However, deficits in procedural knowledge and persistent concerns about paediatric pain highlight a requirement for structured public health education. To optimize regional implementation, healthcare policies must integrate affordable screening services with targeted antenatal counselling to minimize loss to follow-up care.

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Authors' contributions: AAK: conception and design, analysis, interpretation of data and drafting of the article. GSM: conception and design, data collection, analysis and interpretation of data. SCL: study design and interpretation of data. SM: study design and interpretation of data. All authors have read and approved the manuscript.

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'Super El Niño' deepens hunger crisis in South Sudan – WFP

The already dire hunger crisis in South Sudan is becoming increasingly critical as violence, extreme weather and dwindling aid leave millions without enough food, the UN World Food Programme (WFP) warned on Tuesday.

Key points

- 7.8 million South Sudanese face high levels of acute food insecurity.
- El Niño is already threatening farming output.
- Sudan's war is driving more refugees and returnees into South Sudan.
- Funding shortages and access constraints threaten life-saving food assistance.

A further million vulnerable people could lose access to life-saving food and nutrition assistance by October without additional resources.

By Dominika Tomaszewska-Mortimer in Geneva

https://news.un.org/en/story/2026/09/1168334

Prevalence and impact of dual clinical practice in healthcare delivery systems in Juba, South Sudan: A cross-sectional survey

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ABSTRACT

Introduction: Dual clinical practice (DCP), the concurrent engagement of healthcare workers (HCWs) in public and private health sectors, is a widespread and yet under-quantified phenomenon across sub-Saharan Africa (SSA). In South Sudan, DCP is widely common, but no empirical baseline data have previously characterised its prevalence, patterns, and/or implications for health service delivery.

Method: A sequential mixed-methods, cross-sectional study conducted from April to May 2026 among 288 HCWs recruited from 20 purposively selected public and private health facilities in Juba. Quantitative data on DCP prevalence and associations with quality of care, productivity, absenteeism, ethical concerns, and patient care were analysed. Qualitative data from 22 key informant interviews and three focus group discussions provided contextual depth and analysed thematically using ATLAS.ti.

Results: DCP prevalence was 62.2% (95% CI: 56.3–67.7). Most respondents 80.2% (95% CI: 75.7–84.7) were primarily employed in the public-sector. Among those holding additional jobs, 27.4% (95% CI: 20.7–33.5) worked exclusively in public facilities, 33.0% (95% CI: 26.3–39.7) in private facilities, and 39.7% (95% CI: 32.4–47.5) in both sectors. Sex was associated significantly with DCP (χ^2=12.50, df=1, p<.001; Cramer's V=0.208), with male HCWs more likely to engage in DCP than female (71.7% vs 51.5%). DCP showed no association with quality of care (χ^2=0.56, p=.453), productivity (χ^2=0.72, p=.397), or absenteeism (χ^2=0.003, p=.956), but was significantly associated with ethical concerns and work-related challenges (χ^2=71.70, p=.021), reported by 71.9% DCP practitioners. Perceived effects on patient care were mixed, with 41.3% reporting positive, 37.8% negative, and 20.8% neutral).

Conclusion: DCP prevalence in Juba ranks among the highest reported in SSA, confirming multiple job-holding as a structural, normalised feature of South Sudan's health labour market. Evidence-informed workforce governance reforms, including salary restructuring and transparent regulatory frameworks, are required to address structural drivers of secondary employment and safeguard public healthcare integrity.

Keywords: prevalence, impact, dual clinical practice, healthcare workers, South Sudan.

Introduction

Dual clinical practice (DCP), variously termed moonlighting, locum practice, or multiple job holding (MJH), refers to the concurrent engagement of HCWs in both public and private health sector jobs.[1,2] It is increasingly recognised as a global healthcare workforce scenario, with no major difference reported in high-income versus low- and middle-income settings.[3] However, the prevalence ranging from 20% in Spain to over 90% in Ethiopia, and estimated at 77% in high-income countries (HICs) and 82% in low- and middle-income countries (LMICs).[4–6]

Across sub-Saharan Africa (SSA) and other LMICs settings, DCP is driven by low and irregular public-sector salaries, chronic underfunding of health systems, weak regulation, and high private-sector demand.[7,8] Weak enforcement and regulation allow DCP to expand, making it difficult to manage through bans alone.[5] Private health sector demand and opportunities for additional remuneration shape who engages in DCP.[9,10] DCP consequences are controversial.[11] However, supplementary income appears to support HCW retention, especially where governments cannot offer competitive salaries. Other studies describe gains in healthcare availability, skills, research productivity, and knowledge transfer.[12]

A study in Ethiopia showed that most specialist doctors reported they would leave the public health sector if DCP was prohibited.[1] In Iran, permission for DCP/MJH increased the probability of selecting a rural health facility for work.[12] Negative impacts include absenteeism, diversion of patients from public to private facilities, pilfering of public resources, informal payments, reduced quality of care (QoC), and professional conflicts of interest.[7]

In SSA, a review found absenteeism rates of 14% to 49%, with DCP identified as a cause in 75% of studies.[13] Patient diversion is not just theoretical. In Tigray, 20.3% of patients admitted to a public facility had been referred to a private clinic before their current admission, and nearly one-fifth of those diverted reported diversion by public-hospital workers.[14] Nigerian health service users and stakeholders reported late attendance, low commitment to public patients, and illegal practices linked to DCP.[15]

South Sudan's circumstances predispose to detrimental forms of DCP since its health system is understaffed, resource-constrained and fragile.[16] The country has about 7.6 HCWs per 10,000 population, far below the WHO threshold of 44.5–45.5 per 10,000 needed for universal health care (UHC) delivery.[16,17]

International practitioners working in South Sudan describe the Human Resources for Health (HRH) as insufficient, and conflict and political instability make sustained system strengthening difficult. Despite the scale of the problem, no published data exist on DCP.[7,18] This evidence gap limits policymakers' ability to design informed workforce governance interventions.

This study, conducted in Juba[3,10], addresses this gap by estimating DCP prevalence among HCWs in Juba. It assesses the impact on healthcare delivery systems.

Method

Study design and setting

A mixed-methods, cross-sectional, explanatory sequential study design was conducted in Juba, South Sudan, from April to May 2026. Juba hosts the country's main tertiary referral facilities, a substantial number of private hospitals and clinics, the largest concentration of skilled HCWs, and a high density of health sector NGOs, making it an ideal site for studying DCP.

Sampling and participants

Twenty health facilities (10 public and 10 private) were selected via stratified sampling by facility type (primary, secondary, and tertiary levels) across three administrative blocks of Juba city (Kator, Juba, and Munuki). Within facilities, HCWs were enrolled via systematic random sampling, with proportionate allocation to facility staffing numbers to ensure equity across health professional cadres. Inclusion criteria comprised active clinical involvement and at least five years of professional experience. Administrative-only staff were excluded.

A sample of 289 participants was calculated using Fisher's formula for cross-sectional prevalence studies, assuming a DCP prevalence of 50% (to maximise sample size), a precision of 5%, a 95% confidence level, and an adjustment for the design effect of 1.5. Of the 289 enrolled participants, 288 completed the survey. For the qualitative component, purposive sampling was applied to select 22 key informants (HCWs of mixed cadres, Ministry of Health Directors General, parliamentarians, academia, professional bodies, and medical council officials) and three focus groups (service users, opinion leaders, and community members), drawn from the three blocks of Juba city.

Data collection

Quantitative data were collected using a structured, pretested, self-administered questionnaire covering sociodemographic profiles, employment, primary and secondary employment sectors, income levels, motivation, and perceived impact on QoC, productivity, absenteeism, ethical challenges, and patient care. Qualitative data were gathered through semi-structured key informant interviews and focused group discussion, audio-recorded, transcribed, and analysed in ATLAS.ti version 7.

Table 1. Prevalence of dual clinical practice (N= 288)

Variable	n (%)	(95% CI)
Currently/previously in public-sector	231(80.2)	(75.7–84.7)
No public-sector employment	57(19.8)	(15.3–24.3)
Engaged in additional/ secondary job (DCP)	179(62.2)	(56.3–67.7)
No secondary employment	109(37.8)	(32.3–43.8)
Secondary job sector		
Public only	49(27.4)	(20.7–33.5)
Private only	59(33.4)	(26.3–39.7)
Both public and private	71(39.7)	(32.4–47.5)

Statistical and qualitative analysis

Quantitative data were imported and analysed in SPSS version 26. Frequencies, proportions, and 95% CI computed for all variables. Chi-square tests of independence were used to assess bivariate associations between DCP and participant characteristics and impact indicators, with Cramer's V reported as the effect-size measure. Statistical significance was accepted at P≤0.05. Qualitative data underwent thematic analysis, with themes quotes inductively arrived at and verified against quantitative findings.

Ethical considerations

Ethical clearance was obtained from the Ministry of Health Research Ethics and Review Board (MOH-RERB - MOH-RERB/A/030/2026). Written informed

Table 2. DCP prevalence by participant characteristics (bivariate analysis)

Variable	DCP: No n (%)	DCP: Yes n (%)	Total n (%)	χ^2 (p-value)	Cramer's V
Sex				12.50 (<.001)	0.208
Female	66 (48.5)	70 (51.5)	136 (47.2)		
Male	43 (28.3)	109 (71.7)	152 (52.8)		
Age Group				1.04 (0.308)	0.060
20–39 years	73 (36.0)	130 (64.0)	203 (70.5)		
40 years &above	36 (42.4)	49 (57.6)	85 (29.5)		
Marital Status				0.78 (0.378)	0.052
Single	44 (41.1)	63 (58.9)	107 (37.2)		
Married	65 (35.9)	116 (64.1)	181 (62.8)		
Facility Ownership				0.05 (0.832)	0.013
Public	65 (37.4)	109 (62.6)	174 (60.4)		
Private	44 (38.6)	70 (61.4)	114 (39.6)		
Total	109 (37.8)	179 (62.2)	288(100)		

consents obtained from all participants. Participation was voluntary, and data anonymised, password-protected, and accessible only to the principal investigator.

Results

Sociodemographic and participant profile

Of the 288 participants, 52.8% (95% CI: 46.5–58.7) were male, and 47.2% (95% CI: 41.3–53.5) were female. HCWs were predominantly young: 39.9% were aged 20–29 years and 30.6% were aged 30–39, accounting for 70.5% of our sample under 40 years old. 56.9% (95% CI: 51.4–62.5) were married, and 60.8% had fewer than five dependents.

Diploma-level qualifications were held by 52.1%, and bachelor's degrees by 32.6%. Nurses comprised 27.4%, clinical officers 16.3%, medical laboratory technicians 15.6%, and doctors 14.9%. Public-sector employment dominated, with 60.4% (95% CI: 54.9–66.0) working in public facilities.

Table 3. Impact of dual clinical practice on healthcare service delivery

Variables/Impact of DCP	No	Yes	Total n (%)	χ^2 (p-value)	Cramer's V
Do you think DCP/MJH affect quality of care or services in public sector facilities?				0.56 (0.453)	0.044
No	42(35.3)	77(64.7)	119(41.3)		
Yes	67(39.6)	102(60.4)	169(58.7)		
Does DCP/working in more than one job affect productivity in your primary job (public sector)?				0.72 (0.397)	0.050
No	50(40.7)	73(59.3)	123(42.7)		
Yes	59(35.8)	106(64.2)	165(57.3)		
Have you ever faced/experienced work-related challenges due to dual clinical practice or having more than one job? Including ethical issues				0.13 (0.717)	0.021
No	32(39.5)	49(60.5)	81(28.1)		
Yes	77(37.2)	130(62.8)	207(71.9)		
In your opinion, what impact does DCP or having more than one job have on patient's care?				4.59 (0.101)	0.126
Negative	44(40.4)	65(59.6)	109(37.8)		
Positive	37(31.1)	82(68.9)	119(41.3)		
Neutral	28(46.7)	32(53.3)	60(20.8)		
Does dual clinical practice/multiple job holdings lead to healthcare worker's absenteeism and/or reduced working hours in public health sector?				0.003 (0.956)	0.003
No	32(38.1)	52(61.9)	84(29.2)		
Yes	77(37.7)	127(62.3)	204(70.8)		
Total	109(37.8)	179(62.2)	288(100)		

Overall DCP prevalence

Among 288 respondents, 80.2% (95% CI: 75.7–84.7) reported current or past employment in the public sector as their primary job. Of these, 62.2% (95% CI: 56.3–67.7) reported holding an additional job outside their primary public employment. Only 37.8% (95% CI: 32.3–43.8) revealed no secondary work (Table 1).

Distribution of secondary employment sectors

Among the 179 (62.2%) respondents who reported DCP, secondary employment sectors were diverse. While 33.0% worked exclusively in private health facilities, the largest subgroup (39.7%) worked in both public and private settings. Only 27.4% confined their secondary job to additional public health-sector roles. This tripartite distribution, public-on-public, public-on-private, and both (mixed), endorses that lines drawn between sectors are permeable and routinely traversed.

DCP by participant characteristics

The only sociodemographic variable with a statistically significant association with DCP was sex (χ^2 = 12.50, df = 1, p < .001; Cramer's V = 0.208) – Table 2. Male HCWs reported DCP at 71.7% compared with 51.5% among females. Other bivariate associations, such as age group (χ^2 = 1.04, p = 0.308), marital status (χ^2 = 0.78, p = 0.378), number of dependents (χ^2 = 0.04, p = 0.849), educational qualification (χ^2 = 5.39, df = 3, p = 0.145), professional role (χ^2 = 6.81, df = 6, p = 0.339), and health facility ownership (χ^2 = 0.05, p = 0.832), were non-significant, showing that DCP is nearly universally distributed across health workforce strata.

Impact of Dual Clinical Practice on Healthcare Service Delivery

The following sections summarise quantitative associations between DCP and five impact domains, contextualised with findings from the 22 KIIs and 3 FGDs. The analysis showed mixed consequences of DCP for healthcare service delivery, with most associations not reaching statistical significance (Table 3).

Quality of Care (QoC)

QoC in public facilities was not statistically associated with DCP (χ^2 = 0.56, df = 1, p = 0.453, Cramer's V = 0.044). Among HCWs who believed DCP affects quality, 60.4% engaged in DCP, and among those who did not, 64.7% were DCP practitioners. The non-significant associations suggest that cross-facility perceptions of quality impact are numerous; several informants described DCP as leading to "*divided attention,*" while others attributed improved service responsiveness to healthcare workers' DCP health sector engagement.

Productivity in primary job

Productivity in primary public sector jobs showed no significant association with DCP (χ^2 = 0.72, df = 1, p = 0.397, Cramer's V = 0.050). Among HCWs who believed productivity was affected, 64.2% engaged in DCP. Among those not reporting productivity effects, 59.3% were DCP practitioners. Views of managers varied from "*reduced attendance and attention to public patients*" to practitioners *"were among their most motivated and skilled staff*".

Absenteeism and reduced working hours

Absenteeism and reduced working hours in the public sector showed no significant association with DCP (χ^2 = 0.003, df = 1, p = 0.956, Cramer's V = 0.003). Among HCWs who believed DCP leads to absenteeism, 62.3% were engaged in DCP, but among those who did not, 61.9% were dual practitioners. Despite this lack of statistical association, "*absenteeism was the most frequently cited concern"* in FGDs and KIIs. Community members and facility managers consistently described staff absences during scheduled public working hours as "*a visible and recurring challenge linked to secondary employment*".

Ethical concerns and work-related challenges

Ethical concerns and work-related challenges were significantly associated with DCP (χ^2 = 71.70, df = 1, p = 0.021, Cramer's V = 0.021). Among HCWs who reported experiencing such challenges (71.9%), 62.8% were engaged in DCP compared with 60.5% among those not reporting challenges.

Ethical concerns identified included conflicts of interest between public roles and private income incentives, prioritisation of private over public patients, informal referrals and patient diversion, informal fees charged in public facilities, and stock-outs arising from resource diversion to private settings. Qualitative analysis identified "*a coherent theme of ethical erosion associated with DCP in the absence of regulatory oversight"*. Informants from professional bodies and academia highlighted: *"the absence of a code of conduct for dual practitioners as a structural governance failure"*.

Patient care perceptions

Overall perceptions of DCP's impact on patient care were mixed and non-significant (χ^2 = 4.59, df = 2, p = 0.101, Cramer's V = 0.126). Among HCWs with positive perceptions of DCP's effect on patient care, 68.9% were in DCP themselves. Of those with negative perceptions, 59.6% were DCP practitioners, and those with neutral perceptions, 53.3% engaged in DCP.

This reflects differences: a substantial minority (37.8%) viewed DCP as detrimental to patient care in public facilities, while 41.3% regarded it as positive, primarily because dual practitioners maintained access to superior diagnostic equipment, medications, and professional networks through their private sector engagement.

Discussion

Prevalence and structural nature of DCP

The DCP prevalence of 62.2% in Juba places South Sudan at the upper end of SSA estimates and is consistent with the LMICs pattern, where more than half of public-sector healthcare providers report secondary employment.[12] This finding confirms that DCP in Juba is not up to a minority of motivated opportunists, but a structural and normalised workforce adaptation to systemic conditions, notably the profound gap between public and private sector remuneration potential.

The fluid distribution of secondary employment across public-only (27.4%), private-only (33.0%), and mixed (39.7%) settings mirrors patterns documented in Cambodia, South Africa, Brazil, and China, where providers cross institutional boundaries[8]. The high proportion working in both sectors simultaneously indicates not only supplementary income seeking but also a systematic reallocation of clinical labour across the public and private divide, with potentially important consequences for public sector availability and patient equity.

The Sex/Sex disparity, with male HCWs significantly more likely to engage in DCP (71.7% vs 51.5%), echoes findings from Uganda, Nigeria, and Ethiopia, where greater male mobility, fewer domestic care obligations, and stronger access to private-sector professional networks are associated with higher DCP participation.[26] The non-significance of all other bivariate associations reflects the cross-cutting nature of DCP in this context: economic pressure is sufficiently universal that it transcends age, marital status, professional role, and facility ownership as explanatory limits.

Limited associations between DCP and technical quality or productivity

The non-significant associations between DCP and quality of care or productivity are consistent with findings from Uganda[24] and Nigeria, where perceptions of quality impact were divergent and not statistically substantiated.[32] In South Sudan's fragile context, where the baseline quality of public health services compromised by structural underfunding and Human Resources for Health (HRH) shortages, detecting a marginal quality impact from DCP may require more sensitive longitudinal instruments than cross-sectional surveys allow.

This is consistent with the depletion-enrichment framework proposed by Campion, Caza and Moss (2019),[33] in which dual practice outcomes are non-linear. Some practitioners experience resource depletion, while others experience knowledge and skill enrichment through cross-sector exposure. Without longitudinal data and objective quality metrics, the net effect cannot be estimated.

Ethical concerns as a central impact

The significant association between DCP and ethical concerns (p = 0.021) resonates with the literature identifying conflicts of interest, patient diversion, and informal payments as the most often reported adverse consequences of unregulated dual practice.[16] In the absence of monitoring mechanisms, accountability, and professional standards for dual practitioners, these ethical tensions operate without institutional remedies. Principal-agent theory provides a useful explanatory lens at play: DCP creates a multi-principal setting in which HCWs balance obligations to their public sector employer, their private sector clients, and their professional ethics. Without aligned incentives and enforceable contracts, the agent's (private) interests systematically diverge from the public (principal's) goals.

The absenteeism paradox

The paradox between the quantitative non-significance of absenteeism (p = 0.956) and its qualitative prominence as a community and management concern reflects a measurement problem common in DCP research. Self-reported data are subject to social desirability bias: HCWs are unlikely to report their own absenteeism on a survey. The qualitative record is consistent across managers, community leaders, and FGD participants, suggests that absenteeism remains a real and visible governance

challenge even where it does not manifest as statistically significant in the survey instrument.

Contextual comparison with LMIC evidence

The findings are consistent with, though distinctive within, LMIC literature. In Ghana and Kenya, dual clinical practitioners discriminate care quality in the public sector towards private patients, while in Uganda and Cambodia, DCP is associated with compromised public service performance.[36] In contrast, studies from Spain, Portugal, and Thailand, contextually managed with balanced regulatory frameworks, documented the net positive impact of DCP, including specialist retention and knowledge transfer.[37] South Sudan's experience of unregulated DCP more closely mirrors Uganda and Kenya than Europe.

Limitations

The cross-sectional design precludes causal inference. Self-reported income, employment, and impact data may be subject to social desirability bias, particularly for sensitive domains such as absenteeism and ethical conduct. The sample, confined to Juba's urban and semi-urban facilities, limited generalisability to rural or conflict-affected areas of South Sudan.

Conclusion

This study records both the first baseline of DCP and an assessment of its effects on service delivery in South Sudan. High prevalence, fluid distribution across health sectors, and consistent sex disparity reveal that DCP is systemic rather than exceptional within the health labour market. These findings provide policymakers in South Sudan, and in comparable fragile health systems where DCP remains prevalent but poorly governed, with the information needed to design such reforms.

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Research Article

Prevalence of hearing loss in children presenting with speech and language delay at a Tertiary Hospital, Tanzania

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ABSTRACT

Introduction: Speech and language development is essential in childhood. Delay adversely affects psychosocial and educational outcomes, with hearing loss (HL) being a major contributing factor. In Tanzania, population-based data on childhood speech and language disorders are unavailable. This study provides baseline evidence to guide future research on the national burden of speech and language delay.

Method: A descriptive cross-sectional study was conducted at Muhimbili National Hospital from January 2023 to December 2025. Children presenting with speech and language delay or regression who met the eligibility criteria were recruited. Demographic and clinical information was collected, and participants underwent otoscopy, tympanometry, and development-appropriate audiological assessment. Associations between hearing status and selected clinical characteristics were assessed using appropriate statistical tests.

Results: Fifty-nine children were included; 43 (72.9%) had hearing loss (95% CI: 59.7–83.6%). The median age was 4.0 years (IQR3.25-5:00). Otoscopic and tympanometry findings suggestive of middle-ear pathology were not significantly associated with hearing status.

Conclusion: Hearing loss was common among children presenting with speech and language delay at this tertiary hospital. These findings support the importance of timely audiological assessment in this population. Further studies involving larger and more representative populations are needed to establish the broader burden of hearing loss among children with speech and language delay in Tanzania

Keywords: prevalence, children, hearing loss, speech and language delay, Tanzania

Introduction

The first years of life are crucial for speech and language development.[1] The process relies on an intact auditory system, adequate audiovisual stimulation, and sufficient exposure to spoken language. Children unable to perceive sound are therefore at risk of impaired language development.[2]

Speech refers to verbal language production, while language involves cognitive processing of communication.[3] Speech delay is suspected when spoken language is absent or less intelligible than expected for age. By two years, children should use about 50 words and combine them into meaningful two-word phrases.[4] Language delay occurs when children cannot effectively use acquired vocabulary. Key milestones include saying "mama" or "dada" by the end of the first year and making requests and following familiar one-step instructions by 18 months.[3]

Yoshinaga-Itano et al. found that hearing-impaired children identified by six months achieved better receptive and expressive language outcomes those diagnosed later.[5] Fulcher et al. similarly showed that children identified and treated by 12 months achieved better outcomes compared to normal-hearing peers by five years, whereas delayed intervention resulted in poorer outcomes.[6]

Speech and language delay may indicate hearing loss (HL).[7] Speech and language delay is among the most common developmental disorders affecting children aged 3–16 years, with an estimated prevalence of 3–10% worldwide.[8,9] However, prevalence remains uncertain due to under-recognition. HL severe enough to affect speech and language occurs in approximately 1–6 per 1,000 children in high-income countries.[10] Persistent speech delay beyond 3 years affects 4–5% of children in Germany, while prevalence ranges from 2–15% among those aged 4–6 years.[11] In the United States, prevalence ranges from 2.3% to 19% among children under 5 years.[12] Despite this burden, recognition remains inadequate, with low identification rates among parents, healthcare providers, and educators.[13,14]

Evidence from sub-Saharan Africa remains limited despite a significant burden of communication disorders.[13] Nwosu et al. reported communication impairments in 8–30% of Nigerians, while speech and language disorders affect approximately 6% of South African children.[15] Limited access to auditory and verbal rehabilitation may cause affected children to lag behind peers by up to 7.5 years by adolescence.[12] In Tanzania, population-based data on childhood speech and language disorders are unavailable. This study provides baseline evidence from Muhimbili National Hospital (MNH) to guide future research on the national burden of speech and language delay.

Method

This descriptive cross-sectional study was conducted at the ENT Department at MNH from January 2023 to December 2025. Participants were children aged 18 months to eight years presenting with speech and language delay or regression. Children with primary developmental delay disorders were excluded.

Ethical approval was obtained from the Muhimbili University of Health and Allied Sciences Ethics and Research Committee. Participants were recruited using convenience sampling. After informed assent and parental/guardian consent, history focusing on HL and physical examination, including otoscopy, were performed. Data were collected using a standardised form followed by audiological assessment.

Children below four years underwent tympanometry and click Auditory Brainstem Response (ABR) testing, while those aged ≥4 years underwent Conditioned Play Audiometry (CPA) or Pure Tone Audiometry (PTA) based on developmental age and cooperation. ABR was performed when cooperation was inadequate or results were inconsistent.

Tympanometry was performed using a 226 Hz probe and click ABR was performed accordingly, with hearing thresholds determined using waves I, III, and V and interpreted alongside tympanometry findings.

CPA assessed hearing thresholds at 0.5, 1, 2, and 4 kHz. PTA was performed using an Interacoustics AC33 clinical audiometer. Children diagnosed with HL were referred to the ENT clinic for further management. Freeman-Halton extension of Fisher's exact test was used for statistical significance and p-value of less than 0.05 was considered to be statistically significant.

Results

Demographic characteristics of participants

The median age was 4.0 years (interquartile range 3.25–5.00; range 18 months to 8 years). Females comprised 50.8% of participants (Table 1).

Prevalence of hearing loss

Overall prevalence of HL was 72.9% (43/59) with a 95% Confidence Interval (CI) of 60.9%–84.9% (Standard Error = 6.1%).

The median age of presentation of participants with HL was 4.00 years (IQR 3.25-5.00) and without HL was 4.30 (IQR 3.25-5.00).

Prevalence of HL by age and sex

Females comprised 50.8% of participants and 55.8% of the participants with HL. Among participants with normal hearing, 62.7% were males; however, this difference was not statistically significant (p-value 0.200) Table 2.

Hearing loss prevalence by age range and sex

Among the female participants, most of those with HL were in the age range of 2-3 and 3-4 years, followed by 4-5 years, while among male participants, most were in the age range of 4-5 years, followed by the age range of 3-4 years (Figure 1).

Table 1. Demographic characteristics of participants

Characteristic	Overall Participants N=59
Age in years (Median, IQR)	4.00 (3.25-5.00)
Sex:	
Female	30 (50.8%)
Male	29 (49.2%)

Table 2. Prevalence of hearing loss by age and sex

Characteristic	Normal hearing, N=16	HL, N= 43	p-value
Age in years (Median, IQR)	4.30 (3.38-5.00)	4.00 (3.25-5.00)	0.700
Sex			
Females	6 (37.5%)	24 (55.8%)	0.200
Males	10 (62.7%)	19 (44.2%)	

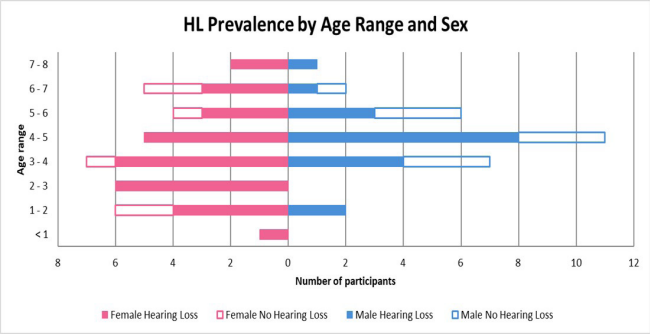


Figure 1. Prevalence of HL by age in years and sex

Hearing thresholds by sex

Among male participants with HL (n=19), the most common degree was

mild (42.1%), followed by severe (31.6%). In female participants with HL (n=24), moderate HL was most common (33.3%), followed by mild HL (25.0%). Mild HL was common among participants with HL overall (32.6%) (Table 3).

Types of HL

The most common middle ear finding was a bulging tympanic membrane, observed in 37.2% of participants with HL. Among participants with type B tympanograms, 48.8% had varying degrees of HL in the right ears and 44.2% in the left ears. The Freeman-Halton extension of Fisher's exact test showed no significant association between otoscopic and tympanometric features suggestive of Otitis Media with Effusion (OME) and HL in either the right or left ear - Table 4.

Discussion

Speech and language development depends on intact auditory, neurological, and psychological systems. This study described demographic characteristics and HL degree among children presenting with speech and language delay.

A total of 59 participants were recruited, with a median age of 4.0 years (interquartile range 3.25–5.0 years), consistent with previous studies.[11–15] Females comprised 30 (50.8%) and males 29 (49.2%). Although females represented a slightly higher proportion of participants with HL (55.8%), the difference was not statistically significant (P = 0.200). The prevalence of HL was 72.9%, higher than the 13.3% reported in other studies.[13,14] This may reflect the referral nature of MNH, where more severe cases are managed.

Most participants had mild HL (32.6%), followed by moderate HL which accounted for 25.6%. Severe HL was revealed in 23.3% of participants with HL. These findings are comparable with previous reports showing mild to moderate HL in 42.1% and severe HL in 11.0% of children with speech delay.[10]

Otoscopic findings suggestive of OME were common, affecting 25 right and 23 left ears, while tympanic membrane perforations and retractions were uncommon. Most OME cases had mild to moderate HL; however, OME was not significantly associated with HL.

Conclusion

The prevalence of HL among children aged 18 months to 8 years presenting with speech and language delay was 72.9%. Mild to moderate and severe HL were the most common degrees identified. OME was not significantly associated with HL. Hearing assessment is recommended for all children presenting with speech and language delay to enable early diagnosis and intervention.

Table 3. Hearing loss severity by sex

HL Level	Males N=19	Females N=24	Total with HL (N=43)	Proportion of total participants (N=59)
Mild	8 (42.1%)	6 (25.0%)	14 (32.6%)	23.7%
Moderate	3 (15.8%)	8 (33.3%)	11 (25.6%)	18.6%
Moderately Severe	2 (10.5%)	3 (12.5%)	5(11.6%)	8.5%
Severe	6 (31.6%)	4 (16.7%)	10(23.3%)	16.9%
Profound	0 (0.0%)	3 (12.5%)	3(7.0%)	5.1%
Total	19 (100%)	24 (100%)	43(100.0%)	72.9%

Table 4. Otoscopy and tympanometry findings

Characteristic	Overall, N= 59	Normal hearing, N=16	HL, N=43	p-value
Right TM appearance				
Normal	36 (61.0%)	12 (75.0%)	24 (55.8%)	
Bulging	20 (33.9%)	4 (25.0%)	16 (37.2%)	0.441
Inflamed	1 (1.7%)	0 (0%)	1 (2.3%)	
Perforated	2 (3.4%)	0 (0%)	2 (4.7%)	
Left TM appearance				
Normal	37 (62.7%)	12 (75.0%)	25 (58.1%)	
Bulging	20 (33.8%)	4 (25.0%)	16 (37.2%)	0.548
Perforated	1 (1.7%)	0 (0%)	1 (2.3%)	
Retracted	1 (1.7%)	0 (0%)	1 (2.3%)	
Right tympanogram				
A	34 (57.6%)	12 (75.0%)	22 (51.2%)	0.141
B	25 (42.4%)	4 (25.0%)	21 (48.8%)	
C	0 (0%)	0 (0%)	0 (0%)	
Left tympanogram				
A	36 (61.0%)	12 (75.0%)	24 (55.8%)	0.224
B	23 (39.0%)	4 (25.0%)	19 (44.2%)	
C	0 (0%)	0 (0%)	0 (0%)	

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Liver abscess in a child: A case report

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ABSTRACT

Liver abscess is rare but carries a high risk to life. Risk factors include low immunity and malnutrition. Infection usually reaches the liver through blood, penetrating trauma, and spread from intra-abdominal conditions such as ruptured appendicitis or diverticulitis. An 18-month-old boy presented with fever and abdominal pain for four weeks, progressive abdominal distension for two weeks, and anorexia and vomiting for ten days. On examination, he looked very sick with marked loss of weight, pale but not jaundiced. He was febrile and tachycardic, with abdominal distension and tenderness in the right upper quadrant, and a palpable liver edge at five centimetres below the costal margin. A CT abdominal scan was done and showed a large liver abscess. Laparotomy was done through a Kocher incision, and the abscess was drained. The pus showed no growth on culture. Ultrasonography is considered the main diagnostic tool for liver abscess. However, ultrasound gave a misleading initial diagnosis, which may reflect the need for more training and experience. Radiological assessment plays an important role in the diagnosis. Therefore, improvement in radiological interpretation and experience would aid the diagnostic process.

Keywords: liver abscess, child liver abscess, radiological assessment, St. Kizito Medical Centre, South Sudan

Introduction

A liver abscess is rare but carries a high risk to life. Risk factors include low immunity status, malnutrition, and comorbidities such as diabetes mellitus. Four main groups of organisms can cause liver abscess: bacteria, fungi, protozoa, and parasites.[1] Although falling, the mortality rate remains between 10% and 20%.[2]

Infection usually reaches the liver by haematogenous spread, inoculation through penetrating trauma, or blunt trauma, and spread from an intra-abdominal condition such as ruptured appendicitis or diverticulitis. However, about half of cases nowadays are due to biliary system infections.[2] In children, liver abscess occurs more often in males than females, but there is no clear explanation for this difference. It occurs more commonly in the right lobe of the liver.[3]

Children with liver abscess usually present with nonspecific symptoms of fever, chills, and abdominal pain. On physical examination, there is usually right hypochondrial tenderness, and the liver may be enlarged.[4] The diagnosis is made by clinical evaluation and radiological imaging. Prognosis depends on the

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time from diagnosis to onset and the quality of care and management.[5]

Treatment options vary according to the size of the abscess and include conservative management with a long course of antibiotics alone, percutaneous drainage, ultrasound-guided aspiration, and open surgery.[6]

Case report

The patient was seen and managed at Saint Kizito Medical Centre in Juba, South Sudan. An 18-month-old boy presented with fever and abdominal pain for four weeks, progressive abdominal distension for two weeks, anorexia and vomiting for ten days.

Initially, the child was taken to a clinic with fever, abdominal pain, and loose stool and was diagnosed with malaria and gastroenteritis. Oral antimalarials and antibiotics were given for five days, but without improvement, and the intermittent fever continued. A week later, the child was taken to a surgeon who requested an abdominal ultrasound scan and complete blood count (CBC) (Table 1). A hepatoblastoma was diagnosed.

They were told that the child had a malignant liver and would need a liver transplant outside the country. Resources for this were unavailable. Intravenous antibiotics (a third-generation cephalosporin and metronidazole) were given.

The family took the child to a paediatrician for another opinion. A CBC, malaria test, CT abdominal scan and alpha-fetoprotein were requested. CBC showed severe anaemia (7.1g/dl) and a very high WBC count (Table. 1). The CT scan showed a large liver abscess (about 300 ml) at segment VII (i.e. the extreme upper right) (Figure 1). The alpha-fetoprotein was negative. Stool analysis was mucoid with numerous pus cells. Hepatitis B and C virus tests and an HIV test were negative.

On examination the child was very sick with marked loss of weight, pale but not jaundiced. He was febrile with temperature of 39°C, and tachycardia (a pulse rate of 140 beats per minute), abdominal distension, a tender right upper quadrant, and palpable liver edge at 5 centimetres below the costal margin.

Table 1. Patient Complete Blood Count (CBC) profile

Parameter	10 days pre-operative	4 days pre-operative	4 days post-operative	4 weeks post-operative	Normal range	Units of measurement
WBC	16.7	32.4	12.4	9.5	4.0 – 10.0	10^9/L
Lymphocytes	5.1	5.7	5.100	5.2	0.8 – 4.0	10^9/L
Mixed Cells	1.7		1.0	0.7	0.1 – 1.5	10^9/L
Granulocytes	9.9		6.3	3.6	2.0 – 7.0	10^9/L
Lymphocytes	30.5		41.2	54.5	20 – 40	%
Mid-sized white blood cell count.	10.3		8.3	7.4	3 – 15	%
Granulocytes	59.2	26.5	50.5	38.1	50 -70	%
Red blood cell count	3.11	5.0	5-00	4.55	4.00 – 5-50	10^12/L
Haemoglobin	7.1	10.6	12-7	12.5	13.0 – 18.0	g/dl
Haematocrit	21.4	35.2	35.5	33.1	40-0 – 54.0	%
MCV	68.1	72.4	70.9	72.7	80.0 – 100	fL
MCH	26.2	22.1	25.4	27.5	27.0 – 34.0	pg
MCHC	34.2	30.2	35.8	37.8	32.0 – 36.0	g/dl
RDW-CV	0.227		0.226	21.9	11.0 – 16.0	%
RDW-SD*	56.7		56.2	55.9	35-0 – 56.0	fL
Platelets	517	535	125	274	150 – 450	10^9/L
MPV	8.6		8.9	7.9	6.5 – 12.0	fL
PDW	15.5		15.9	16.0	15.0 – 17.0	Absolute
Plateletcrit	0.445		0.111	0.218	0.108 – 0.282	%

*Red Cells Distribution Width – Standard Deviation

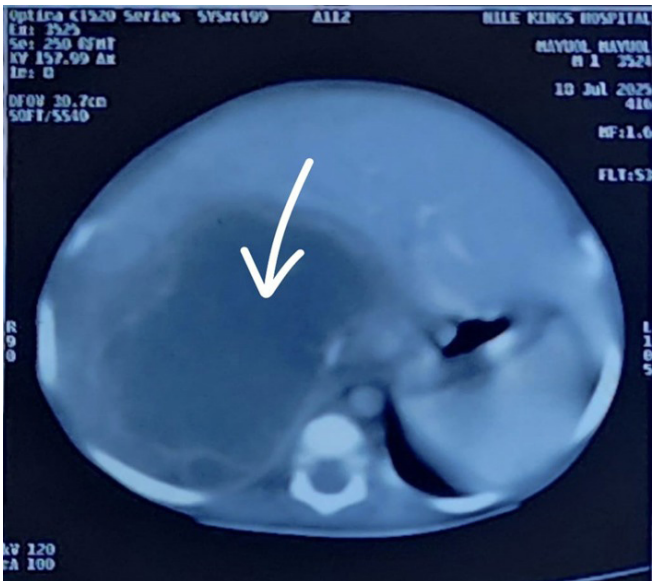


Figure 1. CT abdomen showing large hepatic abscess at segment VII (Photo credit - John Chol)

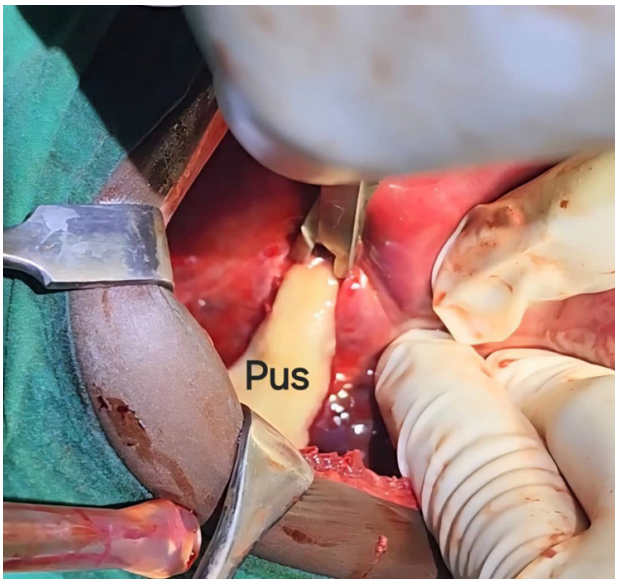


Figure 2. Intraoperative picture showing thick pus from the liver. (Photo credit - John Chol)

Liver function tests showed an increased serum alkaline phosphatase (ALP) (118.2 IU/l, normal value 26 – 117 IU/l); renal function tests were normal, but electrolytes showed low serum potassium (2.3 mmol/l, normal 3.5 -5.5 mmol/l) and low serum chloride (87.9 mmol/l, normal 95 – 115 mmol/l.

A decision was made to drain the abscess based on its size and unsatisfactory response to antibiotics over five weeks. The child received two units of blood transfusion before the laparotomy. Laparotomy was done through a Kocher incision, and a large abscess was drained of approximately 300 mL of thick yellowish pus (Figure 2). Intravenous antibiotics continued, and because of blood loss during surgery, the child was transfused with another two units of blood on postoperative days two and three.

During the first postoperative day, the child remained febrile with mild vomiting and developed a cough on day four postoperatively. The CBC on day four showed a reduction in the leucocyte count (Table. 1).

The child dramatically improved. His appetite returned, as did his social interactions. The abdominal pain and swelling subsided gradually within the first week post-surgery. He was discharged from the hospital on the 19th postoperative day with satisfactory wound healing.

Follow-up four weeks later showed the child to be well with a healthy surgical scar and no abnormal signs. CBC was normal (Table. 1). The prognosis was considered very good at this time. Long-term follow-up was done at 6-month and 12-month intervals; the child was very well with normal developmental milestones.

Discussion

The incidence of liver abscess worldwide is very rare, including in South Sudan, which contributes to limited experience in diagnosis and management. It often presents with nonspecific symptoms, making clinical diagnosis difficult. Reaching a clear diagnosis is therefore based on radiological imaging.[7] Due to its availability, affordability, and non-invasiveness, ultrasonography is considered the main diagnostic tool.[8] However, in our case, ultrasound gave a misleading diagnosis, suggesting the need for more training and experience.

There are many risk factors for liver abscess, and their identification plays an important role in clinical judgment. Our case was diagnosed initially with gastroenteritis, and this may have predisposed to infection with gastrointestinal pathogens via the haematogenous route.[4]

Studies showed that poor hygiene and prolonged exposure of a child to a pathogen were etiological factors among different paediatric age groups.[9] Also, in light of the clinical picture, the duration of the symptoms, and the high WBC count, a diagnosis of sepsis should be considered as a predisposing factor for developing liver abscess in this child.[9,10] Immunological workup (e.g., testing of the

complement system and CD4 and CD8 lymphocytes) was not possible because of limited resources. With poor radiological facilities and expertise, a careful clinically based decision is crucial.

Studies suggest treating a small liver abscess with antibiotics alone.[10] In our case, the decision for surgical drainage was made given the inadequate response to a prolonged course of antibiotics and the large size of the abscess. Studies suggest that large abscesses benefit more from surgical drainage.[2,11]

Antibiotic therapy is essential in the management of liver abscess. Our child was treated with intravenous third-generation cephalosporin and metronidazole in the pre-operative and perioperative periods and continued post-operatively for two weeks, as supported by other studies.[9,12, 13]

Postoperative complications are often very common in a patient with liver abscess.[11] Our child developed fever on the first postoperative day, with vomiting and a mild cough on the fourth postoperative day. Paracetamol IV was initiated for fever, and promethazine syrup was given for vomiting, along with a cough syrup.

Anaemia is common in liver abscess,[14] and our child was transfused in both preoperative and postoperative periods.

Bacterial culture of the pus was negative, as with most liver abscesses,[15] probably because of prior antibiotic use.[10]

Conclusion

Liver abscess in paediatrics is rare but should be considered in a child who presents with nonspecific symptoms and abdominal distension even in the absence of risk factors.

Radiological assessment plays an important role in diagnosis; therefore, improved radiological interpretation and experience would aid the diagnostic process.

Open surgery (incision and drainage) of liver abscess is essential, especially in a large abscess.

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Limitations: A single case: a series would be more informative.

Conflicts of interest: None.

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South Sudan: Unicef Reaches Communities Cut Off By Conflict in Jonglei State

14 September 2026 UN News Service

The UN Children's Fund (UNICEF) and partners have delivered lifesaving assistance to families in conflict-affected communities in South Sudan's Jonglei state, many of whom had gone months without humanitarian support.

Jonglei is among a handful of states that have seen a return to armed conflict, with clashes between Government and opposition forces.

"Access challenges in Jonglei state have left the lives of mothers and their children hanging in the balance," said Noala Skinner, UNICEF South Sudan Country Representative.

Since January, escalating fighting, mass displacement and unsafe routes have cut off services and forced health facilities to close, leaving families without reliable access to healthcare, safe water, protection and nutrition support.

UNICEF is calling for action in four areas:

- Safe, predictable and sustained humanitarian access to conflict-affected communities
- An end to grave violations against children, including recruitment, and greater investment in protection services for women and children, including the prevention of gender-based violence, child abductions and other protection risks.
- Continued support for emergency response activities including the RRM missions and to prevent supply disruptions including therapeutic food, medicines and clean water.
- Sustained partnerships and flexible humanitarian financing to maintain operational readiness, pre-position essential supplies, mobilize multidisciplinary response teams and enable the rapid deployment of lifesaving assistance whenever and wherever emergencies occur.

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Review Article

Climate-related disruptions to health facility services in South Sudan: Evidence, vulnerabilities, and integrated resilience

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ABSTRACT

Climate change is impacting health services via flooding, extreme heat, drought, disease outbreaks, and other hazards. The most profound impact of climate change is seen on health facilities (HFs) in fragile and conflict-affected regions, which already face challenges due to poor infrastructure, insecurity, and resource scarcity. This narrative review highlights the impact of climate-induced hazards on HFs' service delivery, using South Sudan as a country example, and explains the importance of linking preparedness to the sustainability of the healthcare system. The review was conducted in accordance with the Scale for the Assessment of Narrative Review Articles (SANRA), and evidence was analysed using the WHO Guidance for Climate Resilient and Environmentally Sustainable Health Care Facilities as an analytical framework. In 2024, flooding had affected up to 58 HFs in five counties, with almost 90 being inaccessible. In 2025, at least 121 HFs were affected, and it was later reported that 144 HFs were damaged. These climate-related effects occur within a broader context of underdeveloped infrastructure, where about 70% of the population had no access to basic healthcare services, 7% had access to electricity, 41% to potable water, and 10% to improved sanitation. HF-specific evidence reveals problems with infection prevention and control, lack of coordination, guidelines, vector control, staff management, training, waste segregation, incineration, and disposal sites for medical waste. The combination of flooding, cholera outbreaks, and insecurity in Jonglei, Unity, and Upper Nile States illustrates the hazards HFs face.

Keywords: flooding, health facility resilience, fragile health systems, disaster preparedness, South Sudan

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Introduction

The negative impact of climate change on the functioning of health facilities (HFs) continues to increase due to heatwaves, flooding, drought, and disease outbreaks, particularly in vulnerable and crisis settings that have been neglected in climate and health studies.[1–3] HFs play an important role as key referral and emergency treatment facilities. Failure to function well in such situations affects access to emergency surgery, obstetric and in-patient care, and diagnostic tests.[4]

South Sudan, independent since 2011, illustrates this well, having faced conflicts, political turbulence, and a fragile health sector, alongside high vulnerability to floods, global warming, and disease outbreaks.[5] Although HFs in sub-Saharan Africa have faced flooding and other environmental hazards, little is known about how these hazards affect their ability to function effectively.[6]

Method

This review was conducted and appraised using the Scale for the Assessment of Narrative Review Articles (SANRA), a validated quality appraisal tool covering justification of importance, objectives, literature search, referencing, level of evidence, and data presentation.[7] The literature used was obtained through a search in PubMed and Google Scholar databases, as well as grey literature in World Health Organisation (WHO), OCHA, Inter-governmental Authority on Development (IGAD), and Médecins Sans Frontières (MSF) databases. The search terms employed included: health facility resilience, climate change and health care systems, fragile countries and health, flooding and health facilities, health system of South Sudan, and disaster preparedness. Table 1 summarises the inclusion and exclusion criteria applied during source selection.

The evidence was synthesized using a theme-based approach and evaluated in light of WHO Guidance for Climate Resilient and Environmentally Sustainable Health Care Facilities framework.[8]

How climate hazards hamper health facility (HF) services

There is much more to how climate hazards impact HFs than physical destruction of facilities.[1,6] Flooding can affect infrastructure, contaminate water, disrupt electricity systems and supply chains, limit movement of healthcare workers and ambulance access, and cause HF admissions associated with displacement, injuries, and waterborne disease outbreaks.[6] In addition, it could interrupt fuel supplies for generators, hampering theatres, oxygen concentrators, vaccine cold rooms, sterilisation, and communication processes in referrals.[6]

Climate hazards also harm HF service delivery by increasing risks to children, the elderly, and febrile patients; reducing the potency of drugs and vaccines; increasing staff fatigue; and hampering ward ventilation.[1] Climate-change-related disease outbreaks increase patient numbers, strain infection prevention systems, and exacerbate cholera, water, sanitation, and hygiene (WASH), and nutrition challenges. Floods increase the risk of cholera and other waterborne diseases, heat fosters vector-borne diseases like malaria, and agricultural disruption leads to admissions due to malnutrition.[1] In a fragile setting, climate hazards coexist with insecurity and difficult access roads, making single-hazard preparedness ineffective.

Case study: South Sudan

In 2024, according to the World Health Organisation Regional Office for Africa, there were 58 health facilities in five counties that were submerged, and 90 health facilities were cut off from access after the closure of 15 key roads leading to Juba, which includes tertiary-level health care facilities.[9] In 2025, floods continued to disrupt health-service delivery with at least 121 health facilities being affected, and increasing cases of malaria, respiratory infections, and diarrhoea reported in the flood-affected areas.[10] The 2026 Humanitarian Needs and Response Plan reported damage to 144 HFs during flooding.[11] This

Table 1. Inclusion and exclusion criteria for source selection

Criterion	Inclusion	Exclusion
Language	English	Non-English
Publication type	Peer-reviewed articles, grey literature, policy documents	Opinion pieces without evidence base
Topic	Health facility resilience, climate hazards, fragile health systems, disaster preparedness	Studies unrelated to health systems or climate
Setting	Fragile, conflict-affected, or low-resource settings; South Sudan	High-income country settings only
Date	2016 to present	Pre-2016

climate hazard affects not only inpatient, emergency, and maternal health services but also outpatient consultations, especially when no other HFs are available.[4,6]

National-level lack of infrastructure adds to vulnerabilities during flooding, insecurity, and outbreaks. According to the World Bank (2024), about 70% of South Sudanese lack basic health-care services, with only 7% having access to electricity, 41% to potable water, and 10% to improved sanitation.[12] At the HF level, poor readiness to deal with infection prevention and control (IPC) and WASH has been identified. A cross-sectional analysis of 151 health facilities in six high-risk states (Jonglei, Unity, Upper Nile, Northern Bahr el Ghazal, Central Equatoria, and Western Equatoria) revealed significant deficiencies with regard to IPC/WASH coordination, IPC/WASH guidelines and standard operating procedures (SOPs), vector control, human resource management, and training. Other gaps included the lack of waste segregation protocols, high-temperature incinerators, and proper storage facilities for waste materials.[13]

The presence of both floods and cholera cases in Jonglei, Unity, and Upper Nile states highlights the multi-hazard that HFs in South Sudan face, where healthcare workers have to deal with an increase in the number of cholera cases, which require huge amounts of clean water, along with effective infection control and waste management practices, just when there are floods that interrupt these facilities.[5,10] Conflict adds to this problem, as illustrated by the 2025 bombing of the Médecins Sans Frontières-supported hospital in Old Fangak, while insecurity limits staff movements, delivery of medical supplies, and patients' access to the hospital.[5,14]

South Sudan used flood response plans, oral cholera vaccination campaigns, rapid response teams, and IGAD regional cooperation to deal with these disasters.[5] These solutions are rather short-term and externally funded. As soon as priorities are changed and funding decreases, preparedness is compromised, thus highlighting the need to transition from emergency activation to building HF resilience.[3,4,15]

Towards integrated health facility resilience

Findings from South Sudan and existing literature show that HF resilience in fragile settings requires more than emergency plans. It demands investment in the functional systems that make those plans effective: energy systems, water supply, waste management, and resilient infrastructure.[6,15] These systems are not auxiliary but critical to routine and emergency functions.

Health Facility resilience in the face of climate shocks is only possible if such systems are effective; otherwise, even moderate floods and heatwaves can interrupt HF operations.[2] Sustainability and preparedness need to be addressed as complementary issues, rather than separate issues that donor agencies and different departments tackle. Solar energy, water supply, waste management facilities, and climate-resilient infrastructure should be considered components of HF preparedness.[8]

The knowledge and policy gap persists, with information at HFs on service delivery during climate shocks and the link between sustainability practices and preparedness in fragile-state HFs needing further study.[3] Financial resources dedicated to climate finance to support health system resilience are still inadequate, and donor investments are not always harmonised with national plans and initiatives.[2] Addressing this gap calls for research, policy reform, and finance that build institutions, not only respond to disasters.[4]

Conclusion

HFs in South Sudan must cope with vulnerability to climate shocks, weak infrastructure, and interruptions caused by conflict. In addition to damaging physical structures, climate shocks disrupt HFs' energy, water, waste management, and other infrastructure systems which are important for HF safety. The resilience of HFs requires integrating sustainability practices into preparedness planning, evidence generation, and aligning donor investments. Communities without alternatives in health care have no option but to rely on these HFs during climate shocks.

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Review Article

Building a sustainable financing model for primary health care in South Sudan

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ABSTRACT

South Sudan's health system is severely constrained by low public financing, weak institutional capacity, and a historical dependence on external assistance. In 2023, of total health spending in the country from all sources, the government accounted for only 4.3 percent – equivalent to just US$3.10 per capita, among the lowest in the world. External financing accounted for 62.3 percent, and households contributed 27.1 percent through out-of-pocket payments. Government prioritization of health remains low, and even the limited funds allocated are inconsistently executed: the Ministry of Health's budget execution rate reached just 32 percent in Fiscal Year (FY) 2024/25, up from 24 percent the year before. Drawing on secondary analysis of Government documents and the World Health Organization's (WHO) Global Health Expenditure data, as well as consultations with the Ministry of Health's (MOH) Health Financing Unit about the flow of funds in the country, this policy paper examines how public resources are allocated and managed through South Sudan's public financial management (PFM) system and identifies key bottlenecks affecting primary health care (PHC) financing. It finds that health financing is inadequate, unpredictable, and fragmented. Transfers to subnational levels are frequently delayed or not executed, and most donor funding bypasses government systems. Priority actions include strengthening government commitment to health, improving budget execution and credibility, expanding direct facility financing, and ensuring that external support better aligns with national systems.

Keywords: sustainable financing, primary health care, health financing, public financial management, evelopment assistance for health (DAH), South Sudan

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Introduction

The South Sudan's health system operates under severe fiscal constraints, and government health spending is among the lowest in the world, next to Afghanistan. Since independence in 2011, the country has been highly reliant on external assistance, in the form of both humanitarian and development assistance. Households also bear a substantial share of costs directly through out-of-pocket payments, which exposes them to financial hardship. This financing composition leaves the health system vulnerable to fluctuations in donor support, as highlighted by the sharp reductions in development assistance in 2025.

Together, low public investment, high out-of-pocket spending, and volatile external financing constrain the government's ability to plan, prioritize, and sustain essential health services. Strengthening Primary Health Care financing is therefore critical. PHC is the first, and often only, point of care for most of the population and can address most of the preventable illness and death, including maternal and child health, infectious disease, malnutrition, and a growing burden of non-communicable disease.

However, PHC performance depends not only on clinical inputs, but also on both health financing (i.e., how funds are raised, allocated, pooled and used to purchase services) and on the public financial management system - the rules and processes that govern budgeting, fund releases, cash management, procurement, and oversight so that funds can get to where they are needed for the delivery of services, including at the 'last mile'. While health financing is a sector-specific policy domain, PFM is a government-wide function that needs to be examined beyond the sector level. This paper treats PFM as a binding constraint on the financing and delivery of health services. It examines how government resources flow through the PFM system to PHC facilities and communities, identifies key bottlenecks, and highlights priorities to improve execution, accountability, and sustainability.

The paper is intended primarily for Ministry of Health and Ministry of Finance officials and development partners working to improve health financing and PFM systems in South Sudan. It also contributes to the wider literature on PFM reform in fragile and conflict-affected settings.

Method

This paper is a policy paper that draws on secondary analysis of data from the Government of South Sudan's national budget, Ministry of Finance budget performance reports, Ministry of Health's transfer guideline,s[1] WHO Global Health Expenditure Database, and information gathered during several consultations with the Ministry of Health's Health Economics Unit regarding the flow of funds in South Sudan. Findings were validated through consultations with government officials and development partners, including during a high-level health financing workshop in November 2025 and through three separate consultations with the Ministry of Health and Ministry of Finance Director Generals, Undersecretaries, other technical directors, and the World Bank's Governance and Health, Nutrition and Population teams. The analysis traces financing pathways to PHC facilities and identifies bottlenecks affecting the adequacy, timeliness, predictability, and accountability of funds.

Limitations of the study include reliance on secondary and administrative data, including the WHO Global Health Expenditure Database (2023), Ministry of Finance budget performance reports (FY2022/23-FY2024/25), and MOH transfer guidelines (FY2025/26), all of which differ in timing and are not always directly comparable due to different methodologies and frameworks for collecting information. Budget outturn figures are also provisional and not yet externally audited. Because the analysis draws on national and state-level budget data rather than facility-level records, it cannot directly trace how much of an approved transfer reaches a given facility. Where administrative data were unavailable, the paper draws on stakeholder estimates from MOH staff, cited as personal communication.

Results

Health financing context

Government spending on health is among the lowest in the world, at just $3.10 in domestic government spending per capita in 2023.[2] The country's fiscal base is narrow and volatile, with oil accounting for around 90 percent of government revenue in recent years.[3,4] Recurrent disruptions to export routes through Sudan, compounded by domestic political instability and inflation, have led to unpredictable revenues and limited fiscal space. The World Bank estimates that South Sudan's economy contracted by 30 percent in FY2024/25, further constraining fiscal space for social sectors, including health.[5]

Despite stated political commitments to the social sectors in the National Development Strategy, health receives low priority relative to other sectors, reflecting the competing priorities and weak institutional advocacy for health within the broader budgeting process. The rapid decline in development assistance in 2025 would have made a strong justification for increasing the allocation to health. Instead, the health sector's share of total government spending fell from 1.3 percent in FY2024/25 to 1.27 percent in FY2025/26, even as the nominal health budget nearly doubled. This is evidence that the low priority given to health reflects a deliberate distributional choice rather than fiscal scarcity alone. WHO's Global Health Expenditure Database, which records expenditures as late as 2023, shows that the share of government expenditure spent on health was lower than that of all other countries in the region, and the second lowest in the world, after

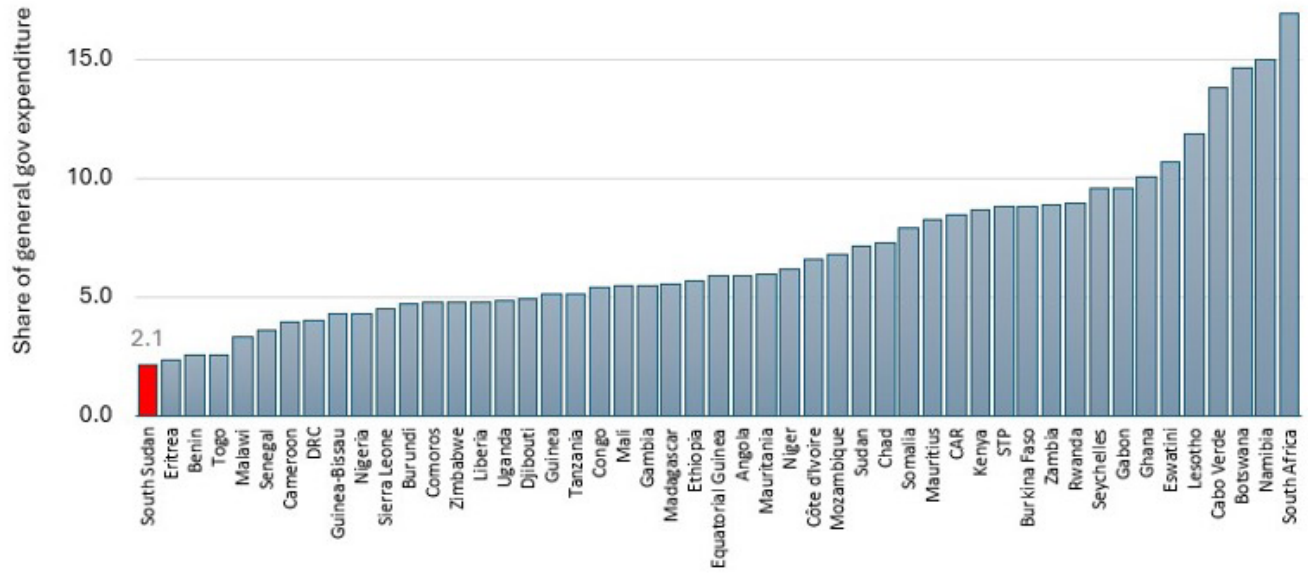


Figure 1. Domestic public health expenditure as a share of general government health expenditure, Sub-Saharan African countries, 2023.[2]

Afghanistan.[6] (See Figure 1). Much of the government budget at the federal level goes to economic functions and mandatory payments (including debt management, oil payments to Sudan, civil servants' salary arrears, contingency funds, etc.), followed by security, public administration, and rule of law. Education, health, and social and humanitarian affairs together constitute just over seven percent of the overall budget.

In addition to low prioritization, hyperinflation has driven a real decline in health spending. Although the health budget grew by 41 percent in nominal terms over the same period, inflation averaged 180 percent in 2025 and remained high in FY26, leading to a real decline in health spending of 26 percent.[7]

The composition of health expenditure further highlights the system's dependence on external and private sources. According to WHO's Global Health Expenditure Database, 62.3 percent of current health spending in 2023 came from external assistance, 27.1 percent from household out-of-pocket payments, and only 4.3 percent from domestic government revenues. A mix of voluntary health insurance and other expenditures accounts for another 6.3 percent of spending (See Figure 2). This financing mix carries real costs for equity and sustainability. In a context of widespread poverty, even small health expenditures can be catastrophic, undermining financial protection and delaying access to care.

At the same time, heavy reliance on external assistance limits the government's ability to plan, prioritize, and sustain essential services. Donor financing has played a critical role in maintaining service delivery, particularly through large, pooled mechanisms, but much of this funding remains off-budget and subject to shifting priorities. As a result, it is inherently volatile. Recent reductions in development assistance in 2025—driven by global geopolitical and fiscal pressures—highlight how exposed South Sudan's health system is to external shocks.

Government fund flow mechanisms for primary health care

The Ministry of Health is the central authority overseeing PHC, responsible for policy, planning, and coordination, while states and counties manage provision of secondary and primary care, respectively. All government financing for PHC originates from the Ministry of Finance and Planning (MOFP) and is disbursed through the Bank of South Sudan. Funds reach the health sector through four main channels defined in the national transfer guidelines: (i) conditional salary and operating transfers through states and counties; (ii) direct transfers to state and county hospital bank accounts; (iii) a conditional PHC Centre (PHCC) grant disbursed directly to eligible facilities; and (iv) transfers to the National Ministry of Health (NMOH) for central-level salaries, operations, and capital expenditure (See Figure 3).

The bulk of PHC financing flows through conditional salary and operating transfers. Under this channel, MOFP transfers funds to State Ministries of Finance, which then allocate resources to State Ministries of Health for state-level staff and hospitals, and to County Administration Departments (CAD), which pass funds to County Health Departments (CHD). According to the FY2025/26 transfer guidelines, the allocation formula is as follows:

- State operating transfers: 50 percent of funds are shared equally across all 10 states; 25 percent according to the population of each state; 25 percent based on the number of secondary facilities in the state.
- County operating transfers: 50 percent of the total funds transferred to counties is allocated equally across 79 counties; 25 percent based on population; and 25 percent based on the number of PHC facilities in the State.
- County operating transfers have been aggregated into a state-level total, but these must finance county health operations and contribute towards the operationalization of the Boma Health Initiative[1], (South Sudan's flagship community health programme) across all states.

The payments are supposed to take place monthly, with clear reporting requirements laid out in the transfer guidelines. In practice, however, these allocations are highly discretionary, rarely follow a transparent formula, and are often delivered in-kind rather than as predictable cash transfers.[8]

While the Ministry of Health receives the majority of government health funding (86 percent of central funding for health in the most recent budget), smaller allocations are directed to the National HIV/AIDS Commission (4 percent); the Drug and Food Control Authority (4 percent); The South Sudan Medical Council (2 percent); and the newly established National Public Health Institute (NPHI), which received 3 percent of the budget for the most recent year. Transfers to the National Ministry of Health finance salaries, central operations, and capital investments, including essential medicines procurement.

1. A boma is the smallest administrative unit in South Sudan, usually a cluster of villages. Under the Boma Health Initiative, each boma recruits and trains a small team of Boma Health Workers (BHWs) and their supervisors to deliver a standard package of preventive and basic curative services at the community level.

The PHCC grant is the only mechanism that funds facility bank accounts directly. It is conditional and application-based: facilities must meet eligibility criteria, including having a bank account, a functional management committee, a health improvement plan, and routine reporting through District Health Information Software

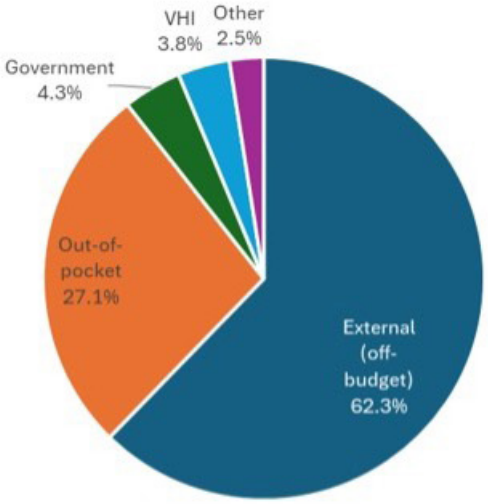


Figure 2. Source of health spending in South Sudan (percent of current health spending), 2023

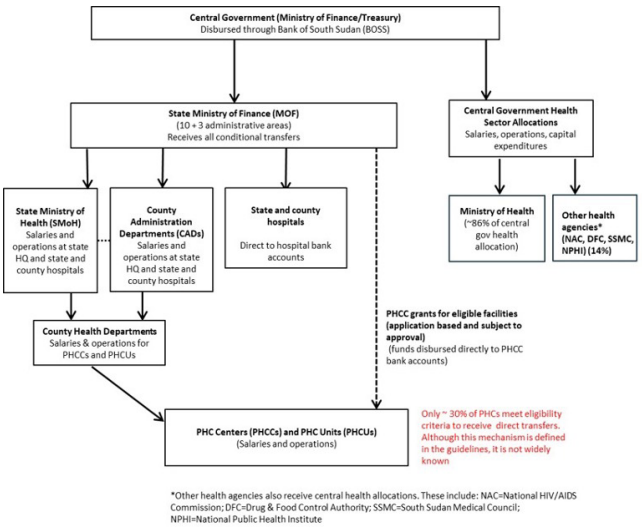


Figure 3. Public Financing Channels for Primary Health Care in South Sudan

Note: Arrows represent intended flows per PFM rules. Actual disbursements are frequently delayed or incomplete. Source: Interpretation by the authors, based on the MOH Transfer Guidelines.[7]

2 (DHIS2). Under the Ministry of Health, the Health Transfer Monitoring Committee (HTMC) reviews facility applications and confirms eligibility before the MOH can submit the release request to the MOFP. Approved facilities receive 288,000 South Sudanese pounds (SSP) quarterly (approximately US$50 per month) at the $ exchange rate, plus an additional SSP 72,000 (equivalent to $12) per PHC Unit (PHCU) under their supervision (as per the FY2025/26 guidelines).

Stakeholders from the Ministry of Health estimate that roughly one-third of facilities are currently eligible for the PHCC grant, with lower participation in remote areas due to administrative and access constraints. Even among eligible facilities, grant values are small relative to operational needs and are frequently delayed by almost two quarters, limiting their effectiveness. However, the FY2025/26 Budget Book explains that the intention is for the Government to take over responsibility for providing primary health care and facility 'exit strategies' for external support. The grants could therefore cover both administrative and outreach activities for qualifying PHCCs, with more details in the information sheets.

Direct transfers to hospital bank accounts are intended to improve efficiency and reduce diversion by routing funds directly to facilities rather than through line ministries. However, like other channels, their effectiveness depends on actual budget execution and timely release of funds.

Across all channels, the structure of financing is clearly defined in policy, but effectiveness is constrained by weak budget execution, limited predictability, cash rationing, and fragmented implementation, particularly for transfers and capital spending, which limits the Ministry's ability to sustain supply chains, support subnational levels, and meet co-financing commitments to development partners. As a result, most PHC facilities operate without reliable government funding and depend on a combination of irregular transfers, donor support, and user fees.

Budget execution and credibility

Budget execution in the health sector is consistently low. Between FY2022/23 and FY2024/25, execution to the Ministry of Health averaged less than one-third of approved allocations. These patterns reflect broader weaknesses in budget credibility, stemming from unpredictable cash availability and competing fiscal priorities, rather than a lack of absorptive capacity. In FY2024/25, total government spending exceeded the approved budget by 28 percent, driven largely by Economic Functions expenditures, while some sectors were over-executed, such as infrastructure (1499 percent) and security (165.5 percent)(see Table 1).[9]

Within health, there was also variation in execution rates across spending categories (Table 1). Roughly two-thirds of goods and services were executed, roughly one-third of transfers and grants were executed, and less than 5 percent of capital expenditure was executed. Although execution of wages and salaries reached 88 percent in FY2024/25, this masks frequent payment delays.

Development partner financing: a lifeline under strain

In the context of chronically low domestic financing and persistent budget execution challenges, development partners have become the primary source of sustaining PHC service delivery in South Sudan. External assistance accounted for 62.3 percent of total health spending in

Table 1. Budget execution to the Ministry of Health: South Sudan, Fiscal Years 2023 through FY 2025

Ministry/ category	FY2022/23 Budget in SSP	Execution rate	FY2023/24 Budget in SSP	Execution rate	FY2024/5 Budget in SSP	Execution rate
MOH (total)	33.0 B	23.1%	43.6 B	24%	66.3 B	**32%**
Wages and salaries	1.7 B	54.7%	6.6 B	20%	5.3 B	88%
Goods and services	6.3 B	66.6%	14.4 B	39%	23.0 B	63%
Transfers and grants	8.2 B	10.5%	8.2 B	2%	1.5 B	37%
Capital expenditure	16.9 B	9.9%	14.3 B	23%	36.4 B	4.3%

Source: Ministry of Finance and Planning Budget Performance Reports; Budget Books 2025-26; World Bank staff calculations

2023, financing core inputs including staff incentives, community health workers, essential medicines, vaccines, and health information systems. While this support has been critical to maintaining services, it leaves the system highly exposed to aid fluctuations, as shown by the sharp and largely unanticipated reductions in development assistance in 2025.

The largest source of external financing is the World Bank–financed Health Sector Transformation Project (HSTP), supported through a Multi-Donor Trust Fund (MDTF) with contributions from partners including United Nations Children's Fund (UNICEF), WHO, United Kingdom Foreign, Commonwealth and Development Office (UK FCDO), Canada, and the European Union (EU). HSTP supported 816 facilities in its first year of implementation, falling to 715 in its second, a decline driven by phased donor contributions and delayed administrative agreements, which also forced UNICEF and WHO to pre-finance some activities. HSTP finances pharmaceutical supply chains, the Boma Health Initiative, and service delivery at the community and facility level. By channelling funds through structured project mechanisms with dedicated fiduciary and implementation arrangements, HSTP has provided a relatively reliable flow of financing, helping to compensate for weaknesses in government budget execution.

Other partners play similarly critical roles. Gavi supports immunization and health system strengthening, the Global Fund finances commodities for HIV, tuberculosis, and malaria, and UNICEF provides essential support for supply chains, training, and community health services. Collectively, these programs underpin the majority of PHC service delivery.

Despite their importance, donor-financing remains off-budget and is delivered through project-based modalities with separate fiduciary, procurement, and reporting systems. While these arrangements are necessary to manage risks in a fragile context, they contribute to fragmentation and limit alignment with national priorities and systems.

A key constraint to stronger alignment is the persistent failure to meet co-financing commitments. Domestic contributions to programs such as the HSTP, Gavi and the Global Fund were included in the 2025/26 budget but had not yet been released at the time of writing. This undermines government credibility with partners, constrains integration of external resources into national systems, and limits the potential for donor financing to strengthen public financial management over time.

Together, these findings describe a PFM system that is under-resourced, unpredictable, and fragmented. Low and inconsistently executed allocations leave facilities dependent on discretionary, often in-kind transfers, a PHCC grant that reaches only a fraction of eligible facilities, and out-of-pocket payments from patients. Centralized control over staffing and commodity procurement leaves facility managers accountable for services they cannot fully finance or control. Finally, the persistent non-release of budgeted cofinancing undermines the credibility needed to align donor support with government systems. Sustained progress will require simultaneous movement on government commitment, execution reliability, facility-level financing, and donor alignment.

Policy directions

Strengthening PHC financing in South Sudan requires progress on four fronts: government commitment to health financing, predictable facility-level financing, more reliable intergovernmental transfers, and better-aligned external support. The priorities below are sequenced by how quickly they could plausibly be implemented.

- Short-term: The most immediate credibility-building step is releasing the domestic co-financing already budgeted for HSTP, Gavi, and the Global Fund. Doing so would also help unlock additional external financing tied to these commitments.

  Strengthening coordination between the Ministry of Finance and Ministry of Health on cash-flow planning and disbursement schedules can help align releases with service delivery needs, while regular publication of budget execution reports would enhance transparency. Such disaggregation of budget data by ministry, spending category, and possibly by state would allow government and partners to jointly track where funds stall. ate, would allow government and partners to jointly track where funds stall rather than relying on aggregate year-end figures.

  Expanding PHCC grant eligibility is the fastest practical route to more predictable facility-level financing, since it is the only channel reaching facility bank accounts directly. This requires the government to take a more active role in helping facilities meet eligibility requirements and addressing practical constraints such as access to banking services and the security conditions for facilities holding cash, particularly in remote areas.

- Medium-term: Strengthening intergovernmental transfers requires attention not only to national-level release but to the state level, where funds may stall before reaching County Health Departments and facilities – a risk illustrated by comparable experience in Kenya, where county treasuries have delayed transfers to facilities. As direct-to-facility financing expands, government and partners should also weigh the trade-offs: bypassing state and county levels avoids one bottleneck but ignores weaknesses in intermediate oversight, as Ghana's experience with facility-level bypass financing suggests. This means assessing fiduciary risk explicitly, including facility financial management capacity, reporting reliability, and county- and state-level oversight, rather than treating direct financing as risk-free.

  Primary health care is constitutionally guaranteed to be free of charge in South Sudan,[10] yet an independent study published in 2021 found that 32 percent of patients report paying informal fees at PHCCs and PHCUs, driven by facility underfunding and poor staff remuneration.[11] Closing this gap between policy and practice is therefore less a matter of clarifying an ambiguous policy than of financing it. This requires expanding publicly financed inputs and predictable facility-level financing, so facilities no longer need informal charges to operate.

  Development partners will remain a critical source of financing in the near term, but stronger alignment with government systems is essential for sustainability. A central priority is the reliable fulfilment of co-financing commitments. Releasing budgeted domestic contributions to programs such as the HSTP, Gavi, and the Global Fund would strengthen government credibility, improve resource alignment, and help sustain external financing. Even modest but predictable co-financing can have a catalytic effect.

  Building on existing models, hybrid financing arrangements that combine donor support with strengthened government systems offer a pragmatic pathway forward. A clear transition framework can set out steps to increase domestic contributions, improve execution, and progressively integrate external financing into national systems, including for the Boma Health Initiative. This model of hybrid financing would build on HSTP, which has demonstrated that pooled financing can align with government systems while maintaining fiduciary safeguards.

Conclusion

South Sudan's PHC financing system is constrained less by the absence of a policy framework than by the gap between that framework and its execution: transfers that are formally defined but rarely predictable, a facility grant that reaches only a fraction of eligible providers, and donor financing that remains largely parallel to government systems. This paper's fund-flow mapping provides a basis for tracking where resources stall in the system. Meeting cofinancing commitments and publishing execution data would offer the most immediate signal of government commitment, but sustaining that signal over time is what will determine whether South Sudan's PHC financing model becomes more equitable, accountable, and self-reliant.

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How South Sudan is staying ahead of drug resistance

Malaria remains a major public health issue in South Sudan, with the disease accounting for over 38 percent of outpatient visits and around 64 percent of inpatient deaths in 2025. As antimalarial drug resistance continues to emerge across East Africa, there is a growing concern that the malaria burden could increase if resistance spreads further and undermines the effectiveness of existing prevention and treatment drugs, including artemisinin-based combination therapies (ACTs).

ACTs act as the first-line treatment for uncomplicated malaria, made up of the powerful antimalarial compound artemisinin and a partner drug with complementary features. Resistance to artemisinin has been steadily spreading in parts of southeast Asia for more than 15 years and has more recently emerged in east Africa; a 2024 study documented cases of partial resistance among children hospitalised with complicated malaria in Uganda.

Molecular surveillance techniques can pinpoint specific genetic alterations linked with antimalarial drug resistance, playing a crucial role in detecting emerging resistance and ensuring that responses remain effective. As evidence evolves, the strategies we use to prevent, diagnose and treat malaria should evolve as well.

Malaria Consortium's South Sudan team has been working closely with government and partners to strengthen the use of evidence in decision-making, including through convening stakeholders to interpret new findings and translate them into action.

Read more at https://www.malariaconsortium.org/blog/south-sudan-drug-resistance?utm_source=Malaria+Consortium+Mailing+List+-+Master&utm_campaign=dcf5c13230-EMAIL_CAMPAIGN_2024_06_28_03_37_COPY_01&utm_medium=email&utm_term=0_-61cb29d84b-22612365.

Letter to the Editor

RE: The goal of sustainability for hospitals in South Sudan

Dear Editor,

Jonathan Majok and colleagues raise some important questions in their article, *Stakeholders' perspectives on determinants of health financing in South Sudan: a qualitative assessment.*[1] I completely agree that sustainability has to be one of the major goals of any hospital in South Sudan. Indeed, a reportedly major discouragement to the continuation of the Health Pooled Funds (HPF) was that hospitals made little progress toward sustainability, although the quality of health delivery improved significantly during the time of HPF funding. Since the end of the HPF, many hospitals have collapsed or greatly reduced their services.

Although I am sure the Ministry of Health (MoH) see themselves as *"visionaries and the advocates for health financing,"* I am convinced that some of their well-intentioned interventions hinder sustainability. It is no secret in South Sudan that there exists an enormous chasm in the actual patient charges for medical interventions in Juba and the allowable charges in other hospitals. The MoH would like to see health care delivered completely free or at charges far below the actual costs to hospitals and clinics. Such magnanimous goals can only be achieved if there is a substantial and inexhaustible source of revenue from outside which I do not believe exists. At present, MoH offers little to help sustain those hospitals and clinics but ties their hands in seeking to provide care by placing unwise restrictions on charges.

The Lakes State had a similar experiment in regulating matatus. From about 2010 to 2013, matatus ran from Aluakluak to Rumbek offering inexpensive transportation to everyone willing to pay their reasonable charges. As inflation hit, the matatus increased their charges to keep their service profitable, but the government sought to limit how much the matatus could charge. The result was that we lost the service and transportation in the Lakes State is far more expensive.

The reality is that South Sudan is an impoverished nation and all medical institutions need to be ready to give free or greatly reduced charges to the truly destitute, but the hospitals and clinics of South Sudan can never achieve anything close to sustainability unless we can charge reasonable fees and make determined efforts to collect those fees from our patients who can afford them. There is a great irony that unlicensed and unqualified pharmacies in the markets routinely charge far more than official hospitals and clinics are allowed to charge, yet they continue to operate and dispense their wares without any attempts at control by the MoH. If the MoH truly does *negotiate on behalf of the South Sudanese*, they can best show their concern by shutting down unlicensed medical providers and attempting to help the few functional hospitals and clinics in South Sudan achieve sustainability rather than burdening us with unrealistic constraints.

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Medical Consultant

Akot Medical Center

1. Majok et al. Stakeholders' perspectives on determinants of health financing in South Sudan: a qualitative assessment. South Sudan Medical Journal, 2026;19(3):167-171

NEWS

The Physicians Association of South Sudan (PASS)

The Physicians Association of South Sudan (PASS) elects a new Executive Committee and a Training Committee.

Executive Committee Members:

1. Dr Mawien Tong, General Internal Medicine, Chairperson.
2. Dr Korbe Alfred, General Internal Medicine, Deputy Chairperson.
3. Dr Margaret Richard Hassan, General Internal Medicine, Secretary General.
4. Dr Bino Andrea, Gastroenterology - Secretary for Finance.
5. Dr Kamba Taban, General Internal Medicine, Secretary for Research and Education.
6. Dr Jimmy Fraizer, Emergency and Critical Care Physician, Secretary for Information and Publicity.
7. Dr Anyak Mangar, Secretary for Social Welfare and Investment.

South Sudan ECSACOP (East Central and Southern African College of Physicians) Training Committee:

1. Dr Eluzai Hakim, Consultant Physician in Rehabilitation and Stroke Medicine.
2. Dr Ben Lomatayo, Nephrologist.
3. Dr Ronald Woro, Gastroenterologist.
4. Dr Charles Ochero Langoya, Infectious Diseases and Medical Microbiologist Specialist.
5. Dr Boniface Lumori, General Internal Medicine.
6. Dr Ajawin Anthony, General Internal Medicine.
7. Dr Mawien Tong, General Internal Medicine.
8. Dr Korbe Alfred, General Internal Medicine.
9. Dr Ramzy Muorwell, General Internal Medicine.
10. Dr Bino Andrea, Gastroenterologist.
11. Dr Ruot G Teny, Cardiologist, Immediate Past Chairman.

The ECSACOP committee is making preparations for the site inspection of the Juba Centre for approval as an ECSACOP fellowship training centre. Further developments on these preparations and the outcome of the college visit will be published in due course.

Understanding the evidence and process for establishing identification criteria for infants less than 6 months of age at risk of poor growth and development



World Health Organization

Every effort has been made to ensure that the information and the drug names and doses quoted in this Journal are correct. However readers are advised to check information and doses before making prescriptions. Unless otherwise stated the doses quoted are for adults.