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Research Article

To Study the Obstetric Care as a Surrogate Indicator of Maternal Near-Miss Cases at a Tertiary Care Centre in Southern Bihar

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ABSTRACT

Introduction: "Maternal Near Miss" refers to the occurrence of a woman's survival after a serious illness during or after pregnancy, birth, or the first 42 days following an abortion due to complications that happened during or during these times. Death, chronic sickness, or a near-miss are all possible outcomes of Severe Acute Maternal Morbidity (SaMMM).

Aim and Objectives:

- To assess the obstetric care by referencing maternal near-misses as an intermediary metric.
- To evaluate and study the frequency of near-miss incidents involving mothers at the tertiary care facility.
- To Identify and investigate the factors that lead to maternal mortality in the tertiary care facility.

Material and Methods: The ethics committee gave their stamp of approval before the prospective observational study could begin. The chronological age, total number of pregnancies, and gestational age at admission were important pieces of patient data. Regardless of gestational age, this study documented prenatal booking status. Above and beyond that, we recorded the patients' admission conditions, delivery manner. The patients were all closely monitored from the time they checked into the hospital until they were either released or passed away on. We have computed the following indicators.

Result: In a total of 120 cases, 10 were maternal fatalities and 110 were maternal near misses. Near misses were most commonly caused by anaemia (21.8%), sepsis (19.1%), and pre-eclampsia (14.5%). Anaemia (30.0% of cases) and preeclampsia (20.0% of cases) were the leading causes of maternal death.

Conclusions: The current study found that out of 120 maternal cases, there were significant associations with the following variables: booking status, mode of delivery, ICU stays, uric acid, potassium, haemoglobin levels, and types of organ dysfunction and surgical interventions. Maternal age, gestational age, OBS scores, birth weight, timing of events, and referral status did not show a significant relationship with maternal outcomes. Better outcomes were associated with booking and LSCS.

Keywords: *MNM, Maternal death, maternal mortality, obstetric care.*

INTRODUCTION

One key metric for evaluating the effectiveness of healthcare systems in preventing maternal mortality is the MMR, which is defined as the number of maternal fatalities divided by the total number of live births[1]. Even though the MMR rate has been falling worldwide, there are still issues with maternal health, particularly in developing nations like India. While the National Health Mission (NHM) has helped reduce maternal mortality in India through greater financing and programs, the country still needs to move faster if it wants to meet its international and national goals.

Because these ladies experience life-threatening illnesses like organ dysfunction yet are able to survive because medical professionals respond quickly, their stories shed light on the effectiveness of the healthcare system[2]. The data provided by maternal deaths—those that occur during a woman's pregnancy or within 42 days after the termination—are insufficient. Given the rarity of maternal mortality, evaluating maternal healthcare quality via the lens of near-miss cases offers a more realistic and all-encompassing approach.

For the purpose of identifying maternal near-miss cases, the WHO standardised the criteria in 2009 to include specific markers of organ dysfunction across many systems, including as neurologic, cardiovascular, respiratory, renal, and hepatic functions[3]. Since then, healthcare facilities around the world have embraced these standards, allowing for more uniform comparison and analysis of maternal near-miss data. Health care practitioners and legislators might learn more about maternal healthcare deficiencies that might not be obvious from death rates alone by looking at near-miss occurrences. Because of the greater sample size they provide, near-miss cases allow for the gathering of crucial data on healthcare delivery and the identification of problem areas[4]. It is possible to learn a great deal about the efficacy of care and the gaps in the system by speaking with women who have survived difficulties.

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This research fills a critical need in the literature by examining maternal health in India's rural and impoverished areas.

The research seeks to shed light on the healthcare system's ability to handle serious maternal problems in regions with limited infrastructure by examining obstetric care as a proxy for maternal health. In the long run, this information will help advance safe motherhood programs in underdeveloped areas.

Aim and Objectives

Aim: In order to assess the obstetric care by referencing maternal near-misses as an intermediary metric.

Objective

- To determine the frequency of maternal near-misses in the tertiary care centre and
- To determine the reasons behind mother mortality in this centre.

Review of Literature

Maternal Mortality: Initiated in 2000 following the UN Millennium Summit, the MDG laid out eight global development targets to be complete by 2015. Aiming to achieve universal access to reproductive health services was the emphasis of Target 5B, while Target 5A sought to decrease the MMR by 75% from 1990 to 2015[5]. Both targets were part of Goal 5's explicit focus on improving maternal health.

MMR: MMR is the proportion of live births to total births within a given time frame expressed as a percentage. There are 210 cases of measles per 100,000 live births worldwide; the rate is significantly lower in developed regions compared to developing ones[6]. The MMR is 14 per 100,000 live births in developed nations and 240 per 100,000 live births in poor ones. From 1997–1998 to 2018–2019, the MMR fell dramatically, from 398 to 103 per 100,000 live births.

India's MMR Reduction

- 1997–1998: 398 per 100,000 live births
- 2001–2003: 301 per 100,000 live births
- 2007–2009: 212 per 100,000 live births
- 2010–2012: 178 per 100,000 live births
- 2011–2013: 167 per 100,000 live births
- 2017–2018: 113 per 100,000 live births
- 2018–2019: 103 per 100,000 live births

Maternal Near Miss (MNM): AMNM case refers to a situation where a pregnant or recently delivered woman encounters a life-threatening complication but ultimately survives[7]. Severe Acute Maternal Morbidity (SAMM) signifies these critical conditions that may lead to near-miss cases, whether or not there are residual health impacts.

Importance of MNM: MNM cases closely resemble maternal death cases, providing essential data on the types of complications that can be life-threatening. Studying and addressing these near-miss instances help to implement targeted interventions, thereby reducing both mortality rates and long-term health impacts[8].

Identification of MNM: To identify maternal near-miss cases, several criteria have been established, including:

1. Waterstone's Criteria (Clinical Diagnosis-Based)

- Severe preeclampsia
- Severe sepsis
- Uterine rupture
- Eclampsia
- HELLP syndrome (hemolysis, elevated liver enzymes, low platelet count)
- Severe hemorrhage

2. Mantel's Criteria (Organ Dysfunction and Management-Based)

- ICU admission for any reason
- Severe hypovolemia requiring a transfusion of at least five units of packed red blood cells
- Pulmonary edema
- Emergency hysterectomy for any cause
- ICU admission due to sepsis[9]
- Requirement for endotracheal intubation and mechanical ventilation for over 60 minutes (excluding general anesthesia cases)
- Diabetic ketoacidosis
- Coma lasting over 12 hours
- Cardiorespiratory arrest
- Persistent peripheral oxygen saturation below 90% for more than 60 minutes
- PaO2/FiO2 ratio below 300 mmHg
- Oliguria (less than 400 ml urine output in 24 hours), unresponsive to hydration, furosemide, or dopamine therapy
- Elevated blood urea nitrogen levels exceeding 15 mmol/L or serum creatinine levels above 400 mmol/L[10]
- Jaundice associated with preeclampsia
- Thyrotoxic crisis
- Severe thrombocytopenia requiring platelet transfusion
- Intracranial hemorrhage (subarachnoid or intraparenchymal)
- Anesthesia-related incidents, such as severe hypotension due to epidural or spinal anesthesia

The studies highlighted above provide a broad perspective on MNM cases across various regions and healthcare settings.

Key findings from these studies emphasize the importance of identifying and managing high-risk maternal conditions to reduce severe maternal outcomes and maternal mortality. Hypertensive disorders and hemorrhage are consistently identified as leading causes of MNM, with significant contributions to maternal mortality rates (MMRs) in several studies, including those by[11] Sepsis, anemia, and medical/surgical

conditions are also frequent contributors to maternal morbidity.

A recurrent theme across studies is the role of healthcare accessibility and quality. For instance,[12] report that a significant number of near-misses originated in primary care facilities before being referred to tertiary hospitals. This underlines the need for strengthened emergency obstetric care at lower-tier facilities. Issues with patient management and delays in treatment have been shown to impact outcomes.[13] noted the critical association between treatment response time and maternal outcome, suggesting the importance of rapid intervention and adequate healthcare infrastructure to improve maternal survival rates. Across multiple studies, a high prevalence of near-miss cases was seen among unbooked and rural women. For example,[14] found that a significant portion of MNM cases involved women from lower socioeconomic backgrounds and with limited education, suggesting socio-demographic factors play a role in maternal health risks.

Various studies report different MNM ratios, reflecting the varied healthcare contexts. For instance,[15] recorded a MNM incidence ratio of 65.95 per 100,000 live births, while[16] observed a lower MNM rate of 4.71 per 1,000 live births. Such variations underscore the impact of healthcare system efficacy and resource availability on MNM outcomes.

Critical interventions frequently employed in MNM cases include blood transfusions, mechanical ventilation, and, in severe cases, hysterectomy. These interventions are essential for managing life-threatening complications, with studies like [17] detailing the specific types of clinical support provided in MNM cases, such as vasopressors and dialysis.

The findings from these studies underscore the need for targeted policies to improve antenatal care, reduce patient delays, and address socioeconomic barriers that affect access to quality healthcare for pregnant women. Emphasizing the importance of regular antenatal care and improving the readiness of primary and secondary healthcare facilities to handle obstetric emergencies are critical steps in reducing MNM events and maternal deaths.

Material and Methods

Study Site: The research took place at Narayan Medical College and Hospital's Obstetrics & Gynaecology Department in Jamuhar, Sasaram, Bihar.

Study Population: The population included all pregnant females and those who had undergone termination of pregnancy within the past 42 days, presenting in the emergency department or admitted to Narayan Medical College and Hospital, Jamuhar, Sasaram. Subjects were selected based on the inclusion criteria after obtaining proper informed consent.

Study Design: This study is an observational prospective trial that took place in a healthcare facility.

Sample Size: The study included a total of 120 subjects.

Study Duration: The research lasted for a whole 18 months.

Inclusion Criteria

- Women who are pregnant and have complicated health issues that require hospitalisation.
- It was possible to identify patients who needed intensive care unit admission or crucial interventions.
- People who met the World Health Organization's near-miss criterion due to organ failure or malfunction.
- There were also reports of maternal fatalities.

Exclusion Criteria

- Women who developed the above conditions unrelated to pregnancy.
- Unconscious patients whose relatives did not consent to participate in the study.

Statistical Analysis: The data was input into Microsoft Excel and subsequently analysed with the help of SPSS. We used appropriate statistical tests and a p-value to establish statistical significance.

Results

One indicator of the potential for mother mortality during childbirth is the MMR, which is at 36.36 per 100,000 live births. When the SMOR for severe maternal complications is 39.50 per 1000 live births, it means that these complications occur frequently and can be fatal for the mother. Last but not least, the 9.21% Mortality Index highlights the importance of efforts aimed at improving maternal health.

Table 1: Table representing the age group of the respondents according to the group

Age group		Maternal death	Maternal near miss	Total	Chi square (p value)
<20 years	N	0	7	7	
	Percent	0.0%	6.4%	5.83%	
20-25 years	N	4	63	67	
	Percent	40.0%	57.27%	55.83%	
25-30 years	N	4	28	31	
	Percent	40%	25.45%	28.18%	
>30 years	N	2	12	12	
	Percent	20%	10.9%	10.9%	
Total	N	10	110	120	
	Percent	100.0%	100.0%	100.0%	1.028 (0.795)

The data indicates that maternal near misses were most frequent in women aged 20-25, followed by those aged 25-30. Maternal deaths occurred across various age groups, with no fatalities among women under 20. In total, out of 120 cases, there were 10 maternal deaths and 110 near misses. However, age group differences in maternal outcomes were not statistically significant (p=0.795).

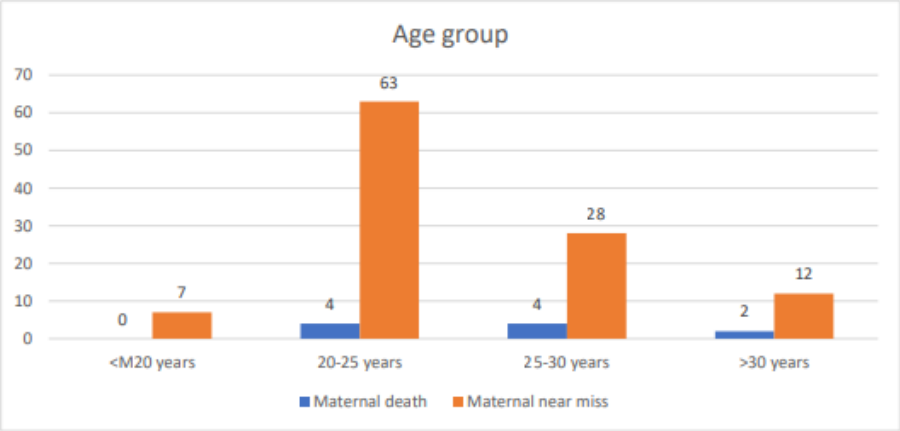

Figure 1: Figure representing the age group of the respondents according to the group

Table 2: Table representing the booking status of the respondents according to the group

			Group		Total	P VALUE
			Maternal death	Maternal near miss		
Booking Status	No	Count	7	14	21	<0.01, Significant
		% within Group	70.0%	12.7%	17.5%	
	Yes	Count	3	96	99	
		% within Group	30.0%	87.3%	82.5%	
Total		Count	10	110	120	
		% within Group	100.0%	100.0%	100.0%	

The table shows the impact of booking status on maternal outcomes, distinguishing between maternal deaths and near misses. Among unbooked cases, 70% resulted in maternal deaths, compared to only 12.7% in the near-miss category. For booked cases, 30% led to maternal deaths, while 87.3% resulted in near misses. The differences are statistically significant ($p < 0.01$), suggesting that prior booking is linked to fewer maternal deaths and higher rates of near misses, indicating improved maternal outcomes with antenatal care.

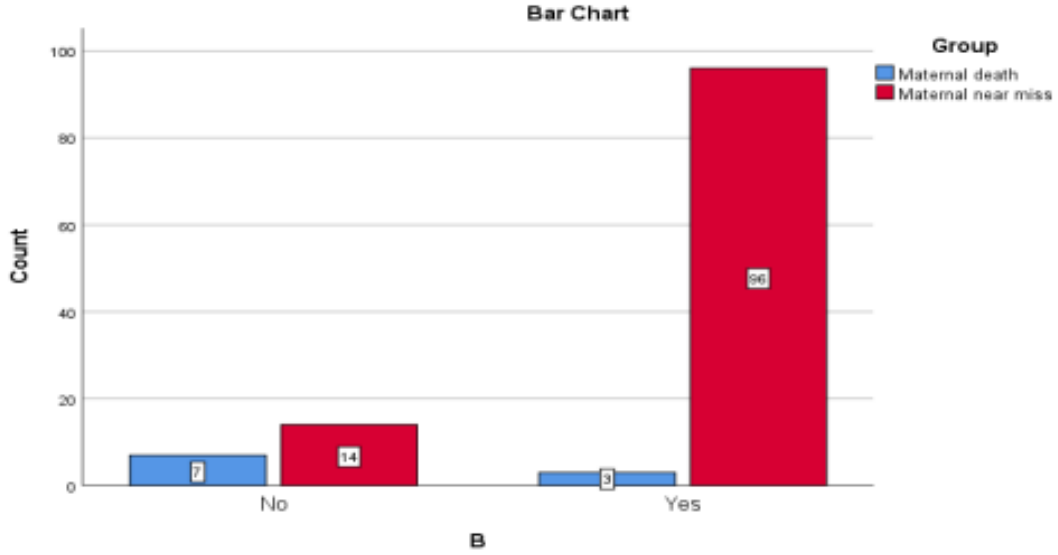

Figure 2: Figure representing the booking status of the respondents according to the group

Table 3: Table representing the referral status of the respondents according to the group

			Group			P-Value
			Maternal Death	Maternal Near Miss	Total	
Referral status	Not Referred	Count	2	47	49	0.16, no significant
		% within Group	20.00%	42.70%	40.80%	
	Referred	Count	8	63	71	
		% within Group	80.00%	57.30%	59.20%	
Total		Count	10	110	120	
		% within Group	100.00%	100.00%	100.00%	

The table displays maternal outcomes based on referral status, with outcomes divided into maternal deaths and near misses. In the non-referred group, 20% resulted in maternal death and 42.7% in near misses. Among those referred, 80% experienced maternal death and 57.3% a near miss. The differences are not statistically significant (p = 0.16), suggesting no substantial link between referral status and maternal outcomes in this sample.

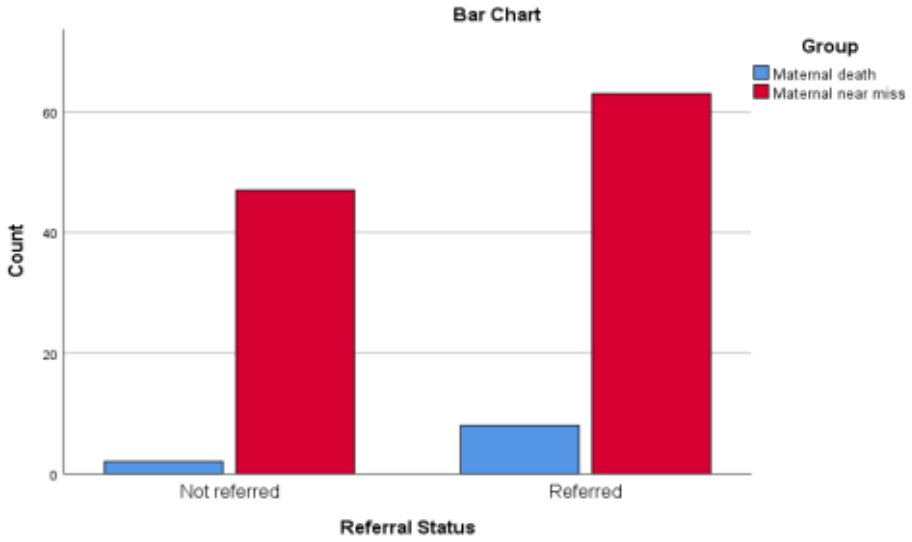

Figure 3: Figure representing the referral status of the respondents according to the group

Table 4: Table representing the OBS score of the respondents according to the group

OBS Score		Group		Total (N)	Chi-Square (P-Value)
		Maternal Death	Maternal Near Miss		
G2	N	5	31	36	2.935 (0.710)
	Percent	50.00%	28.20%	30.00%	
G3	N	2	17	19	
	Percent	20.00%	15.50%	15.80%	
G4	N	0	3	3	
	Percent	0.00%	2.70%	2.50%	
G5	N	0	2	2	
	Percent	0.00%	1.80%	1.70%	
G6	N	0	1	1	
	Percent	0.00%	0.90%	0.80%	
Primi	N	3	56	59	
	Percent	30.00%	50.90%	49.20%	
Total	N	10	110	120	
	Percent	100.00%	100.00%	100.00%	

The analysis of Obstetric Severity (OBS) scores showed no statistically significant link between OBS score categories and maternal outcomes, such as mortality or near misses (p=0.710). Notably, however, primigravidae (first-time mothers) exhibited the highest rate of maternal near misses compared to other OBS score groups.

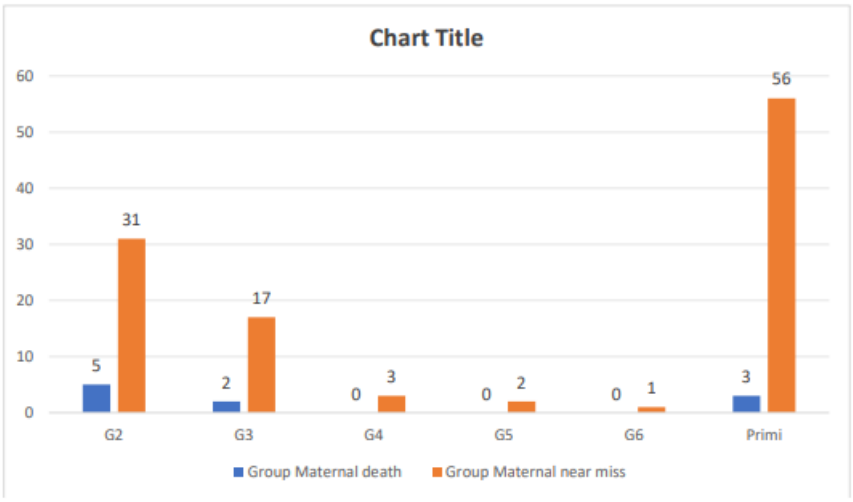

Figure 4: Figure representing the OBS score of the respondents according to the group

Table 5: Table representing the Gestational age of the respondents according to the group

			Group		
			Maternal Death	**Maternal Near Miss**	**Total**
GA	1st Trimester	Count	3	18	21
		% within Group	30.00%	16.40%	17.50%
	2nd Trimester	Count	1	15	16
		% within Group	10.00%	13.60%	13.30%
	3rd Trimester	Count	6	77	83
		% within Group	60.00%	70.00%	69.20%
Total		Count	10	110	120
		% within Group	100.00%	100.00%	100.00%
Chi-sq value: 1.19, p-value: 0.55, non-significant					

The table shows maternal outcomes according to GA, which shows that there were a total of 110 near misses and 10 maternal deaths over all trimesters. There was no statistically significant correlation between maternal mortality or near-miss rates and gestational age (p=0.55), according to a chi-square test. It is worth mentioning, nevertheless, that the third trimester accounted for almost 70% of near misses and 60% of maternal deaths.

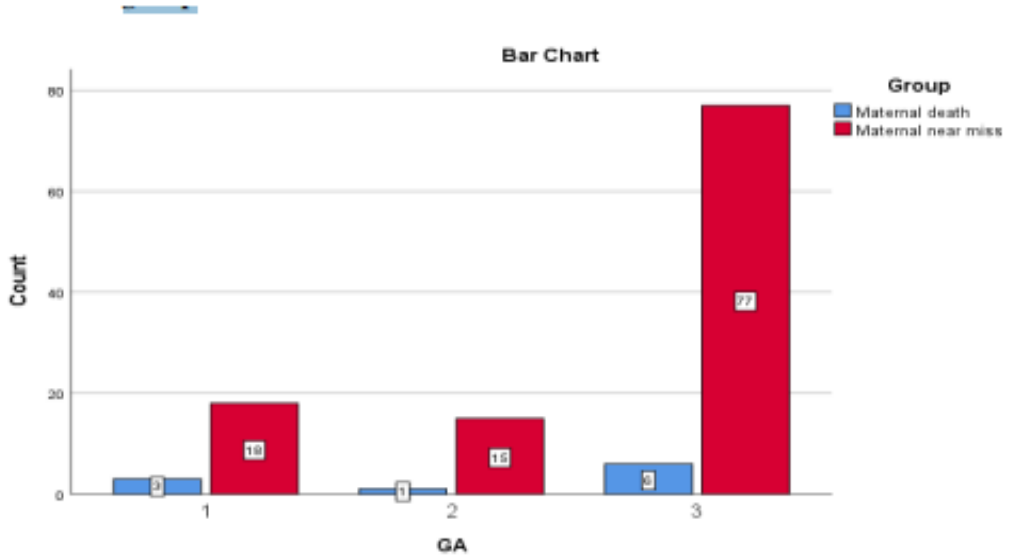

Figure 5: Figure representing the Gestational age of the respondents according to the group

Table 6: Table representing the mode of delivery of the respondents according to the group

Mode of delivery		Group			Chi square (p value)
		Maternal death	Maternal near miss	Total	
Em.Hysterotomy	N	1	3	4	47.626(<0.001)
	Percent	10.00%	2.70%	3.30%	
Em.Laparotomy	N	5	2	7	
	Percent	50.00%	1.80%	5.80%	
LSCS	N	3	57	60	
	Percent	30.00%	51.80%	50.00%	
MVA	N	0	7	7	
	Percent	0.00%	6.40%	5.80%	
Spon.Expulsion	N	1	1	2	
	Percent	10.00%	0.90%	1.70%	
Vaginal	N	0	40	40	
	Percent	0.00%	36.40%	33.30%	
Total	N	10	110	120	
	Percent	100.00%	100.00%	100.00%	

The results showed a statistically significant correlation between the modalities of delivery and mother outcomes ($p<0.001$). Near misses involving mothers were most common after caesarean sections (LSCS), while emergency laparotomies were related with more maternal fatalities.

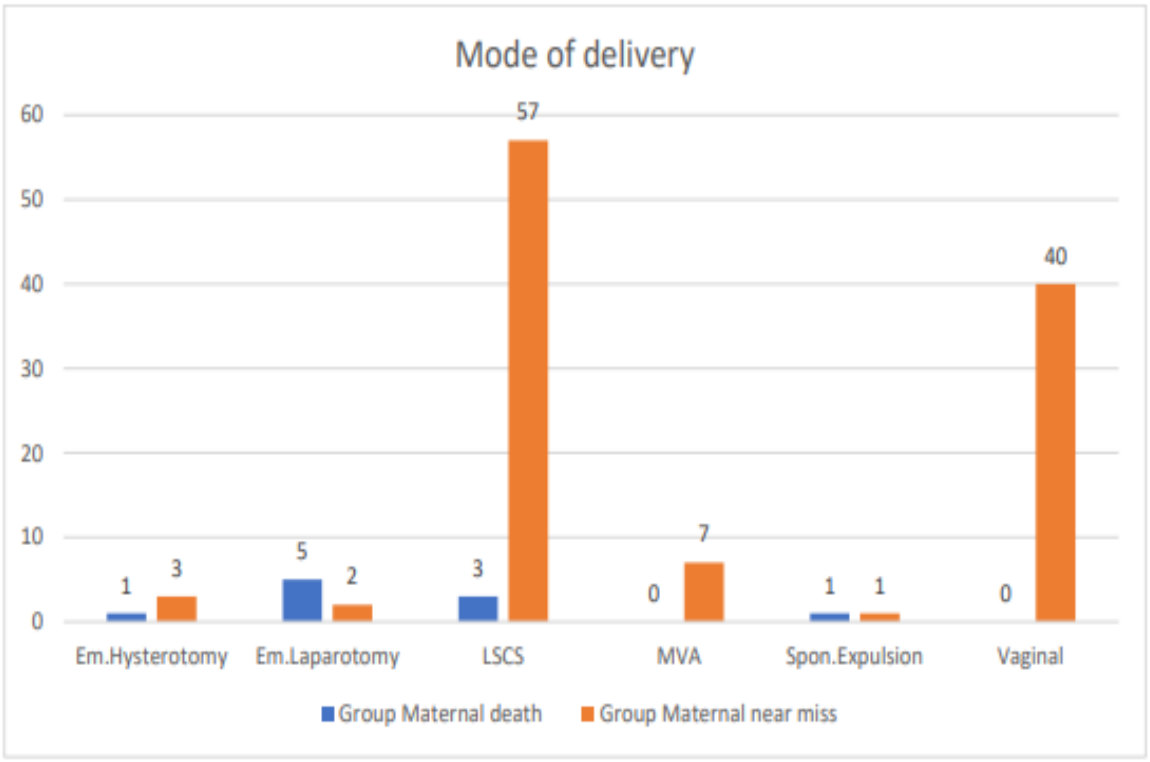

Figure 6: Figure representing the mode of delivery of the respondents according to the group

Table 7: Mean systolic BP in both the study group

	GRP	N	Mean	Std. Deviation	Std. Error Mean	P VALUE
sys BP	Maternal near miss	110	109.93	31.645	3.017	0.81. NON-SIGNI-FICANT
	Maternal Death	10	107.40	34,177	10.808	

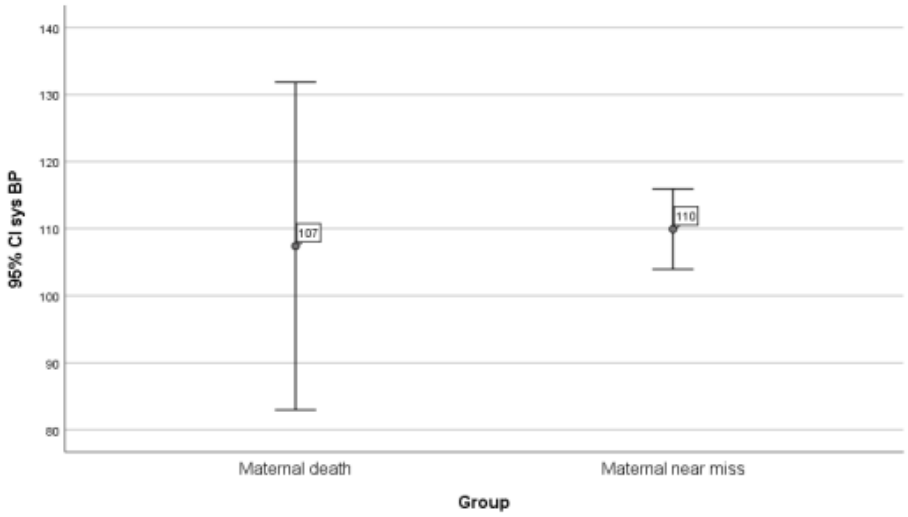

Figure 7: Mean systolic BP in both the study group

Table 8: Mean diastolic Bp in both the study group

	GRP	N	Mean	Std. Deviation	Std. Error Mean	P VALUE
Dias Bp	Maternal near miss	110	71.35	23.496	2.240	0.70
	Maternal Death	10	68.40	25.851	8.175	

Within the maternal near miss group, the mean diastolic blood pressure (BP) was 71.35 mmHg (SD = 23.496 mmHg), but within the maternal death group, the mean BP was 68.40 mmHg (SD = 25.851 mmHg). For the group that experienced a near miss, the standard error of the mean was 2.240, whereas for the group that died, it was 8.175.

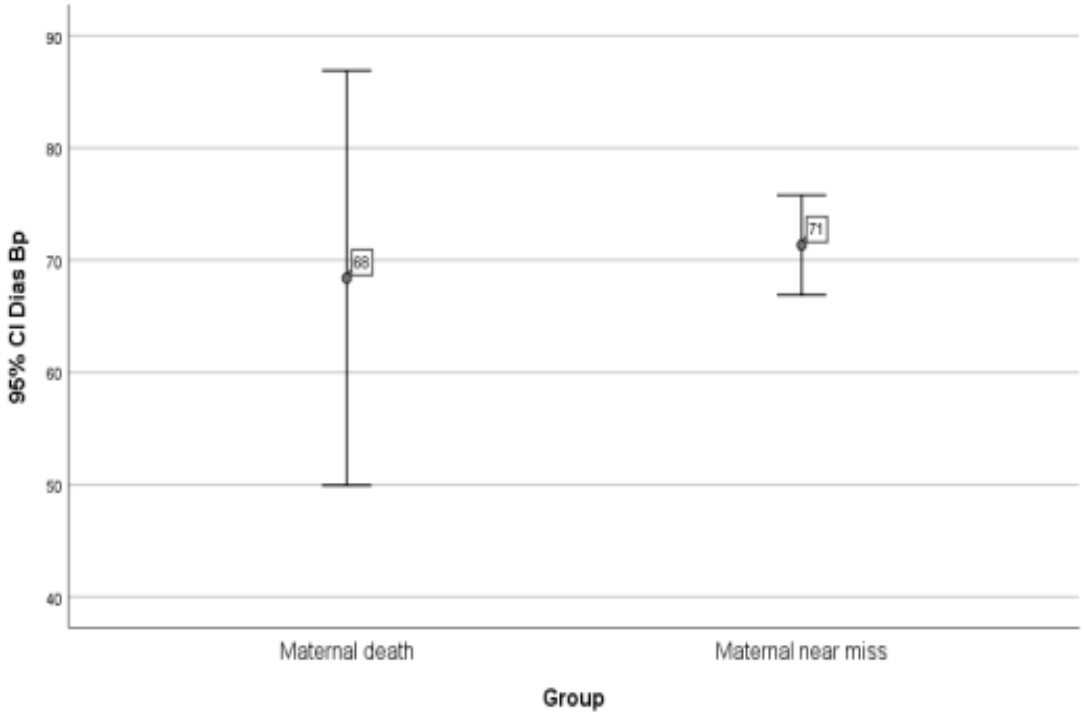

Figure 8: Mean diastolic BP in both the study group

Table 9: Mean pulse rate in both the study group

	GRP	N	Mean	Std. Deviation	Std. Error Mean	P VALUE
PR	Maternal near miss	110	102.73	25.117	2.395	0.23
	Maternal Death	10	112.60	20.871	6,600	

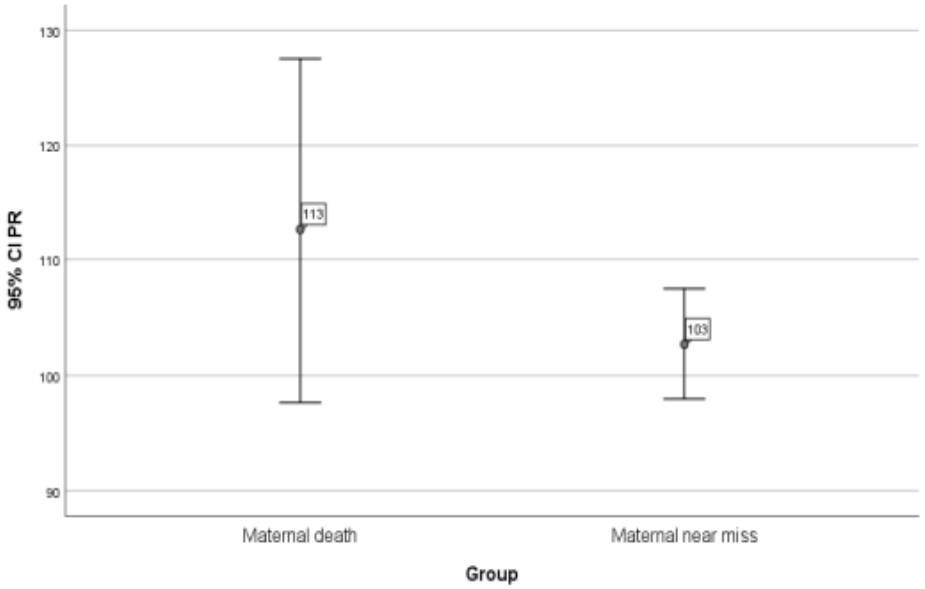

Figure 9: Mean pulse rate in both the study group

Table 10: Mean SPO2 in both the study group

	GRP	N	Mean	Std. Deviation	Std. Error Mean	P VALUE
SPO2	Maternal near miss	110	94.05	9.907	.945	0.91
	Maternal Death	10	94.40	7.749	2.450	

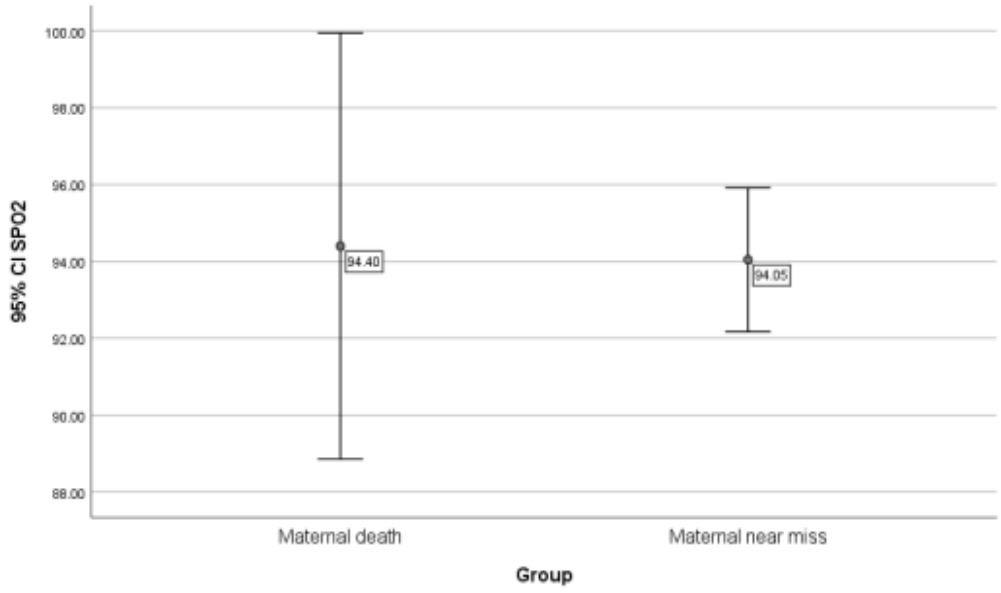

Figure 10: Mean SPO2 in both the study group

Table 11: Mean Temp in both the study group

	GRP	N	Mean	Std. Deviation	Std. Error Mean	P VALUE
Temp	Maternal near miss	110	98.018	1.7865	.1703	0.29
	Maternal Death	10	98.660	2.2609	.7150	

98.660°F (SD = 2.2609°F) was the mean temperature for the maternal death group (N=10), whereas 98.018°F (SD = 1.7865°F) was the mean temperature for the maternal near miss group (N=110). The near miss group had a standard error of the mean of 0.1703, whereas the death group had a standard error of 0.7150. A p-value of 0.29 suggests that there is no statistically significant difference in the temperatures of the two groups.

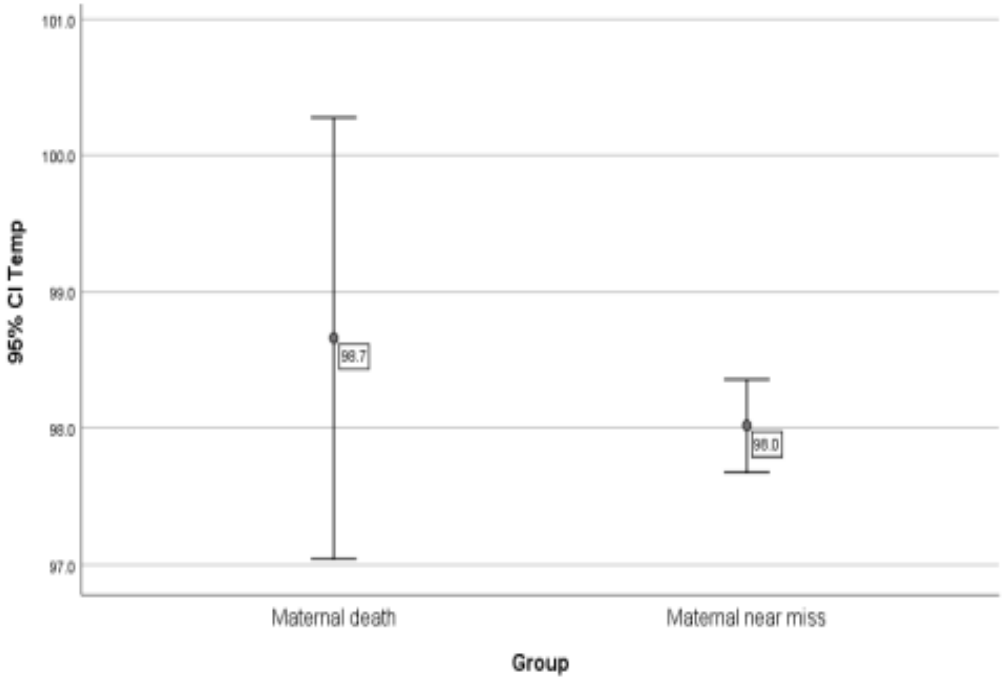

Figure 11: Mean Temp in both the study group

Table 12: Distribution of study subjects as per pH<7.1

			Group		
			Maternal death	**Maternal near miss**	**Total**
Ph 7.1	no	Count	7	93	100
		% within Group	70.0%	84.5%	83.3%
	Yes	Count	3	17	20
		% within Group	30.0%	15.5%	16.7%
Total		Count	10	110	120
		% within Group	100.0%	100.0%	100.0%
Chi-sq value-1.39, p value-0.24,non-significant					

Based on the pH values, 30% of the mothers in the group that died during pregnancy and 15.5% of the mothers in the group that had a close call had a pH lower than 7.1. The maternal near miss group had an average pH of 8.45 while 70% of the maternal death group had an average pH of 7.1. A p-value of 0.24 and a chi-square value of 1.39 indicate that there is no statistically significant difference in the occurrence of pH levels below 7.1 between the two groups.

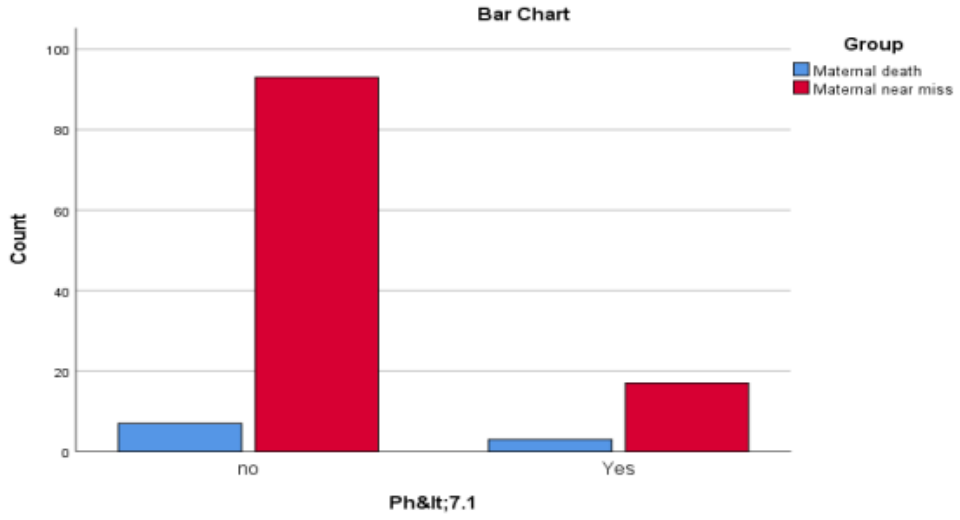

Figure 12: Distribution of study subjects as per pH<7.1

Table 13: Table representing the surgical intervention according to the group

			Group		Total
			Maternal death	Maternal near miss	
Surgical intervention	hemorrhage leading to hysterectomy	Count	0	7	7
		% within Group	0.0%	6.4%	5.8%
	Hysterotomy	Count	0	3	3
		within Group	0.0%	2.7%	2.5%
	laparotomy	Count	0	18	18
		within Group	0.0%	16.4%	15.0%
	No	Count	9	82	91
		% within Group	90.0%	74.5%	75.8%
	Rent closure done	Count	1	0	1
		% within Group	10.0%	0.0%	0.8%
Total		Count	10	110	120
		% within Group	100.0%	100.0%	100.0%
Chi-sq value-13.83, p value-0.008, significant					

The table analyzes maternal outcomes related to the necessity of surgical interventions during delivery. Out of the 120 cases studied, there were 10 maternal deaths and 110 near misses. The chi-square test revealed a significant association ($p = 0.008$) between surgical interventions and maternal outcomes. Notably, laparotomy cases showed a higher percentage of near misses (16.4%) compared to maternal deaths (0.0%), indicating a potential link between the type of surgical intervention and the severity of maternal outcomes in this study.

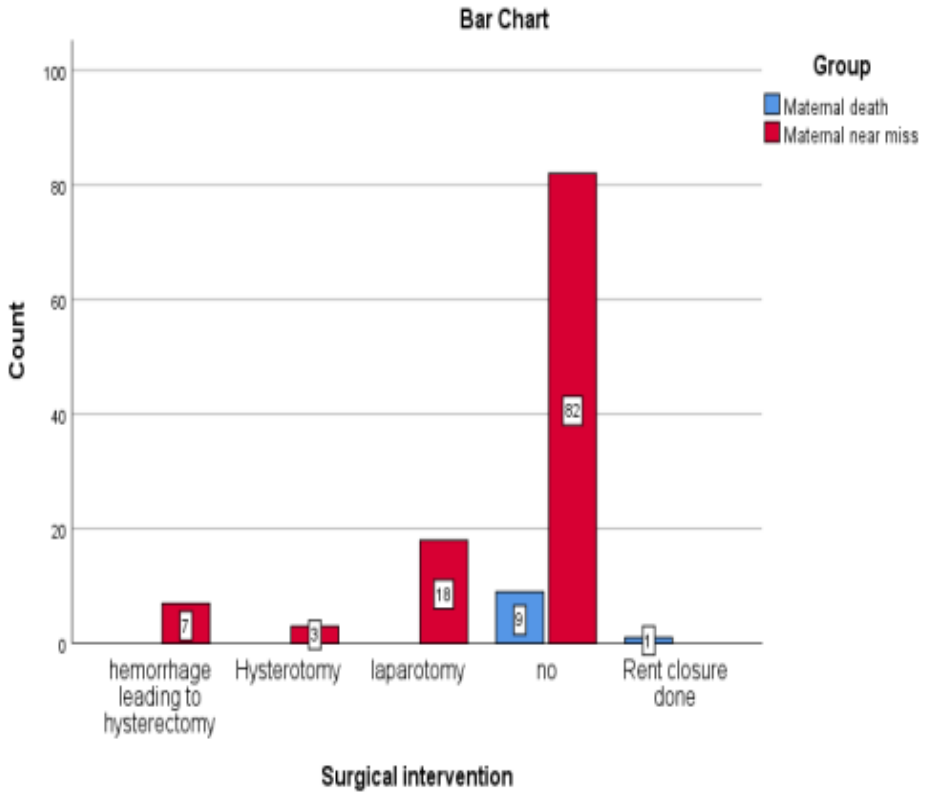

Figure 13: Figure representing the surgical intervention according to the group

Table 14: Table representing the mean comparison of Bilirubin direct according to the group

		N	Mean	Std. Deviation	Std. Error Mean	test (p value)
BIL DIR	Maternal near miss	110	0.18702	0.131963	0.012582	-0.095
	Maternal death	10	0.19110	0.097587	0.030860	0.924

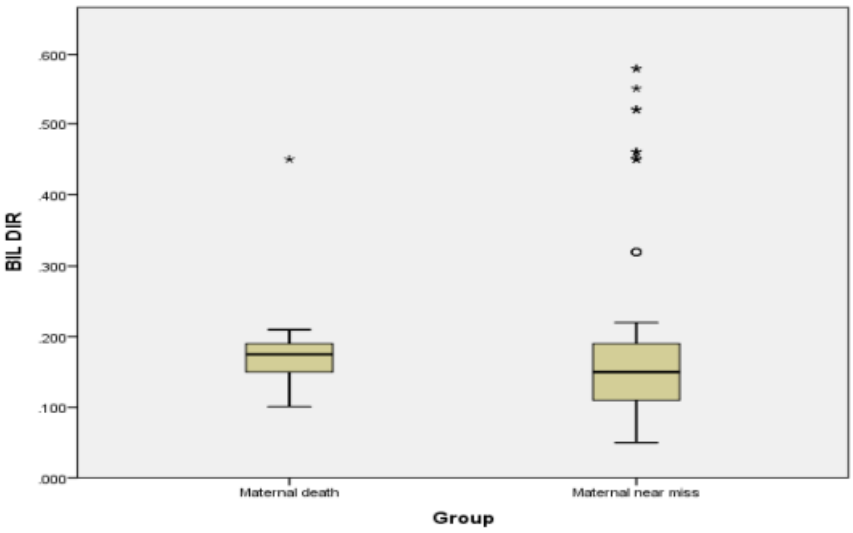

Figure 14: representing the mean comparison of Bilirubin direct according to the group

Table 15: Distribution of study subjects as per intubation

			Group		
			Maternal death	**Maternal near miss**	**Total**
Intubation	NO	Count	7	94	101
		% within Group	70.0%	85.5%	84.2%
	YES	Count	3	16	19
		% within Group	30.0%	14.5%	15.8%
Total		Count	10	110	120
		% within Group	100.0%	100.0%	100.0%
Chi-sq value- 1.64, p value-0.20, non-significant					

With a p-value of 0.20 and a chi-square value of 1.64, there was no statistical significance in the study's distribution of individuals according to intubation status. This indicates that in the sample population, intubation status was not significantly associated with maternal outcomes (maternal death versus near miss). Therefore, we cannot rule out the possibility that intubation was necessary for moms who had a maternal death or a near miss, as we did not find sufficient evidence to reject the null hypothesis.

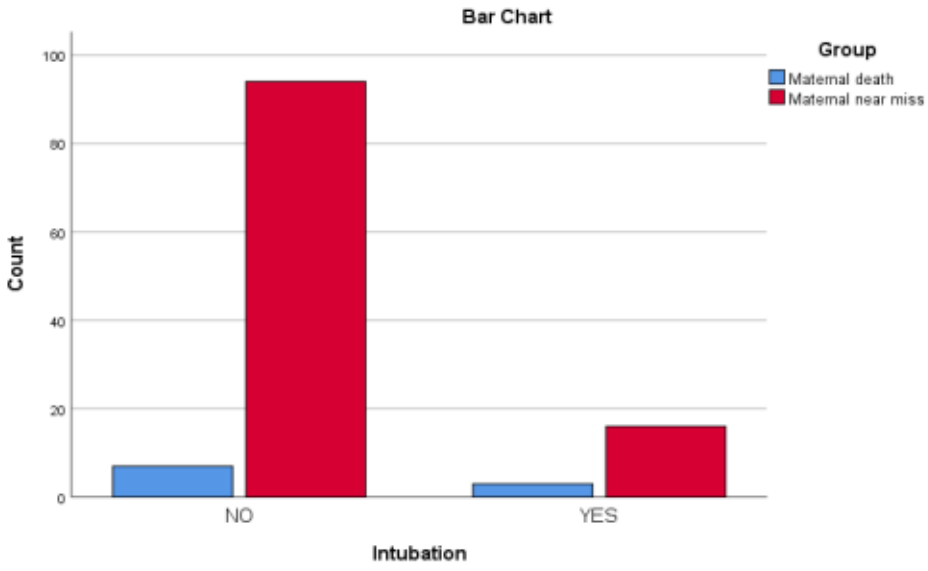

Figure 15: Distribution of study subjects as per intubation

Table 16: Distribution of study subjects in both the study group as per jaundice with eclampsia

			Group		Total
			Maternal death	Maternal near miss	
jaundice with pre-eclampsia	no	Count	6	77	83
		% within Group	60.0%	70.0%	69.2%
	yes	Count	4	33	37
		% within Group	40.0%	30.0%	30.8%
Total		Count	10	110	120
		% within Group	100.0%	100.0%	100.0%
Chi-sq -0.43, p value- 0.51, non-significant					

Those without jaundice who did have preeclampsia were more likely to be in the maternal death group (60%) or the maternal near miss group (70%) according to the study's examination of individuals. Whereas 30% of those experiencing jaundice and preeclampsia were in the group that experienced a maternal near miss and 40% were in the group that experienced maternal mortality. The lack of statistical significance in the chi-square test result (0.43) and p-value (0.51) suggests that there is no significant correlation between jaundice with preeclampsia and maternal outcomes (maternal mortality versus near miss) in this study population.

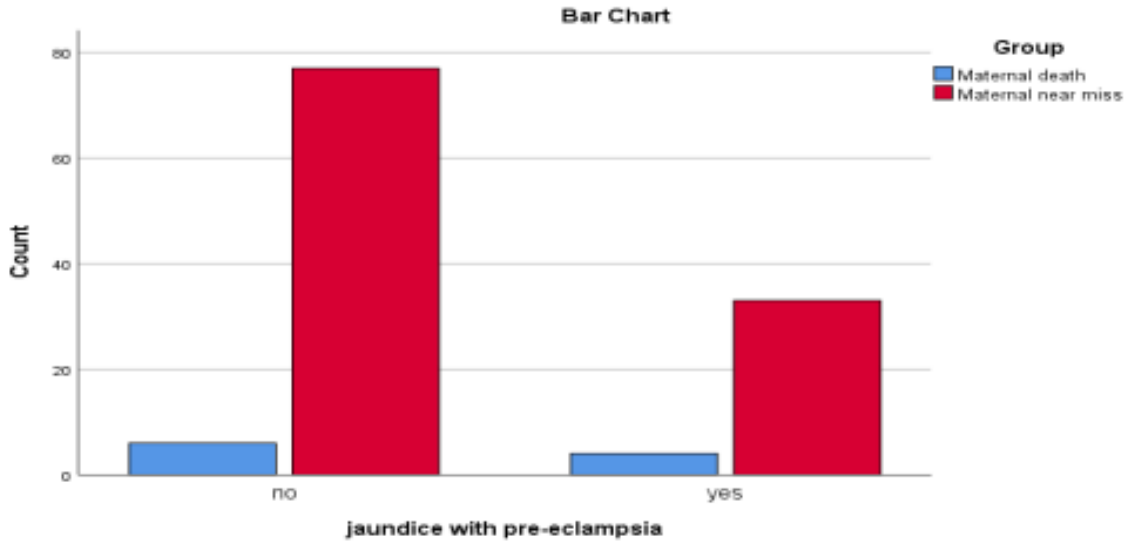

Figure 16: Distribution of study subjects in both the study group as per jaundice with eclampsia

Table 17: Distribution of study subjects as per vasoactive drugs

			Group		Total
			Maternal death	Maternal near miss	
vasoactive drug use	no	Count	1	39	40
		% within Group	10.0%	35.5%	33.3%
	yes	Count	9	71	80
		% within Group	90.0%	64.5%	66.7%
Total		Count	10	110	120
		% within Group	100.0%	100.0%	100.0%
Chi-sq-2.67, p value-0.10, non-significant					

According to the study's analysis of individuals based on vasoactive medication use, 10% of non-users were in the maternal death group and 35.5% were in the maternal near miss group. Vasoactive medication users, on the other hand, were more likely to be in the maternal death group (90%) and the maternal near miss group (64.5%). This points to a possible correlation between the use of vasoactive medications and an elevated risk of maternal mortality in this research group, as a higher proportion of maternal fatalities occurred among individuals who took these treatments.

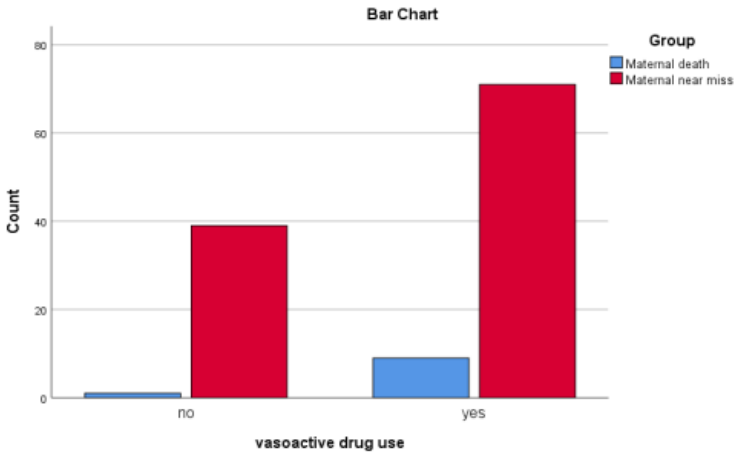

Figure 17: Distribution of study subjects as per vasoactive drugs

Table 18: Distribution of study subjects as per baby status

			Group		
			Maternal death	**Maternal near miss**	**Total**
baby status	ALIVE	Count	3	82	85
		% within Group	30.0%	74.5%	70.8%
	IUD	Count	7	28	35
		% within Group	70.0%	25.5%	29.2%
Total		Count	10	110	120
		% within Group	100.0%	100.0%	100.0%
Chi-sq value-8.80, p value-0.003, significant					

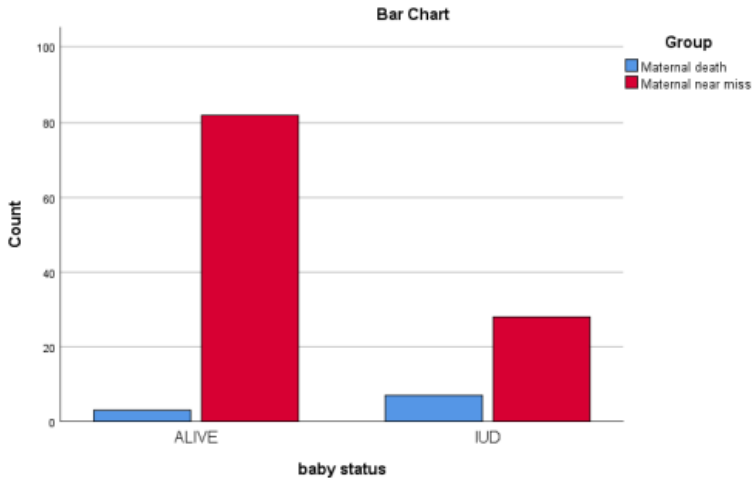

Figure 18: Distribution of study subjects as per baby status

Table 19: Table representing the ICU stays according to the group

ICU stays		**Group**		**Total**	**Chi square (p value)**
		Maternal death	**Maternal near miss**		
No	N	3	8	11	5.687 (0.017)
	Percent	30.0%	7.3%	9.2%	
Yes	N	7	102	109	
	Percent	70.0%	92.7%	90.8%	
Total	N	10	110	120	
	Percent	100.0%	100.0%	100.0%	

The data indicates a significant association between ICU stays and maternal outcomes (p=0.017). Maternal deaths were more common among women requiring ICU care, while maternal near misses were primarily found in those not needing ICU stays. This suggests that ICU admission is a critical factor in predicting and managing severe maternal complications.

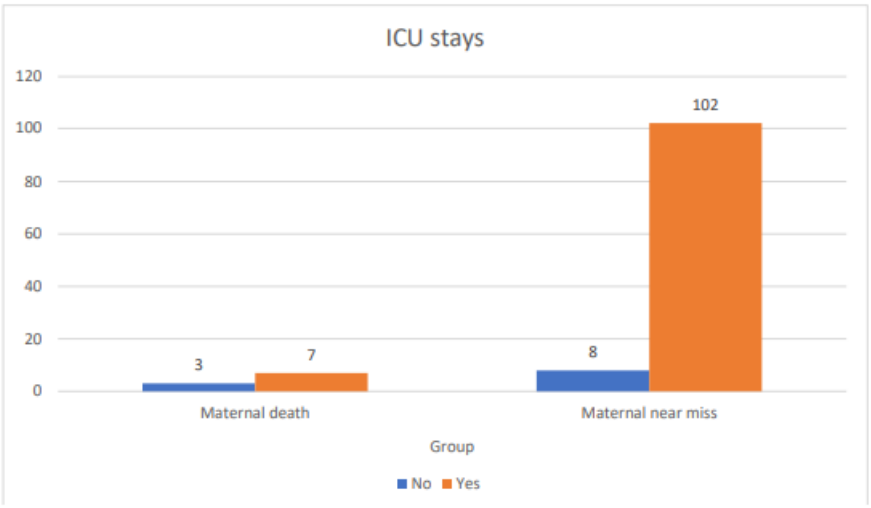

Figure 19: Representing the ICU stays according to the group

Discussion

The study on obstetric care as a surrogate indicator for maternal near-miss cases in a tertiary care center in Southern Bihar provides valuable insights into factors influencing maternal health outcomes. Among the 120 cases, 10 resulted in maternal deaths, while 110 were classified as near misses. The analysis revealed that near misses were predominantly caused by conditions like anemia (21.8%), sepsis (19.1%), and preeclampsia (14.5%), while maternal mortality was most commonly linked to anemia (30%) and preeclampsia (20%). Key findings indicate that prior antenatal booking significantly improved outcomes, with unbooked cases showing a higher rate of mortality. Cesarean sections (LSCS) were associated with more favorable outcomes compared to emergency laparotomies, which saw a higher mortality rate.

The data also underscore the importance of ICU access, as ICU admission correlated with poorer outcomes, reflecting the critical nature of cases admitted to intensive care. The study highlights the role of clinical and biochemical parameters in determining maternal outcomes. Lower hemoglobin levels were more frequently observed in maternal deaths, whereas elevated uric acid and potassium levels were notable in near-miss cases.

Additionally, age, gestational age, referral status, and obstetric scores showed no significant statistical impact on outcomes, suggesting that specific complications and timely access to care were more crucial determinants. The findings stress the need for enhanced maternal health services, emphasizing preventive antenatal care, improved ICU readiness, and strategic interventions for high-risk pregnancies.

Conclusion

The current study found that out of 120 maternal cases, there were significant associations with the following variables: booking status, mode of delivery, ICU stays, uric acid, potassium, haemoglobin levels, and types of organ dysfunction and surgical interventions. Maternal age, gestational age, OBS scores, birth weight, timing of events, and referral status did not show a significant relationship with maternal outcomes.

Results improved with booking and LSCS, but maternal mortality increased with emergency laparotomy and intensive care unit stays. Haemoglobin levels were considerably lower in maternal deaths, but elevated uric acid and potassium levels were substantially associated with near misses and deaths, respectively.

References

1. Sharma, B., Lahariya, C., Majella, M. G., Upadhyay, A., Yadav, S., Raina, A., ... & Aggarwal, N. (2023). Burden, Differentials and Causes of Stillbirths in India: A Systematic Review and Meta Analysis. Indian Journal of Pediatrics, 90(Suppl 1), 54-62.
2. Luhar, R. K., Maheshwar, K., Shah, R. J., &Harimoorthy, V. (2024). TRANSCON 2023 Oral Paper Abstracts. Asian Journal of Transfusion Science, 18, S3.
3. Aggarwal, N., Lahariya, C., Sharma, B., Khan, T., Sood, B., Singh, V. V., ... & Dhaliwal, L. K. (2023). Stillbirths in India: current status, challenges, and the way forward. Indian Journal of Pediatrics, 90(Suppl 1), 63-70.
4. Newtonraj, A., Kaur, M., Gupta, M., & Kumar, R. (2017). Level, causes, and risk factors of stillbirth: a population-based case control study from

Chandigarh, India. BMC pregnancy and childbirth, 17, 1-9.
5. Singh, A., & Kumar, M. (2019). An analysis of cause of stillbirth in a tertiary care hospital of Delhi: A contribution to the WHO SEARO Project. The Journal of Obstetrics and Gynecology of India, 69, 155-160.
6. Mali, R. V., Dalal, A., Khursheed, R., & Gan, A. (2021). Association of stillbirths with maternal and fetal risk factors in a tertiary care hospital in south India. Obstetrics and Gynecology International, 2021(1), 8033248.
7. Sharma, B., Prasad, G. R. V., Aggarwal, N., Siwatch, S., Suri, V., &Kakkar, N. (2019). Aetiology and trends of rates of stillbirth in a tertiary care hospital in the north of India over 10 years: a retrospective study. BJOG: An International Journal of Obstetrics & Gynaecology, 126, 14-20.
8. Khader, Y. S., Batieha, A., Khader, A., &Hamadneh, S. (2020). Stillbirths in Jordan: rate, causes, and preventability. The Journal of Maternal-Fetal& Neonatal Medicine, 33(8), 1307-1314.
9. KunjachenMaducolil, M., Abid, H., Lobo, R. M., Chughtai, A. Q., Afzal, A. M., Saleh, H. A. H., &Lindow, S. W. (2018). Risk factors and classification of stillbirth in a Middle Eastern population: a retrospective study. Journal of perinatal medicine, 46(9), 1022-1027.
10. Poudel, S., Ghimire, P. R., Upadhaya, N., & Rawal, L. (2020). Factors associated with stillbirth in selected countries of South Asia: A systematic review of observational studies. PloS one, 15(9), e0238938.
11. McClure, E. M., Saleem, S., Goudar, S. S., Tikmani, S. S., Dhaded, S. M., Hwang, K., ... & Goldenberg, R. (2022). The causes of stillbirths in south Asia: results from a prospective study in India and Pakistan (PURPOSe). The Lancet Global Health, 10(7), e970-e977.
12. Boo, Y. Y., Bora, A. K., Chhabra, S., Choudhury, S. S., Deka, G., Kakoty, S., ... &MaatHRI collaborators. (2024). Maternal and fetal factors associated with stillbirth in singleton pregnancies in 13 hospitals across six states in India: a prospective cohort study. International Journal of Gynecology& Obstetrics, 165(2), 462-473.
13. Goldenberg, R. L., Saleem, S., Goudar, S. S., Silver, R. M., Tikmani, S. S., Guruprasad, G., ... & Goldenberg, R. L. (2021). Preventable stillbirths in India and Pakistan: a prospective, observational study. BJOG: An International Journal of Obstetrics & Gynaecology, 128(11), 1762-1773.
14. Bin Islam, D., Purbey, A., Roy Choudhury, D., Lahariya, C., & Agnihotri, S. B. (2023). Seasonal and district level geo-spatial variations in stillbirth rates in India: an analysis of secondary data. Indian Journal of Pediatrics, 90(Suppl 1), 47-53.
15. Wong, S. T., Tse, W. T., Lau, S. L., Sahota, D. S., & Leung, T. Y. (2022). Stillbirth rate in singleton pregnancies: a 20-year retrospective study from a public obstetric unit in Hong Kong. Hong Kong Medical Journal, 28(4), 285.
16. Shattnawi, K. K., Khader, Y. S., Alyahya, M. S., Al-Sheyab, N., &Batieha, A. (2020). Rate, determinants, and causes of stillbirth in Jordan: Findings from the Jordan Stillbirth and Neonatal Deaths Surveillance (JSANDS) system. BMC Pregnancy and Childbirth, 20, 1-8.
17. Matthews, R. J., Draper, E. S., Manktelow, B. N., Kurinczuk, J. J., Fenton, A. C., Dunkley-Bent, J., ... & Smith, L. K. (2022). Understanding ethnic inequalities in stillbirth rates: a UK population-based cohort study. BMJ open, 12(2), e057412.