Section: Obstetrics and Gynaecology

Original Research Article

ESTIMATION OF CAUSES OF PERINATAL MORTALITY AND ASSOCIATED MATERNAL COMPLICATION IN TERTIARY CARE CENTRE

Yashashwini Mishra[1], Bandana Sharma[2], Sugandh Srivastava[3], Karishma Sharma[4], Savita Sahu[5]

[1]*Assistant Professor, Department of Obstetrics and Gynaecology, Ganesh Shanker Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh, India*
[2]*Professor, Department of Obstetrics and Gynaecology, Ganesh Shanker Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh, India*
[3]*Assistant Professor, Department of Obstetrics and Gynaecology, Ganesh Shanker Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh, India*
[4]*Assistant Professor, Department of Obstetrics and Gynaecology, Ganesh Shanker Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh, India*
[5]*Assistant Professor, Department of Obstetrics and Gynaecology, Ganesh Shanker Vidyarthi, Memorial Medical College, Kanpur, Uttar Pradesh, India.*

Received *: 09/06/2024*
Received in revised form *: 25/07/2024*
Accepted *: 10/08/2024*

Corresponding Author:
Dr. Yashashwini Mishra,
Assistant Professor, Department of Obstetrics and Gynaecology, Ganesh Shanker Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh, India.
Email: yashashwinimishra@gmail.com

DOI: 10.70034/ijmedph.2024.3.84

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2024; 14 (3); 464-470

ABSTRACT

Background: There are still unacceptablely high perinatal mortality rates, with up to three million stillbirths and three million neonatal deaths occurring annually across the world. Because of the high frequency of anaemia, problems with maternal health care, and unfavourable birth outcomes in Kanpur. In the course of this research, which was carried out in Kanpur city, Uttar Pradesh, India, we looked into the factors that led to perinatal mortality as well as the issues that were experienced by the mothers of these infants.
Setting and design: Descriptive cross-sectional study, Ganesh Shanker Vidyarthi Medical College, Kanpur city, Uttar Pradesh, India.
Materials and Methods: Total of 212 women were recruited. Data collection focused on sociodemographic and anthropometric factors, as well as reporting of prenatal care and obstetric difficulties during pregnancy, birth outcome (preterm, late, and term), and mode of delivery (normal, caesarean, and stillbirth). **Statistical Analysis:** Data were expressed as mean (standard deviation) and percentage (%). Chi-square, Student's *t*-test, and analysis of variance were used to compare measured variables.
Results: Overall, 21.2% of subjects had severe anaemia; 12.7% of participants had APH; 9.9% of participants had ante-partum eclampsia; 7.5% of participants had PET; 4.7% of participants had NSPET; and 0% of participants had GDM or IHCP. Overall, 76.4% of participants had TT vaccination; 45.8% of participants had preterm delivery; 1.4% of participants had Rh-negative pregnancy; 0.5% of participants had hypothyroidism; 0% of participants had IUD; 61.3% of participants had COVID vaccination; 6.1% of participants had foetal congenital anomalies; and 0% of participants had heart disease.
Conclusion: The prevalence of severe anaemia and maternal anaemia in pregnant women, in addition to APH, preterm eclampsia, PET, and NSPET, is much higher than what is considered acceptable.
Keywords: Maternal mortality, Preterm delivery, Anaemia, Maternalcomplications, Perinatal mortality.

INTRODUCTION

Perinatal mortality rates remain unacceptably high, with up to three million stillbirths and three million neonatal deaths worldwide each year.[1,2] To achieve Millennium Development Goals 4 and 5, the highest priority must be given to perinatal and maternal care before, during, and after birth.[3] These stages of care should receive the greatest attention. Because of the

inextricable relationship between maternal and perinatal outcomes, these goals are intertwined. Moreover, strategies aimed at improving medical care for one population often have a spillover effect on outcomes of care for the other population.[4] Particularly striking examples of this phenomenon include management of hypertensive patients and care during the intrapartum period.

In 2019 alone, 2.4 million infants died in the first month of life, and the World Health Organisation reports that approximately 6700 newborns die every day.[5] One in three of these deaths could have been largely prevented.[6] In many regions of the developing world, childbirth is generally considered a natural process that requires no preparation or medical care. In low- and middle-income countries (LMICs), the number of stillbirths and neonatal mortality can be further reduced through the effective implementation of better health services.[7] This is true despite the fact that conditions have improved in recent years. Home births account for the vast majority of neonatal deaths in underdeveloped countries.[8] It is possible to increase the percentage of newborns who survive the first 28 days of life through community-based initiatives such as expanding access to education, addressing poverty, promoting women's independence and overall growth, and the continued provision of medical care.[9] The term "perinatal mortality" refers to the death of a foetus after 22 weeks of gestation, as well as the death of a newborn within the first seven days of life. The term "early neonatal mortality" refers to deaths that occur within the first week of a baby's life, while "extended perinatal mortality" refers to deaths that occur within the first 28 days of a baby's life.[8] Early neonatal mortality is when a baby dies within the first week of life. Under the Maternal and Perinatal Death Surveillance and Response (MPDSR) System programme, the Family Health Division of the Nepal Ministry of Health and Population studies perinatal deaths.[10] Stillbirths and preterm births are the leading causes of perinatal mortality in Nepal. This mortality can be reduced by prenatal surveillance and monitoring, timely referral of high-risk pregnancies, and appropriate neonatal care for preterm infants.[11]

It has been noted that one of the most important challenges for national governments and international organisations.[12] is to reduce maternal mortality rates. It is estimated that more than 350 000 women worldwide die during or shortly after pregnancy each year. Although this number has declined by more than one-third since 1990,[13] the decline is less than half of what is needed to achieve the United Nations Millennium Development Goal 5: to reduce the maternal mortality ratio (MMR) by three-quarters between 1990 and 2015.[12] Although the most difficult problems to address in the fight against maternal mortality are in developing countries, a significant number of women in developed countries continue to lose their lives unnecessarily during or after pregnancy.[14] In general, maternal mortality rates in developed countries are not declining; in fact, in some countries, such as the United States, they have doubled over the past 20 years.[13]

The quality of care provided to the mother and the newborn baby throughout pregnancy, delivery, and the postpartum period has a significant impact on the likelihood that the baby will survive.[15] A history of stillbirth, smoking, alcohol use, multiple pregnancies, obesity, hypertension, diabetes, HIV, foetal growth restriction, and postpartum pregnancy are all risk factors for stillbirth.[16] Other risk factors include a short interregnum interval, low socioeconomic status, low educational attainment, no prenatal care, and a short interregnum interval between pregnancies.

The risk of perinatal death linked with maternal complications has been thoroughly reported in countries with high incomes and the ability to diagnose and treat obstetric complications.[17] These nations also have the ability to prevent obstetric complications from occurring in the first place. However, these findings cannot always be extended to countries with fewer resources because of the severe limitations in human resources, diagnostic competence, and the availability of obstetric interventions in those nations. Despite accounting for 98% of the global burden, the existing studies of perinatal mortality in LMICs have often been limited in breadth (single or few facilities) and power (unable to incorporate stillbirths and early neonatal deaths as independent outcomes).[18] In previous major epidemiologic surveys of neonatal fatalities in LMICs, data on maternal problems were not collected.[19] We estimate the causes of perinatal death and the related maternal problems in this study, which was conducted in Kanpur city, Uttar Pradesh, India.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted in the antenatal (ANC) and delivery wards of GSVM Medical College, Kanpur, UP, India. Pregnant women aged ≥18 years who presented themselves were screened and enrolled. A total of 212 cases were recruited from July 1, 2022, to June 30, 2023. Ethical clearance was obtained from the institutional ethics committee.

Data collection focused on sociodemographic and anthropometric factors, as well as reporting of prenatal care and obstetric difficulties during pregnancy, birth outcome (preterm, late, and term), and mode of delivery (normal, caesarean, and stillbirth). Interviews with all 212 subjects were conducted by trained members of the technical staff. Data collection focused on anthropometric and sociodemographic parameters. The following categories of demographic data were analysed: Maternal age, place of residence (rural or urban), ethnicity, prenatal care, number of prenatal visits,

gravidity, weeks of gestation, and delivery type. It was found that there were two separate groups of deaths: deaths that occurred in the foetus and deaths that occurred in the early neonatal period. Stillbirths were classified as macerated or fresh births, depending on their state of decomposition. It was decided not to include nonspecific causes documented in the cause of death. For example, if there was no cause of death other than cardiac arrest, this was not considered a specific cause of death. In the autopsy report, maternal conditions that may have been responsible for foetal or neonatal death were listed as a possible contributing factor in the cause of death category. The information recorded for each cause of death was keyworded and categorised. The foetal/neonatal and maternal conditions that led to mortality were designated as cause of death according to the recommendations of the WHO application of ICD-10 to deaths in the perinatal period, also known as ICD-PM.[29] According to the classification of maternal conditions in ICD-PM,[29] maternal causes that contributed to foetal or neonatal death were divided into five different categories.

Statistical Analysis

Data were first entered into Microsoft Excel and then further analysed using SPSS 25.0. Calculations were performed to determine the frequency, mean, and standard deviation of the data. Means and standard deviations were calculated for the haemoglobin concentration, maternal age, and body mass index variables. We calculated not only the total number but also the rate (expressed as a percentage) and the exact binomial confidence interval (CI) for the rate.

RESULTS

The mean age (years) was 27.67 ± 3.94. The 72 (34.0%) of the participants had an age of 20-25 years. 91 (42.9%) of the participants had an age of 26-30 years, 43 (20.3%) of the participants had an age of 31-35 years, 6 (2.8%) of participants had age > 35 years. The percentage of G1, G2, G3, G4, G5 and G6 gravida were 31.6%, 26.4%, 25.9%, 11.3%, 3.8% and 0.9%, respectively. The frequencies of P0, P1, P2, P3, P4, and P5 parity were 31.6%, 26.4%, 24.5%, 13.2%, 3.3%, and 0.9%, respectively. The percentage of 18.5-22.9 Kg/m2,23.0-24.9 Kg/m2,25.0-29.9 Kg/m2 and 30.0-34.9 Kg/m2 BMI were 14.2%, 30.7%, 54.7% and 0.5% with 25.32 ± 2.01 year mean age. The percentage of <28 Weeks, 28-31+6 Weeks and 32-33+6 Weeks were 8.0%, 16.0% and 10.4%, respectively. The percentage A0, A1, A2 and A5 Abortions were 83.0%, 13.2%, 3.3% and 0.5%, respectively. The mean no of ANC visits was 3.18 ± 1.19. [Table 1]

Total 12.7% of the participants had APH, 9.9% of the participants had Ante Partum Eclampsia, 7.5% of the participants had PET, 4.7% of the participants had NSPET, 21.2% of the participants had Sereve Anaemia, 0.0% of the participants had GDM, and 0.0% of the participants had IHCP. [Table 2]

Overall, 76.4% of participants had injection TT coverage, 45.8% of participants had a preterm birth, 1.4% of participants had an Rh-negative pregnancy, 0.5% of participants had hypothyroidism, 0.0% of participants had a IUD history, 61.3% of participants were COVID vaccinated, 6.1% of participants had fetal congenital anomalies, and 0.0% of participants had heart disease. The percentage of live births L0, L1, L2, L3, L4, and L5 were 36.3%, 30.7%, 21.2%, 9.9%, 1.4%, and 0.5%, respectively. [Table 3]

Table 2: Distribution of patients according to baseline characteristics

	Age	Frequency	Percentage	95% CI
Age	20-25 Years	72	34.0%	27.7% - 40.8%
	26-30 Years	91	42.9%	36.2% - 49.9%
	31-35 Years	43	20.3%	15.2% - 26.5%
	>35 Years	6	2.8%	1.2% - 6.3%
	Mean ± SD || Median (IQR) || Min-Max	27.67 ± 3.94 || 27.00 (25.00-30.00) || 20.00 - 39.00		
Gravida	G1	67	31.6%	25.5% - 38.4%
	G2	56	26.4%	20.7% - 33.0%
	G3	55	25.9%	20.3% - 32.5%
	G4	24	11.3%	7.5% - 16.6%
	G5	8	3.8%	1.8% - 7.6%
	G6	2	0.9%	0.2% - 3.7%
Parity	P0	67	31.6%	25.5% - 38.4%
	P1	56	26.4%	20.7% - 33.0%
	P2	52	24.5%	19.0% - 31.0%
	P3	28	13.2%	9.1% - 18.7%
	P4	7	3.3%	1.5% - 7.0%
	P5	2	0.9%	0.2% - 3.7%
BMI	18.5-22.9 Kg/m2	30	14.2%	9.9% - 19.7%
	23.0-24.9 Kg/m2	65	30.7%	24.6% - 37.4%
	25.0-29.9 Kg/m2	116	54.7%	47.8% - 61.5%
	30.0-34.9 Kg/m2	1	0.5%	0.0% - 3.0%
	Mean ± SD || Median (IQR) || Min-Max	25.32 ± 2.01 || 25.30 (23.87-26.80) || 18.70 - 30.40		

POG	<28 Weeks	17	8.0%	4.9% - 12.7%
	28-31+6 Weeks	34	16.0%	11.5% - 21.8%
	32-33+6 Weeks	22	10.4%	6.8% - 15.5%
	34-36+6 Weeks	44	20.8%	15.6% - 27.0%
	≥37 Weeks	95	44.8%	38.0% - 51.8%
No of ANC visits	**Mean ± SD || Median (IQR) || Min-Max**	3.18 ± 1.19 || 3.00 (2.00-4.00) || 0.00 - 6.00		
Abortions	A0	176	83.0%	77.1% - 87.7%
	A1	28	13.2%	9.1% - 18.7%
	A2	7	3.3%	1.5% - 7.0%
	A5	1	0.5%	0.0% - 3.0%

Table 2: Distribution of the Participants in Terms of Maternal Morbidity

		Frequency	Percentage	95% CI
APH	Yes	27	12.7%	8.7% - 18.2%
	No	185	87.3%	81.8% - 91.3%
Ante Partum Eclampsia	Yes	21	9.9%	6.4% - 14.9%
	No	191	90.1%	85.1% - 93.6%
PET	Yes	16	7.5%	4.5% - 12.2%
	No	196	92.5%	87.8% - 95.5%
NSPET	Yes	10	4.7%	2.4% - 8.8%
	No	202	95.3%	91.2% - 97.6%
Sereve Anaemia	Yes	45	21.2%	16.0% - 27.5%
	No	167	78.8%	72.5% - 84.0%
GDM	Yes	0	0.00	-
	No	212	100.0%	97.8% - 100.0%
IHCP	Yes	0	0.00	-
	No	212	100.0%	97.8% - 100.0%
PPROM	Yes	1	0.5%	0.0% - 3.0%
	No	211	99.5%	97.0% - 100.0%

Table 3: Distribution of the Participants in Terms of Maternal Morbidity

		Frequency	Percentage	95% CI
Injection TT Cover	Yes	162	76.40%	70.0% - 81.8%
	No	50	23.60%	18.2% - 30.0%
Preterm Laour	Yes	97	45.80%	39.0% - 52.7%
	No	115	54.20%	47.3% - 61.0%
Rh Negative Pregnancy	Yes	3	1.40%	0.4% - 4.4%
	No	209	98.60%	95.6% - 99.6%
Hypothyroidism	Yes	1	0.50%	0.0% - 3.0%
	No	211	99.50%	97.0% - 100.0%
IUD History	Yes	0	0	-
	No	212	100.00%	97.8% - 100.0%
COVID Vaccinated	Yes	130	61.30%	54.4% - 67.8%
	No	82	38.70%	32.2% - 45.6%
Congenital Anomalies Of Fetus	Yes	13	6.10%	3.4% - 10.5%
	No	199	93.90%	89.5% - 96.6%
Cardiac Disease	Yes	0	0	-
	No	212	100.00%	97.8% - 100.0%
Live Births	L0	77	36.30%	29.9% - 43.2%
	L1	65	30.70%	24.6% - 37.4%
	L2	45	21.20%	16.0% - 27.5%
	L3	21	9.90%	6.4% - 14.9%
	L4	3	1.40%	0.4% - 4.4%
	L5	1	0.50%	0.0% - 3.0%

DISCUSSION

According to the results of our study, a total of 76.4% of women received injectable TT care. If living in districts of high-risk countries that have not yet achieved maternal and neonatal tetanus elimination status,[20] women of reproductive age in these countries should receive three doses of TT vaccine, whether or not they have received the vaccine in the past. This recommendation comes from the World Health Organisation (WHO). Women in all regions of the world receive adequate doses of the TT vaccine. In Sierra Leone, the overall prevalence of women who had received TT vaccination during their last pregnancy was 96.3%, while the overall prevalence of women who had received at least two doses was 82.12%.[21] In Sudan, sixty percent of women had been shown to have received adequate tetanus vaccination.[22] Previous studies found that between 51.8% and 72.5% of pregnant women in different districts of Ethiopia had received three or more doses of TT vaccination.[23,24] According to the results of Ibrahim et al (2023), about forty percent of pregnant women had received three or more doses of TT vaccine.[25] According to the results of another study conducted

in The Gambia, the overall prevalence of TT use among women was 88.2%, but only 34.8% were taking an adequate dose.[26]

In this particular study, 45.8% of the women gave delivery before their 37 weeks of gestation. In many different countries, the real rate of premature birth has not been adequately explained. It is estimated that India is responsible for 23.4% of all preterm births that occur worldwide, making it the country that is responsible for the most preterm births globally.[27] Previous research.[28] found that preterm labour is a prominent source of perinatal morbidity and mortality in both developed and developing nations. This condition affects 5–10% of pregnancies and is a leading cause of perinatal complications. The incidence of premature birth was 5.52%, which is comparable to a research that was conducted in Europe.[29] An Indian multicentric study found the rate of preterm birth to be 8.6%, which is comparable to the results of our study [30]. Preterm births were found to occur more frequently (14.9%) in India, according to the findings of another large longitudinal cohort study.[31]

In the current study, a total of 1.4% of pregnant women were Rh-negative. According to the results of Alakananda et al,[32] the incidence of Rh-negative pregnant women was about 3%. Another study found that the national average incidence of Rh-negative pregnancies in Andhra Pradesh and West Bengal was 4% and 3%, respectively..[33] This result is consistent with the results of the first study.

Only 0.5% of the study participants had hypothyroidism. According to the results of previous studies,[34–36] the incidence of overt hypothyroidism during pregnancy ranges from 0.2 to 2.5%, while the incidence of subclinical hypothyroidism during pregnancy ranges from 2-7%.

In our study, a total of 6.1% of women in this study had foetal congenital anomalies, but none developed heart disease. The overall prevalence of anomalies was reported to be 182 (173-191) per 10,000 live births.[37] The confidence interval for this figure was 95%. According to EUROCAT, the overall prevalence of congenital anomalies was 215.54 (214.14–216.94) per 10,000 births,[39] while the overall prevalence of congenital anomalies was 230.51 (170.99–310.11) per 10,000 births.[38] in,[38] it was found that the prevalence of congenital heart defects was 61.76 per 10 000 live births. in another study, the prevalence of congenital heart defects in Asia was estimated to be 9.3 per 1000 live births.[40]

The prevalence of live births was found to be 63.7% in this study. In a study analysing data from over 176 699 recent pregnancies, we found that 46.6% of neonatal deaths and 56.3% of stillbirths in India occurred in women classified as "low risk" by national standards.[41] This was the finding that emerged from our data analysis.

The overall prevalence of APH was 12.7% among the subjects in this study. Sharma et al,[42] stated that the prevalence of APH in India was 18.8%, although several previous studies reported that the prevalence of APH in India ranged from 1.2% to 5.4%.[43-46]

Among the participants in our study, the incidence of antepartum eclampsia was 9.9%, the incidence of PET was 7.5%, and the incidence of NSPET was 4.7%. Another study found that the prevalence of hypertension in pregnant women was 10.3% in India, 10.9% in Mozambique, and 10.2% in Nigeria.[47]

In Indian hospital practise, the prevalence of preeclampsia ranges from 5% to 15%, while the prevalence of eclampsia is about 1.5%.[48] The risk of eclampsia in India has varied between 0.179 and 5% over the years, from 1976 to 2014, with an average of 1.5%.[49]

In this study, a total of 21.2% of pregnant women suffered from severe anaemia. None of the participants suffered from GDM, and none of the patients had IHCP. It is estimated that 45.7% of pregnant women in urban areas and 52.1% of pregnant women in rural India have haemoglobin levels less than 11 g/dL.[50] This poses a significant public health threat in India.

CONCLUSION

According to the results of our study, the prevalence of severe anaemia and maternal anaemia in pregnant women as well as APH, ante-partum eclampsia, PET, and NSPET is significantly higher than acceptable. Overall, 76.4% of women had TT care, 45.8% of births were preterm, 1.4% of pregnancies were Rh-negative, 0.5% of participants had hypothyroidism, 6.1% of participants were born with foetal congenital anomalies, and 0% of participants had cardiac disease. In addition, 63.7% had live births in the studied population. The anaemia, PTB, PET, and NSPET related prevalence in delivering women from the studied region of Kanpur city are alarmingly much higher than the previous and current national average. This is indicative of a serious health problem affecting women and children in Kanpur city, and it underscores the need for early, active diagnosis and integrated screening to curb the threat to public and community health.

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