

Review Article

Missed Opportunities in Maternal Care: Findings from Death Audits in South Sudan

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Abstract

Maternal and perinatal mortality remain unacceptably high in South Sudan, with a maternal mortality ratio of 692 deaths per 100,000 live births, far exceeding the Sustainable Development Goal (SDG) target. In line with World Health Organization (WHO) recommendations, Maternal and Perinatal Death Surveillance and Response (MPDSR) was introduced to strengthen quality of care, accountability, and learning within the health system. A retrospective descriptive review of maternal and perinatal deaths was conducted in 11 health facilities supported by the Momentum Integrated Health Resilience (MIHR) project in Bor, Budi, Juba, Jur River, Wau, and Yambio Counties between March 2023 and December 2024. Facility-based MPDSR committees reviewed deaths using standardized national tools and the WHO-recommended six-step MPDSR audit cycle. Data were extracted from facility records and analyzed descriptively.

A total of 22 maternal deaths and 117 perinatal deaths were reviewed. Postpartum hemorrhage was the leading cause of maternal death (64%), followed by malaria in pregnancy (14%) and severe anemia (9%). Perinatal deaths were predominantly intrapartum-related, with fresh stillbirths accounting for 59%, followed by macerated stillbirths (21%) and prematurity-related complications (10%). Major modifiable health system factors included shortages of essential medicines and supplies, insufficient availability of skilled health workers, delays in accessing care, weak intrapartum monitoring, unreliable electricity, and limited newborn resuscitation capacity.

MPDSR supports identification of preventable deaths and health system gaps. Strengthened institutionalization of MPDSR and targeted investment in intrapartum, emergency obstetric, and newborn care are essential to reduce preventable maternal and perinatal mortality in South Sudan.

1. Introduction

Maternal health remains a critical public health concern in South Sudan, where access to quality maternal and reproductive healthcare services is limited by ongoing conflict, weak health infrastructure, and widespread poverty [1].

Per the nationally available data, 692 deaths per 100,000 occur annually, which is ten times than the global maternal mortality target of 70 per 100,000 as reported in Sustainable Development Goals—SDG 3.1 [2]. However, the global vision is to achieve zero preventable maternal deaths, where no woman should die from preventable causes that might have been avoided with timely and high-quality care.

Achieving this ambitious goal requires a multifaceted approach, including improved access to healthcare, education on maternal health, and enhanced support systems for expectant mothers. Collaborative efforts among governments, healthcare providers, and communities will be crucial in reducing these alarming statistics and ensuring the safety and well-being of all women during childbirth [3].

South Sudan's Ministry of Health (MOH), in collaboration with World Health Organization (WHO), United Nation Population Fund (UNFPA) and other partners such Momentum Integrated Health Resilience (MIHR), have been working to institutionalize MPDSR in the country. Implementation guidelines development was initiated around 2015 and finalized in 2023. In addition, UNFPA trained 48 MPDSR champions from states levels and established MPDSR committees in main states hospitals across South Sudan's 10 states.

To support the MOH in strengthening MPDSR initiative across the country, MIHR with technical support from the Association of Gynecologists and Obstetricians of South Sudan (AGOSS) trained 92 healthcare workers and established 16 MPDSR committees in 16 MIHR supported health facilities in Bor, Budi, Juba, Jur River, Wau and Yambio Counties. The aim of the introduction of MPDSR was to build capacity of the health providers to identify, review maternal and perinatal deaths, identify modified causes or factors that contributed to the reported deaths, develop and implement feasible solutions to address preventable causes of deaths and also contribute to the quality of care and accountability to services provided.

Despite the guideline's development, training and establishment of MPDSR committees at the health facilities' level through health partners, official institutionalization of the MPDSR through the national MOH still not in place. States MOH and county health are yet to be officially involve in the process to take up the initiative, and ministerial order to introduce the MPDSR process is not yet initiated by the MOH.

This report provides an overview of maternal cases reviewed in MIHR-supported counties, focusing on the nature of complications encountered, outcomes of maternal care, and contributing factors to maternal morbidity and mortality. The data presented reflects both the progress made in enhancing maternal health services and the persistent gaps that require further intervention.

2. Methods

This was a retrospective review conducted in 11 out of 16 health facilities with active MPDSR team formed under MIHR project supported health facilities in Bor, Budi, Juba, Jur River, Wau and Yambio Counties.

Audits were conducted between March 2023 to December 2024 after the teams in these facilities were trained and formed to be able to conduct deaths review. Data for review were driven from facilities and patients' records using the MOH maternal and prenatal deaths review forms.

MPDSR committees in each of these facilities followed the death 6 steps audit cycle to review the deaths cases. These includes [4, 5]

1. **Identification and Notification the Prenatal/Maternal Death:** In this, when the facility record prenatal death, the maternity in charge alert the chair of the facility MPDSR committee. Who at his/her side assigned two individuals from the committee to go to the mentioned department to collect data on the case.
2. **Collect Information:** A trained team from the MPDSR committee comprises of two members are asked by the chair to gathers all relevant data: clinical notes, referral documents, timelines of care, interviews with health workers who managed the case and any other relevant stakeholders involved in the department, and where appropriate family perspectives. No blame is observed during the data collection process.
3. **Review and Analyze the Death:** After the data are gathered the facility MPDSR chair notify the rest of members of the review dates, in which the audit committee reviews the case to determine the cause of death, identify contributing factors (delays, gaps in care, system problems and examine if the death was preventable or not.
4. **Recommend Solutions:** During the audit, the committee proposes clear, practical actions to prevent similar deaths. These may relate to staffing, skills, supplies, protocols, or community factors.
5. **Implement the Recommendations:** Facility leadership and teams take action on what was recommended depending on the level of which the action should be implemented.
6. **Monitor and Evaluate Progress:** The facility tracks whether recommendations were implemented and whether changes improved outcomes. This closes the cycle and starts the next round of quality improvement.

3. Data collection and analysis

Data for prenatal and maternal death reviews were received from different audit committees and entered into Microsoft Excel Open Spreadsheet to generate the descriptive data, graphs and tables.

The MPDSR data collected from the reviewed MPDSR report of the 11 health facilities located in Bor, Budi, Juba, Jur River, Wau, and Yambio Counties within five South Sudanese states (Jonglei, Eastern Equatoria, Central Equatoria, Western Equatoria, and Western Bahr el Ghazal). During this period, 22 maternal deaths and 117 perinatal deaths were reviewed by the MPDSR committees at the facilities' levels. Data extraction from the MPDSR review forms at facility level, after which all records were entered into Microsoft Excel for data management and quality checks, including cleaning and consistency verification. Descriptive statistical analyses were conducted in Excel to summarize the distribution of maternal and perinatal deaths and to examine variations across counties and states.

4. Results

4.1. Common Causes of Maternal And Perinatal Deaths

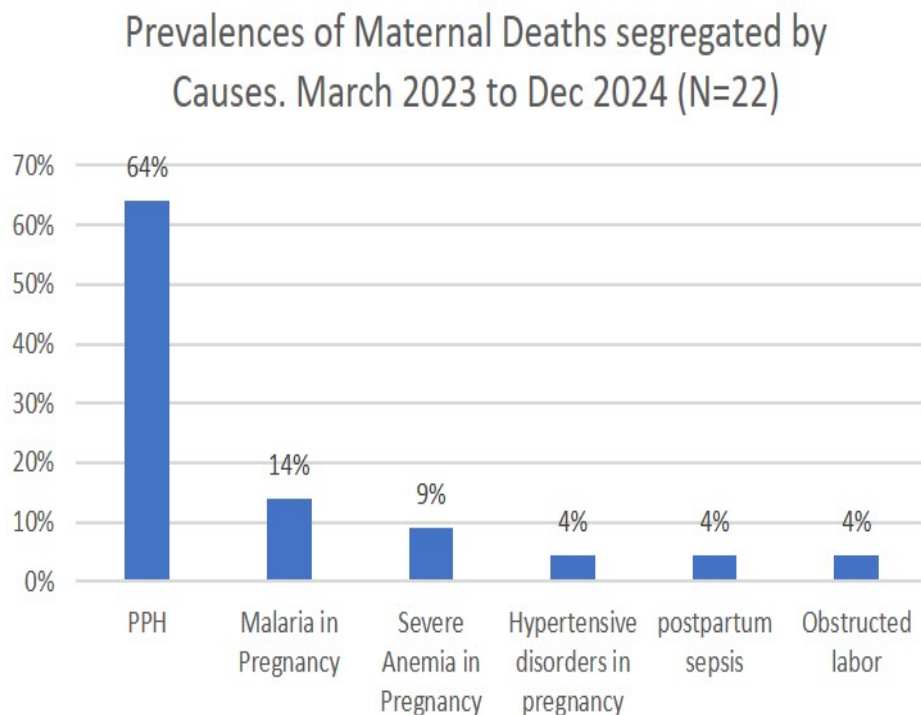


Figure 1: Prevalences of Maternal deaths segregated by Causes, March 2023 – December 2024

The above Figure 1 summarizes the distribution of 22 maternal deaths reviewed between March 2023 and December 2024, highlighting the leading medical causes. In the report, direct maternal death causes remained on top list in which deaths attributed to Postpartum Hemorrhage (PPH) were dominant, accounting for nearly two-thirds of all maternal deaths (64%). Followed by death related to malaria in pregnancy (14%) and anemia in pregnancy with deaths accounting for 9%.

Table 1: Causes of maternal deaths segregated by county

Cause	Bor (n/%)	Budi (n/%)	Juba (n/%)	Jur River (n/%)	Wau (n/%)	Yambio (n/%)	Total (n/%)
PPH	6 (43%)	0 (0%)	0 (0%)	1 (7%)	1 (1%)	6 (43%)	14 (64%)
Eclampsia	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (4.4%)
Severe anemia in pregnancy	1 (50%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (50%)	2 (9%)
Malaria in pregnancy	2 (67%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (33%)	3 (14%)
Puerperal sepsis	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	1 (4.4%)
Obstructed labor	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (4.4%)
Total	10 (45.5%)	1 (4.5%)	0 (0%)	1 (4.5%)	1 (4.5%)	9 (41%)	22 (100%)

Postpartum hemorrhage was a leading cause of maternal deaths in both Bor and Yambio counties, with each contributing 43% of the overall deaths caused by PPH. This was the same for maternal death caused by malaria in pregnancy, which was also reported in Bor (67%) and Yambio (33%). Juba County-supported health facilities had no maternal deaths Table 1.

Fresh still birth were leading conditions (59%) within the prenatal deaths reported and reviewed across the eleven health facilities. This is followed by macerated still birth (21%) and complications attributed to prematurity (10%). Figure 2.

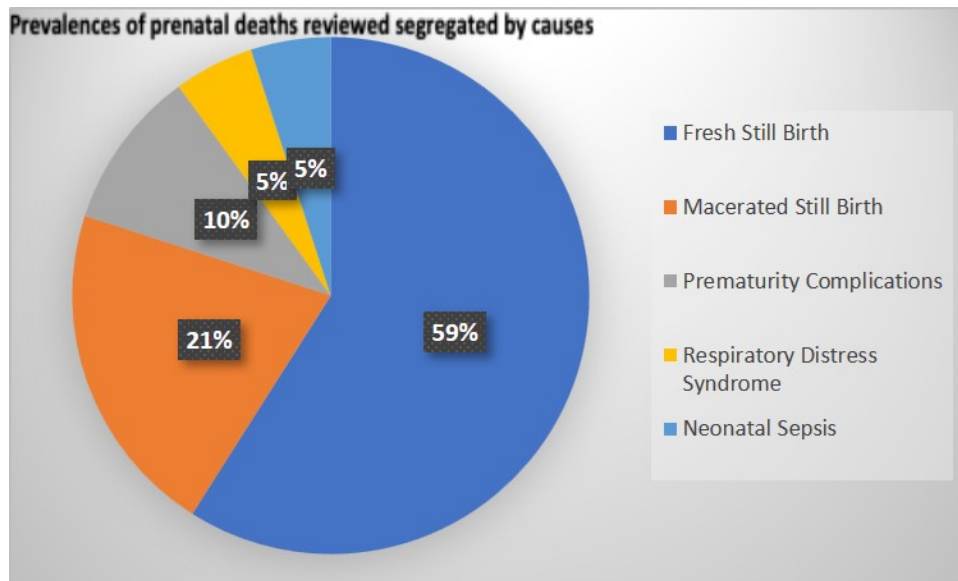


Figure 2: Prevalences of prenatal deaths reviewed segregated by causes

Bor county has higher prevalence of prenatal deaths (30%) followed by Yambio and Juba counties by (28.1%) and 20.5% respectively. While Budi County and Juba have the least prenatal deaths Figure 3.

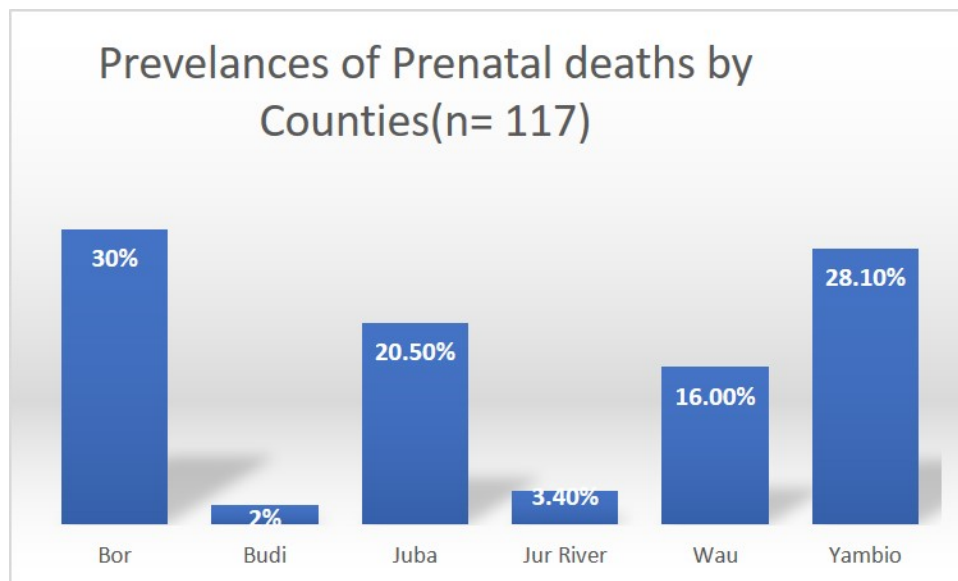


Figure 3: Prevalences of Prenatal deaths segregated by Counties

Table 2: Causes of prenatal deaths segregated by county

Cause	Bor (n, %)	Budi (n, %)	Juba (n, %)	Jur-R (n, %)	Wau (n, %)	Yambio (n, %)	Total (n, %)
Fresh stillbirth	19 (27.5%)	2 (2.9%)	17 (24.6%)	2 (2.9%)	11 (16%)	18 (26%)	69 (59%)
Macerated stillbirth	8 (34%)	0 (0%)	6 (25%)	2 (8%)	2 (8%)	6 (25%)	24 (21%)
Prematurity complications	2 (17%)	0 (0%)	1 (8%)	0 (0%)	3 (25%)	6 (50%)	12 (10%)
Neonatal sepsis	5 (83%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (17%)	6 (5%)
Respiratory syndrome	1 (17%)	0 (0%)	0 (0%)	0 (0%)	3 (50%)	2 (33%)	6 (5%)
Total	35 (30%)	2 (2%)	24 (20.5%)	4 (3.4%)	19 (16%)	33 (28.1%)	117 (100%)

A total of 117 prenatal deaths were recorded across the six counties. Fresh stillbirth was the leading cause, accounting for 69 deaths (59%), indicating a high burden of intrapartum related events. This was followed by macerated stillbirth, which contributed 24 deaths (21%).

Prematurity-related complications accounted for 12 deaths (10%), while neonatal sepsis and respiratory syndrome each contributed 6 deaths (5%), reflecting a smaller but notable burden of postnatal causes among preterm and newborn infants.

In terms of geographic distribution, Bor County recorded the highest number of prenatal deaths with 35 cases (30%), followed by Yambio with 33 deaths (28.1%) and Juba with 24 deaths (20.5%). Wau contributed 19 deaths (16%), whereas Jur River and Budi reported

comparatively fewer deaths at 4 (3.4%) and 2 (2%), respectively.

Fresh stillbirths were particularly prominent in Yambio (26%), Bor (27.5%), and Juba (24.6%), while macerated stillbirths were mainly observed in Bor, Juba, and Yambio. Prematurity related deaths were most common in Yambio (50%) and Wau (25%). Neonatal sepsis deaths were overwhelmingly reported in Bor (83%), and respiratory syndrome deaths were mainly recorded in Wau (50%) and Yambio (33%) Table 2.

4.2. Common Modifiable and Contributing Factors

Maternal deaths

Table 3: Modifiable factors identified by MPDSR committees during audit of 22 Maternal deaths (11 health facilities in South Sudan)

Modifiable factors	Frequency	Percentage %
Delay to seek healthcare in facility	28	11%
Delay to reach health facility	34	13%
Delay to provide care at HF	16	6%
In appropriate intervention	13	5%
Mis-diagnosis	6	2%
Absence of critical human resource	38	14%
Lack supplies and essential medicines	40	15%
Lack of blood transfusion products	15	6%
Delays to refer from HF to HF	5	2%
Lack of electricity for night interventions	32	12%
Lack of documentaion	38	14%

The table 1 presents modifiable factors that contributed to maternal deaths in 13 health facilities. These are weaknesses within the health system or delays in care that, if corrected, could prevent future deaths. The frequencies show how often each factor appeared across all audited cases.

The percentages tell us the proportion of total maternal deaths attributed to each factor, helping identify priorities for interventions. From the results, lack of supplies and essential medicines (15%), lack of blood transfusion products (15%), Absence of critical human resources (14%) such as skilled staff (midwives, doctors, anesthetists) poor documentation (14%) and delay to reach health facility (13%) were among the top contributing factors to poor maternal outcomes or deaths in this analysis Table 3.

Prenatal deaths

The Table 4 above presents modifiable factors contributing to poor prenatal outcomes. The frequencies and percentages show which gaps occur most often and therefore have the highest impact on preventable morbidity and mortality.

The major contributing factors highlighted from the audits that require attention were lack labor care use to monitor labor (10%). This is the single most frequently reported factor, indicating poor intrapartum monitoring and missed early detection of abnormal labor progress. Others include lack of oxygen for newborns needing oxygen (10%), which is a critical gap in emergency care leading to preventable deaths from asphyxia. This is beside absence of critical human resources (9%), lack of birth preparedness (9%), and lack of essential medical supplies (7%).

5. Discussion

This review provides important insights into the causes and contributing factors of maternal and perinatal deaths in MIHR-supported health facilities across six counties in South Sudan following the introduction of the Maternal and Perinatal Death Surveillance and Response (MPDSR) system. The findings demonstrate that most maternal and perinatal deaths remained largely preventable and were strongly influenced by modifiable health system and community-related factors. While progress has been made in establishing MPDSR committees and conducting facility-based audits, significant gaps persist in translating audit findings into sustained system-wide improvements.

5.1. Maternal deaths and direct obstetric causes

The predominance of direct obstetric causes, particularly postpartum hemorrhage (PPH), mirrors patterns reported in other low-resource and humanitarian settings in sub-Saharan Africa. In this review, PPH accounted for nearly two-thirds of all maternal deaths, underscoring its continued status as the leading cause of maternal mortality in South Sudan. This finding is consistent with regional and global evidence, where hemorrhage remains the leading cause of preventable maternal death, especially in settings with limited access to skilled birth attendants, uterotonics, blood transfusion services, and emergency obstetric care [6].

The occurrence of malaria and severe anemia as significant contributors further reflects the dual burden of infectious diseases and chronic maternal undernutrition in South Sudan [7]. These indirect causes highlight missed opportunities for prevention through strengthened antenatal care (ANC), early diagnosis, routine hemoglobin testing, iron supplementation, malaria prophylaxis, and timely treatment. The absence of maternal deaths in Juba supported facilities may not reflect relatively better health services compared to health facilities from other areas. It was because most of these health facilities has better clear referral system, where most of complicated obstetrics cases are referred to be managed in Juba Teaching Hospital which is the main referral tertiary hospital in the town [8, 9].

Table 4: Modifiable factors identified by MPDSR committees during the prenatal deaths audit process

Modifiable factors	Frequency	Percentage
Delay to seek healthcare in HF	78	4%
Delay to reach HF	65	3%
Delay to provide Care at HF	18	1%
Inappropriate intervention	26	1%
Lack of documentaion	82	4%
Labor not monitored with LCG for early abnormal labor progress detection	200	10%
Misdiagnosis	68	3%
Lack of essential medical supplies	150	7%
Lack of resuscitation equipments	92	5%
Lack of NICU	87	4%
No electricity	120	6%
Lack of blood transfusion products	62	3%
Abscens of critical human resource	180	9%
Delays to refer from facility to facility	45	2%
Unskilled deliveries/home deliveries	38	2%
Lack of birth prepardness	186	9%
Failure to recognise danger signs during pregnancy such prevoius scar for C/S, Inadequate perlvic floor, sizable or malpresentation	55	3%
Failure to recognise danger signs that deternine referral or immediate intervion during delivery	42	2%
Lack of essential laboratory reagents/tests	128	6%
Lack of national essential guidelines in emergency obstetrics	88	4%
No oxygen in the health facility for newborn that need oxygen	196	10%

*NICU = Neonatal Intensive Care Unit, *HF= Health Facility, * C/S = Cesarean Section

5.2. Perinatal deaths and intrapartum-related events

Perinatal mortality was dominated by fresh stillbirths, accounting for nearly 60% of all reviewed cases. Fresh stillbirths are widely recognized as indicators of poor intrapartum care, suggesting that many fetal deaths occurred during labor or shortly before delivery. This pattern strongly points to inadequate labor monitoring, delayed decision-making, and insufficient newborn resuscitation capacity at the facility level. It also shows the gap in the skilled birth cadres where some facilities that should offer skilled deliveries to be mainly occupied by non-skillful healthcare workers such traditional birth attendants (TBAs) who can't read or write [10, 11].

The high proportion of macerated stillbirths indicates delayed care-seeking during pregnancy and gaps in ANC quality, including poor identification and management of maternal and fetal risk factors. Prematurity-related complications, neonatal sepsis, and respiratory distress syndrome, though less frequent, also contributed substantially, reflecting weaknesses in immediate newborn care, infection prevention, thermal care, oxygen availability, and neonatal support services such as neonatal intensive care unit (NICU) [12].

Geographically, higher perinatal death burdens in Bor, Yambio, and Juba counties may be explained by higher service utilization volumes, insecure catchment areas, delayed referrals, overstretched facilities managing complicated cases from surrounding regions, and high home deliveries [13, 14].

5.3. Modifiable factors and the “three delays”

Analysis of modifiable factors for both maternal and perinatal deaths highlight the continued relevance of the three-delay model in explaining mortality patterns in South Sudan. Delays in reaching health facilities and delays in receiving appropriate care once at the facility were prominent contributors to maternal deaths, reflecting weak referral systems, transport challenges, insecurity, and limited functional emergency services at lower-level facilities [15].

On the facility side, critical gaps such as lack of essential medicines, blood transfusion products, oxygen, electricity, and skilled human resources were repeatedly identified. These systemic weaknesses significantly undermine the ability of health workers to provide timely life-saving interventions, even when patients present to facilities [16, 17].

For perinatal deaths, poor intrapartum monitoring, particularly failure to use labor monitoring tools was the most frequently identified contributing factor. This finding clearly demonstrates missed opportunities for early detection of abnormal labor and timely intervention [18]. The lack of oxygen, inadequate newborn resuscitation equipment, absence of critical staff, and limited laboratory capacity further compounded preventable neonatal deaths.

Importantly, documentation gaps were common in both maternal and perinatal audits. Poor record-keeping limits the quality of care, weakens accountability, and reduces the effectiveness of MPDSR as a learning and quality improvement tool [19].

5.4. Implications for MPDSR institutionalization

The findings affirm that MPDSR is a valuable mechanism for identifying preventable deaths and actionable system failures. However, the absence of formal national institutionalization and limited engagement of state and county health authorities constrain the sustainability and impact of MPDSR implementation. Without a ministerial directive, dedicated budget lines, and integration into routine health system governance, MPDSR risks remaining a partner-driven initiative rather than a nationally owned quality improvement process.

Strengthening MPDSR in South Sudan will require moving beyond audits to ensuring that recommendations are systematically implemented, monitored, and linked to decision-making at facility, county, state, and national levels. This includes investments in emergency obstetric and newborn care, human resource deployment, blood transfusion services, infrastructure (electricity and oxygen), and continuous mentorship of frontline health workers.

6. Strengths and limitations

This review draws strength from the use of standardized MPDSR tools, multidisciplinary committee reviews, and inclusion of multiple counties across diverse settings. However, the findings may not be fully generalizable to all health facilities in South Sudan, as reviews were limited to MIHR-supported facilities with functional MPDSR teams. Underreporting and incomplete documentation may also have led to misclassification or underestimation of certain causes and contributing factors.

7. Challenges affecting MPDSR process and quality of Maternal and neonatal care in South Sudan:

Challenges were developed and arranged in order of the importance, based on their overall impact on maternal and newborn health and the MPDSR process as follow:

1. Human resources (lack of qualified staff, presence of TBAs, discrepancy in documentation, lack of essential medical supplies, blood bank): Because quality of care depends heavily on staff competencies and availability of essential supplies, and poor HR severely affects both maternal outcomes and MPDSR accuracy.
2. Poor infrastructure affecting the referral system: Referral delays directly contribute to preventable maternal deaths; infrastructure is a foundational determinant of emergency response. Poor roads conditions in South Sudan contribute into second delay maternal deaths.
3. Lack of enough health facilities closer to clients in residential areas: Geographic barriers determine whether women can access timely care, especially during obstetric emergencies. Women and their relatives may have a decision to timely access has health facility; presence of distances may contribute into second delay causes of maternal deaths
4. Lack of staff motivation due to irregular salaries and lack of incentives: This is because the qualified staff may not perform if demotivated, and it indirectly affects quality of maternal health services rendered by the staff and contribute directly into poor maternal and neonatal outcome.
5. Files and record keeping issues: This is one of challenges and critical for MPDSR accuracy and learning from cases. Most of health facilities lack documentation, files for admission and statistical records process.
6. **MPDSR System factors: This includes,**
 - MPDSR teams are not active, and MPDSR is considered a low priority by health facilities, County Health Departments (CHDs), and the State Ministry of Health (SMOH).
 - Lack of ministerial orders and clear directives from the national Ministry of Health (MOH) to the SMOH to implement MPDSR. SMOHs often request proof of activity before their involvement.
 - Misunderstanding of the MPDSR process, with staff misinterpreting it as a form of police investigation or judgment. Providing background on the purpose of MPDSR (a no-blame process) before starting the audit improves staff understanding, cooperation, and involvement.
 - Most action points agreed upon following MPDSR reviews are not implemented, and staff perceive MPDSR as an NGO-driven activity initiated by partners rather than their own responsibility.

8. Recommendations

8.1. Recommendations for the National Ministry of Health (NMoH)

1. Institutionalize MPDSR at national level (policies, guidelines, SOPs)
2. Ensure national MPDSR accountability and learning framework
3. Allocate national resources and budgets to maternal & newborn health
4. Invest in intrapartum care improvement packages
5. Strengthen emergency readiness standards across the health system
6. Create national HRH (human resources for health) strategies for obstetrics, neonatology, anesthesia, and midwifery
7. Secure national procurement systems for essential supplies + drugs
8. Allocate, coordinate with partners and donors for technical & financial support Set national indicators and reporting requirements toward global targets (e.g., zero preventable maternal/newborn deaths)

8.2. Recommendations for State Ministries of Health (SMoH)

1. Operationalize MPDSR processes in state hospitals & counties
2. Supervise health facilities and verify MPDSR data
3. Ensure facility-level emergency readiness and referral pathways

4. Deploy and manage health workforce at state level
5. Facilitate state-level training, mentorship, and supportive supervision
6. Monitor stock levels and distribution of essential supplies
7. Implement intrapartum care improvements (LCG use, partograph, signal functions)
8. Coordinate with hospitals and partners at state level
9. Contextualize accountability and learning at state platforms

8.3. Recommendations for Professional Bodies (e.g., AGOSS, Medical Associations, Councils)

1. Advocate for strengthening emergency obstetric and newborn care (EmONC)
2. Promote adoption of evidence-based intrapartum care tools (e.g., LCG)
3. Lead professional training, CPD, and competency development
4. Support MPDSR through expert reviews, audits, and mentorship
5. Uphold professional accountability and quality of clinical practice
6. Contribute technical advice to national maternal health strategies
7. Champion national commitment to reducing preventable maternal & neonatal deaths

8.4. Cross-cutting among MoH + SMoH + AGOSS + partners

1. Strengthening MPDSR as a national learning system
2. Improving emergency intrapartum and neonatal care
3. Building clinical and managerial workforce capacity
4. Moving toward the goal of zero preventable maternal & newborn deaths

9. Conclusion

In conclusion, maternal and perinatal deaths in South Sudan remain largely preventable and are driven by a combination of direct obstetric causes, indirect medical conditions, and pervasive health system weaknesses. Strengthening MPDSR offers a critical pathway to improve quality of care, accountability, and learning within the health system. Accelerated national institutionalization, coupled with targeted investments in intrapartum care, emergency readiness, human resources, and essential supplies, is essential to reduce maternal and perinatal mortality and move South Sudan closer to the global goal of zero preventable maternal and newborn deaths.

Article Information

Disclaimer (Artificial Intelligence): The author or authors hereby declare that they have not used any generative AI technologies, including text-to-image generators and large language models (ChatGPT, COPILOT, etc.), when producing or revising articles.

Competing Interests: We A declared (authors), that there are no conflicting interests.

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