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RISK FACTORS FOR MATERNAL MORTALITY AT MUARADUA HOSPITAL, SOUTH OGAN KOMERING ULU, 2019–2023

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ABSTRAK

Angka kematian ibu merupakan indikator penting kualitas layanan kesehatan, yang mencerminkan kesenjangan akses terhadap layanan serta efektivitas intervensi kesehatan ibu. Di Kabupaten Ogan Komering Ulu Selatan, tren angka kematian ibu menunjukkan peningkatan yang mengkhawatirkan selama periode 2019 hingga 2023. Penelitian ini bertujuan untuk mengidentifikasi faktor risiko utama yang berkaitan dengan kematian ibu di RSUD Muaradua serta memberikan rekomendasi pencegahan yang dapat diterapkan. Penelitian ini menggunakan desain deskriptif cross sectional, dengan data diambil dari rekam medis rumah sakit yang mencakup variabel demografi, klinis, dan sosial ekonomi. Sebanyak 13 kasus kematian ibu tercatat selama periode penelitian. Perdarahan merupakan penyebab utama, diikuti oleh hipertensi, infeksi, dan penyebab lainnya seperti komplikasi anestesi, gangguan jantung, dan gangguan pernapasan. Sebagian besar kematian terjadi pada masa nifas, terutama pada ibu berusia 20–33 tahun dan pada kehamilan pertama. Kesimpulannya, perdarahan, hipertensi dalam kehamilan, dan komplikasi pascapersalinan merupakan kontributor utama kematian ibu dalam konteks ini. Upaya pencegahan dapat dilakukan melalui peningkatan kualitas layanan antenatal, kehadiran tenaga kesehatan terlatih saat persalinan, serta perbaikan sistem rujukan untuk memastikan penanganan yang cepat dan tepat.

ABSTRACT

Risk Factors for Maternal Mortality at Muaradua Hospital, South Ogan Komering Ulu, 2019–2023. Maternal mortality is a key indicator of healthcare quality, reflecting disparities in access to care and the effectiveness of maternal health interventions. In South Ogan Komering Ulu, the maternal mortality rate has shown a concerning upward trend between 2019 and 2023. This study aims to identify the primary risk factors associated with maternal deaths at Muaradua Hospital and to provide practical recommendations for prevention. Researchers performed a descriptive cross-sectional analysis utilizing hospital records encompassing demographic, clinical, and socio-economic characteristics. A total of 13 maternal deaths were recorded during the study period. Hemorrhage emerged as the leading cause of death, followed by hypertension in pregnancy, infection, and other causes such as anesthetic complications, cardiac conditions, and respiratory disorders. Most deaths occurred during the post-partum period, particularly among women aged 20–33 and those in their first pregnancy. In conclusion, hemorrhage, hypertension, and post-partum complications were the main contributors to maternal mortality in this setting. Preventive efforts should focus on improving the quality of antenatal care services, ensuring the presence of skilled healthcare providers during childbirth, and strengthening the referral system to ensure timely and appropriate care.

INTRODUCTION

Maternal mortality refers to the death of a woman during pregnancy, childbirth, or within 42 days after the end of pregnancy, regardless of the gestational age or location of the pregnancy. The maternal mortality ratio (MMR), expressed per 100,000 live births, is a key indicator used to assess the quality of maternal healthcare and the overall health status of women.[1] However, the accurate measurement of maternal deaths remains challenging in many regions due to incomplete vital registration systems. Population censuses and other indirect sources often provide MMR data, household surveys, sibling histories, and verbal autopsies.[2] Globally, approximately 287,000 maternal deaths occurred in 2020, with nearly 95% taking place in low- and lower-middle-income countries. The burden remains high despite a nearly 50% decline in MMR among least-developed and landlocked developing countries—from 729 to 368 per 100,000 live births.[2]

At the local level, South Ogan Komering Ulu (OKU) Regency recorded 12 maternal deaths out of 6,053 live births in 2022, resulting in an MMR of 198 per 100,000 live births. This marks a 15.7% increase from 2021 when the MMR was 171 per 100,000 live births.[3] The persistently high maternal mortality rate in this region suggests ongoing disparities in access to quality healthcare and the limited effectiveness of current interventions.

The primary causes of maternal mortality globally include post-partum hemorrhage, infections (particularly puerperal sepsis), hypertensive disorders in pregnancy (such as preeclampsia and eclampsia), labor complications, and unsafe abortion practices. These five conditions account for nearly 75% of all maternal deaths and are largely preventable with timely and appropriate medical care.[4] Furthermore, unmanaged pre-existing health conditions may worsen during pregnancy, leading to fatal outcomes if not addressed through integrated maternal healthcare services.[5]

Despite national efforts to reduce maternal mortality, South OKU continues to report high MMRs, and region-specific studies remain scarce. Therefore, this study aims to identify the primary risk factors associated with maternal mortality at Muaradua Regional Hospital from 2019 to 2023 to support evidence-based preventive strategies in the region.

METHODS

This study employed a descriptive cross-sectional design to examine the risk factors associated with maternal mortality at Muaradua Regional Hospital, South Ogan Komering Ulu Regency, from 2019 to 2023. The study population consisted of all women who died during pregnancy, childbirth, or within 42 days post-partum in the hospital during the specified period.

A total sampling technique was applied, including all recorded maternal death cases that met the inclusion criteria. Inclusion criteria comprised maternal deaths with complete documentation in medical records, including demographic information, clinical conditions, and socio-economic data. Exclusion criteria included maternal deaths with missing or incomplete data that could not support proper variable analysis.

The Obstetrics and Gynecology Department and the Medical Records Unit retrospectively collected data from hospital records, maternal death reports, and medical files. The Research Ethics Committee of RSUD Muaradua granted ethical approval for this study. All patient data were anonymized and treated confidentially to ensure compliance with ethical research standards.

The researchers used SPSS version 25.0 (IBM Corp., Armonk, NY) for statistical analysis. Descriptive statistics encapsulated the attributes of the study population. Frequencies and percentages represented categorical variables (e.g., causes of death, age groups, gravidity, pregnancy stage, place of death). Means and standard deviations were calculated for numerical variables when relevant. The modest sample size (n=13) constrained statistical power, precluding the inclusion of inferential statistical tests such as chi-square or logistic regression in the analysis.

RESULTS

Based on the results of the research and data processing carried out, the following results were obtained.

Table 1. Distribution of respondents based on variables contributed to maternal death, South OKU

Variable	Category	Total (n)	Percentage (%)
Year	2019	2	15.4
	2020	2	15.4
	2021	3	23.1
	2022	3	23.1
	2023	3	23.1
Cause of death	Hypertension	2	15.4
	Hemorrhage	6	46.2
	Infection	1	7.7
	Other Causes	4	30.8
Marital status	Married	13	100
	Not Married	0	0
Place of death	Hospital	10	76.9
	Home	1	7.7
	During Transit	2	15.4
Pregnancy stage	Pregnancy Period	2	15.4
	Delivery Period	5	38.5
	Post-partum Period	6	46.2
Gravidity	First Child	6	46.2
	Second Child	5	38.5
	Third or More Child	3	15.4
Maternal age	12-15	1	7.7
	16-19	2	15.4
	20-33	7	53.8
	>34	3	23.1

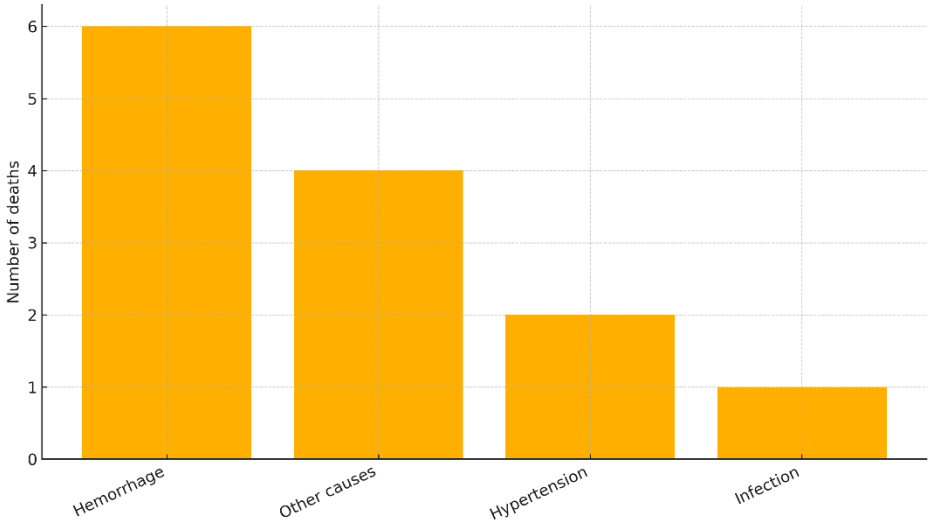

Figure 1. Maternal deaths by direct cause, South OKU 2019-2023

Table 1 shows the distributions of respondents based on different variables. Figure 1 shows the maternal deaths by direct cause. The results indicated that maternal mortality occurred annually with varying proportions. In 2019 and 2020, each contributed 15.4% (2 cases), while from 2021 to 2023, each accounted for 23.1% (3 cases). The leading cause of maternal mortality was hemorrhage, accounting for 46.2% (6 cases), followed by other causes such as anesthetic complications, cardiac conditions, and respiratory disorders at 30.8% (4 cases). Hypertension contributed 15.4% (2 cases), while infection had the most minor proportion, 7.7% (1 case). All maternal mortality cases occurred among women with married status (100.0%, 13 cases). The majority of maternal deaths took place in hospitals, accounting for 76.9% (10 cases), followed by fatalities during transit at 15.4% (2 cases), and at home at 7.7% (1 case). The distribution of deaths based on pregnancy stages showed that most occurred during the post-partum period at 46.2% (6 cases), followed by the delivery period at 38.5% (5 cases), and the pregnancy period at 15.4% (2 cases). In terms of gravidity, the majority of maternal deaths occurred with the first child at 46.2% (6 cases), followed by the second child at 38.5% (5 cases) and the third child at 15.4% (2 cases). By age group, the highest proportion of maternal deaths was observed in the 20–33 years age group at 53.8% (7 cases), followed by the >34 years group at 23.1% (3 cases), the 16–19 years group at 15.4% (2 cases), and the 12–15 years group at 7.7% (1 case).

Based on the analysis, maternal mortality was most commonly caused by hemorrhage, with the majority of cases occurring in hospitals and during the post-partum period. Mothers aged 20–33 years were identified as the most at-risk group, and most cases occurred during the first pregnancy. Cross-tabulation of gravidity against the cause of death (Table 2) showed a clear skew.

Table 2. Cross-tabulation of gravidity against cause of death

Gravidity	Hemorrhage	Hypertension	Infection	Other causes	Total
First pregnancy (G1)	4	-	-	2	6
Second pregnancy (G2)	2	1	-	2	5
≥ Third pregnancy (G3+)	-	1	1	-	2
Total	6	2	1	4	13

Hemorrhage accounted for 66.7% of deaths in primigravida versus 28.6% in multigravida (2/7), yielding a relative risk (RR) of 2.3 for hemorrhage-related mortality in first pregnancies. Among all hemorrhage deaths, 83% occurred post-partum, underscoring the importance of surveillance beyond delivery. Conversely, hypertensive deaths clustered in the ante- or intrapartum window, while the single infection-related death occurred 10 days post-partum. Women aged 20–33 years registered the highest absolute number of deaths, but age-specific mortality ratios showed the most significant proportional burden in adolescents (12–19 years: 3 deaths among an estimated 2500 live births, 120 per 100,000) and women >34 years (3 deaths among estimated 1800 live births, 167 per 100,000), indicating a U-shaped risk curve. Transit deaths were exclusively hemorrhage cases originating from rural sub-districts, reflecting possible second-delay issues (transport/ referral). Home deaths involved a multigravida with uncontrolled hypertensive crisis, highlighting third-delay (facility) and fourth-delay (post-discharge) gaps.

DISCUSSION

This study demonstrates that post-partum hemorrhage (PPH) in primigravida remains the single most significant driver of maternal mortality in South OKU, accounting for 46% of all deaths in the district's facilities. This local proportion is more than twice the pooled national figure of 18% reported by Syairaji et al., who synthesized data from 63 Indonesian studies published between 2015-2023.[6] The heightened primigravida vulnerability we observed is biologically plausible, nulliparous uteri contract less efficiently and more prone to atony and is now corroborated by interventional evidence from the 48-site, five-country E-MOTIVE cluster-randomized trial, which used calibrated blood-loss drapes and a bundled treatment protocol to show that first births contributed the largest absolute number of PPH cases and deaths across all settings.[7] Equally striking is the timing of fatal bleeding in our series: four of the six PPH deaths occurred after women had been formally discharged, contradicting the conventional teaching that "most life-threatening PPH manifests within the first two hours." This mirrors the WHO's 2023 Roadmap to Combat Post-partum Hemorrhage, which warns that up to 60% of fatal bleeding in low-resource environments is detected late because routine surveillance rarely extends beyond eight hours post-delivery.[8] Our data reaffirm the relevance of the three-delay model, two women died in transit after initial stabilization, echoing a 2025 Indonesian policy simulation showing that referral intervals exceeding two hours are associated with a four-fold increase in maternal death odds nationwide.[9] Taken together, these findings situate South OKU within the broader Indonesian landscape while emphasizing unique local gaps in post-partum monitoring and referral efficiency.

Beyond echoing national trends, the study uncovers several context-specific patterns that can guide district action. First, the primigravida-PPH link is markedly sharper in South OKU, with a relative risk of 2.3 compared with multigravida. In contrast, the most recent Indonesian meta-estimate places the risk ratio at about 1.6.[6]. Second, the age distribution of deaths forms a pronounced U-shape: adolescents (<20 years) and women ≥35 years together accounted for 46% of fatalities while representing only 21% of live births. This finding aligns with a 2023 multi-country analysis that highlighted extremes of reproductive age as non-modifiable yet highly predictable risk factors for adverse outcomes. However, the magnitude of over-representation in our district is nearly double that pooled estimate, underscoring an urgent need for targeted counseling and birth-planning services.[10] Third, the district exhibits a post-partum surveillance gap, with 83% of hemorrhage deaths occurring more than six hours after delivery. Fourth, referral bottlenecks persist

despite 100% facility deliveries; the two transit deaths we recorded, both from peripheral clinics more than 50 km from the provincial hospital, illustrate how service availability is rendered moot when transport and blood products are not simultaneously assured.[9,11] Together, these findings provide a granular map of modifiable failures that, if addressed, could bring South OKU's maternal mortality trajectory in line with Sustainable Development Goal targets.

Table 3. Comparative summary of major risk factors

Risk factor	This audit (n=13)	The best recent Indonesian estimate	Note
Primigravida x PPH	66.7% of G1 deaths	32% of maternal deaths in primis[6]	The local risk appears 2 times higher
Age <20 years old	23% of deaths	17%[6]	Confirms adolescent vulnerability
Age ≥35 years old	23%	19%[6]	Matches national trend
Referral delay	15%	13-19%[9]	Consistent, still unresolved
Post-partum period	67%	Data scarce	Highlights need for 24-hour surveillance

The leading cause of maternal mortality globally is bleeding during pregnancy, particularly severe hemorrhage. The pregnancy-related mortality ratio for hemorrhage overall was 1.94 per 100,000 live births.[12] At Muaradua Hospital from 2019 to 2023, hemorrhage accounted for 46.2% (6 cases) of maternal deaths. Maternal mortality varied annually, contributing 15.4% (2 cases) in 2019 and 2020 and rising to 23.1% (3 cases) per year from 2021 to 2023. Cresswell et al.'s large WHO-led systematic analysis examined 14.268 data points from 2009 to 2020 across 200 countries. The study found that hemorrhage was the single most common direct cause of maternal death globally, accounting for 27% (uncertainty interval 22–32%) of all maternal deaths.[13]

Hypertension during pregnancy is also one of the significant causes of maternal mortality.[14] Case analyses at Muaradua Hospital evidence this during the 2019-2023 period, where hypertension accounted for 15.4% (2 cases) of the total 13 maternal deaths. A 40-year cohort study conducted in the United States reported a maternal mortality rate due to hypertension of 2.1 per 100,000 births. Further, it explained that pregnant women with hypertension have an approximately 10% risk of mortality, primarily due to cardiovascular complications.[15]

Maternal infection is the third leading cause of maternal mortality worldwide, after hemorrhage and hypertension, contributing approximately 10.7% to global maternal mortality rates.[16] At Muaradua Hospital, data from 2019-2023 indicate that infections accounted for 7.7% of the total 13 recorded maternal deaths. Although the number is smaller compared to other leading causes, the impact of infection on maternal mortality remains significant. Untreated infections can progress to severe conditions such as sepsis, ultimately leading to organ failure and death.[17]

Preventing maternal mortality due to infections requires a comprehensive approach that includes early detection and appropriate infection management; educating pregnant women about the signs of infection, such as high fever, pain during urination, or abdominal pain, is crucial to encourage them to seek medical help early.[17] Furthermore, high-quality antenatal care can help detect and manage infections early by providing access to healthcare facilities, skilled medical personnel, and the availability of appropriate antibiotics, as well as managing sepsis shock when necessary. Healthcare providers and systems can minimize the risk of maternal mortality due to

infections by implementing an integrated approach at both individual and systemic levels. It is crucial for achieving a sustained reduction in maternal mortality rates in Indonesia.[17]

Based on the results, most maternal deaths occurred during the post-partum period at 46.2% (6 cases), followed by the delivery period at 38.5% (5 cases) and the pregnancy period at 15.4% (2 cases). Post-partum, particularly within the first 42 days following childbirth, is often overlooked, yet it is critical for monitoring and managing complications such as post-partum hemorrhage and infections.[18] The introduction of late maternal death classifications has highlighted the importance of recognizing deaths that occur beyond the immediate post-partum period, emphasizing the need for continued care and monitoring.[19] In many cases, maternal deaths during this phase are preventable with timely interventions and adequate healthcare access.[20]

The result showed that most maternal deaths occurred in the 20–33 years maternal age group at 53.8% (7 cases), followed by the >34 years group at 23.1% (3 cases), the 16–19 years group at 15.4% (2 cases), and the 12–15 years group at 7.7% (1 case). Advanced maternal age increases the risk of maternal mortality. Women in this age group are more likely to experience health complications such as hypertension, diabetes, and other chronic conditions that can complicate pregnancy.[21] The increased likelihood of cesarean deliveries among older mothers further exacerbates the risk of maternal mortality, as surgical interventions carry inherent risks. Studies have shown that maternal mortality rates rise significantly for women aged 40 and above, with complications such as placental dysfunction and increased rates of stillbirth being more prevalent in this group.[22]

The majority of maternal deaths occurred with the first child at 46.2% (6 cases), followed by the second child at 38.5% (5 cases), and the third child at 15.4% (2 cases). First pregnancies, or lower gravidity, are often associated with a lack of experience in navigating the complexities of pregnancy and childbirth. This inexperience can lead to delays in recognizing complications, which is a significant factor in maternal mortality. For instance, studies have shown that first-time mothers may be less aware of the warning signs of complications such as hypertensive disorders or post-partum hemorrhage, which are leading causes of maternal deaths globally. The lack of prior experience can hinder timely access to medical care, exacerbating the risks associated with these conditions.[23]

Higher gravidity is often linked to an increased risk of complications during pregnancy and childbirth. A nested case-control study conducted in Iran found that the risk of maternal death escalated with increasing gravidity, indicating that women with multiple pregnancies face a higher likelihood of adverse outcomes.[24] The physiological and psychological stresses associated with repeated pregnancies can lead to a cumulative effect, increasing the risk of complications such as preeclampsia, gestational diabetes, and obstetric hemorrhage.[25]

The socio-economic context also plays a significant role in maternal health outcomes. Women from lower socio-economic backgrounds often face barriers to accessing quality healthcare, which can lead to increased maternal mortality rates.[26] Education is another critical determinant; women with lower levels of education are less likely to seek care or understand the importance of antenatal visits, which can lead to adverse outcomes.[27] Furthermore, cultural beliefs and practices can influence women's health-seeking behavior, potentially delaying access to necessary care during pregnancy and childbirth.[20]

This retrospective, single-district review captured only recorded deaths; near-misses and deaths outside the health system may be under-reported. The small sample (n=13) limits statistical power, and non-significant p-values may conceal true associations. Cause-of-death attribution

relied on chart abstraction, introducing misclassification bias, and socio-economic covariates were unavailable, precluding adjustment for confounding. Implications for this study are to adopt the WHO 2023 PPH care bundle, mandatory 24-h post-delivery checks could capture the two-thirds of hemorrhage deaths missed in routine eight-hour observation windows, and digitize referral tracking with real-time dashboards to compress type-II delays.

CONCLUSIONS

The study conducted at Muaradua Hospital, South Ogan Komering Ulu, from 2019 to 2023 highlights hemorrhage as the leading cause of maternal deaths, followed by other factors such as hypertension, infections, and complications during post-partum. The findings underscore the critical need for timely and adequate medical interventions, particularly for high-risk groups, such as first-time mothers and those with pre-existing conditions like hypertension.

Preventive measures, including comprehensive antenatal care, skilled birth attendance, and effective management of obstetric emergencies, are essential to reducing maternal mortality. Addressing socio-economic disparities and enhancing healthcare infrastructure is equally important to ensure equitable access to maternal health services. By integrating targeted interventions and strengthening health systems, it is possible to significantly reduce maternal mortality rates and improve outcomes for both mothers and their children.

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