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Research Article

Perinatal morbidity and mortality due to preterm deliveries in a referral hospital, in rural India: a cross sectional study

Mahesh R. Asalkar*, Pradeep R. Gaikwad, Ritesh Pandey

Department of Obstetrics & Gynecology, MIMER Medical College, Talegaon Dabhade-Pune 410507, Maharashtra, India

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***Correspondence:**
Dr. Mahesh R. Asalkar,
E-mail: mahesh@asalkarclinic.com

ABSTRACT

Background: Preterm birth is the most significant problem in current obstetric practice and according to the World Health Organization is the direct cause accounting for 24% of neonatal deaths. Prevalence of preterm birth range between 7-16% and are similar worldwide. There is scarcity of data on preterm birth in India despite having highest number of births and neonatal deaths in the world. The available data indicate that 15% of all neonatal deaths are caused by prematurity and its complication.
Methods: A cross sectional study was done in order to find out incidence of preterm labour and resultant mortality and morbidity associated with preterm deliveries. Over a period of 3 years from 01.01.2008 to 31.12.2010, 3843 pregnant mothers delivered in rural MIMER Medical College, Pune out of which there were 27 cases of twins (24 preterm twins and 3 term twins) and 2 cases of triplets (preterm). Out of 3874 newborns, 476(12.2%) were preterm after excluding the babies with lethal congenital anomalies. 448 mothers (24 preterm twins and 2 preterm triplets) giving birth to 476 preterm babies excluding the lethal congenital malformations were studied.
Results: The overall perinatal mortality amongst preterm births for the 3 years were 426.4/ 1000 preterm birth. Preterm deliveries contributed to 61.50 % of perinatal deaths. Out of 476 preterm babies 83 were stillborn and 120 had early neonatal deaths; thus giving a perinatal mortality rate of 426.4 per thousand preterm births. The main cause of perinatal morbidity was LBW, followed by RDS, septicemia, IUGR and birth asphyxia. The mortality of babies was strongly associated with RDS (18.32%), septicaemia (22.5%), extreme prematurity (14.16%) and birth asphyxia (26%).
Conclusion: This manuscript describes the design, methodology used and the three years result of this cross sectional study to analyze and audit the perinatal mortality and morbidity due to preterm deliveries in a tertiary care teaching hospital of rural area of Maharashtra.

Keywords: Preterm delivery, Perinatal morbidity, Perinatal mortality, Rural referral hospital

INTRODUCTION

Preterm delivery remains the most important obstetric problem in the world today.[1] Preterm birth refers to birth of a baby of less than 37 weeks gestational age. Preterm babies have an increased risk of death in first year of life (infant mortality) with most of them occurring in first week of life (early neonatal mortality). Preterm VLBW babies are especially vulnerable because of immaturity of structures and functions of various systems. Preterm VLWB neonates are vulnerable to develop respiratory distress syndrome (RDS), septicemia, necrotizing enterocolitis (NEC), patent ductus arteriosus (PDA), intraventricular hemorrhage (IVH) and retinopathy of prematurity (ROP), chronic lung disease and developmental disabilities.[2] In developed countries, perinatal mortality rate (PNMR) is <10 per 1000 as compared to the alarmingly high rate of 60-120/1000 in India. About 1.5 million perinatal deaths (PNMD) occur every year in our country.[3] The current perinatal mortality

and stillbirth rates according to The National family health survey (NFHS-3 i.e.2005-06) are 48.5 and 19.2 per 1000 births respectively. The present alarming perinatal mortality can be decreased by repeated periodic analysis of its magnitude and causative factors and by making necessary efforts to rectify them. Though the preterm labour prevalance varies from 7-16% it contributes disproportionately to PNMR as it accounts for 60-70% of perinatal deaths. Also most of the studies on preterm birth are carried out in developed countries or urban parts of the developing countries. Less data is available on rural statistics for perinatal mortality w.r.t to preterm birth.The present study is an endeavour to analyze the perinatal mortality and morbidity due to preterm deliveries in a referral teaching hospital, in rural area of Western India.

METHODS

This cross sectional study is conducted over a period of three years from 01.01.2008 to 31.12.2010 in the Department of Obstetrics and Gynecology of rural MIMER Medical College and Dr. Bhausaheb Sardesai Talegaon rural Hospital, Talegaon Dabhade, Pune, Maharashtra. 3843 pregnant mothers delivered in rural MIMER Medical College, Pune out of which there were 27 cases of twins (24 preterm twins and 3 term twins) and 2 cases of triplets (preterm). Out of 3874 newborns, 476(12.2%) were preterm after excluding the babies with lethal congenital anomalies. 448 mothers (24 preterm twins and 2 preterm triplets) giving birth to 476 preterm babies were studied (excluding the congenital malformations). The data was collected with respect to maternal age, parity, previous obstetric history, medical/obstetric complications in present pregnancy. The fetal outcome in terms of mortality and morbidities of all the preterm deliveries were collected and data analyzed statistically.

Operational definitions and formulas

Perinatal mortality rate (PNMR) is the sum of the number of resident fetal deaths of 28 or more weeks gestation plus the number of resident newborns dying under 7 days of age in a specified geographic area (country, state, county, etc.) divided by the sum of the number of resident live births plus the number of resident fetal deaths of 28 or more weeks gestation for the same geographic area (for a specified time period, usually a calendar year) and multiplied by 1,000.

1. Stillbirth (SB) is the death of a fetus weighing at least 1000g (or when birth weight is unavailable, after 28 completed weeks of gestation).
2. Early neonatal death is the death in the first 7 days of life.

The babies who were discharged before 7 days of postnatal period were considered live as the hospital used to discharge newborn only when they were screened healthy and normal.

Technical Notes

There are actually two different definitions used to calculate a perinatal mortality rate (PNMR). The definition shown here (sometimes referred to as Definition I) includes infant deaths of less than seven days of age and fetal deaths of 28 or more weeks gestation. The second definition used (Definition II) is more inclusive and includes infant deaths of less than 28 days of age and fetal deaths of 20 or more weeks gestation. Definition I is preferred for international and state-to-state comparisons due to differences among countries/states in completeness of reporting of fetal deaths of 20-27 weeks gestation. Definition II is more useful for monitoring perinatal mortality throughout the gestational age periods since the majority of fetal deaths occur prior to 28 weeks gestation.

$$\text{Perinatal mortality rate } (\text{PNMR}) = \frac{(\text{Early neonatal deaths} + \text{stillbirths})}{\text{Total births}} \times 1000$$

Where

Total births = live births + stillbirths.

Inclusion criteria

1. Gestational age < 37 weeks >28weeks, calculated by LMP & confirmed by 1st trimester USG.
2. In patients who were not sure of LMP, 1st trimester USG was considered for calculation of gestational age.
3. Clinical estimation of gestational age by pediatrician by New Ballard Score method was considered where LMP and 1st trimester USG reports both were not available.
4. Case type may be registered/ unregistered/ referred.
5. Newborn weight more than 1000gm were included in this study.

Exclusion Criteria

1. Any congenital malformations as anencephaly, hydrocephalus, multiple congenital anomalies etc which are grouped under lethal congenital anomalies group.
2. Babies delivered outside and transferred to Dr. Bhausaheb Sardesai Talegaon rural Hospital, Pune for NICU care were excluded.
3. Preterm labour patients transferred to other hospitals for various reasons have been excluded.

Ethical aspects

Approval was obtained from the Institutional Ethics Committee of MIMER Medical College, Talegaon Dabhade, Pune. Confidentiality was maintained regarding the data during the study.

Variables measured

The key outcome variables measured included: birth weight, mode of delivery and mortality and morbidity in newborn. The data also included information on the antenatal history, details of the delivery, the neonatal status at delivery, diagnoses, procedures and complications in neonate during hospital stay, NICU requirements and outcome at discharge. Other variables measured were socioeconomic characteristics (education of mother, maternal factors (age, parity, height, weight), pregnancy-related complications, extent of utilization of ANC services, distance travelled in reaching hospital, maternal morbidity along with treatment.

Data management

The database was collected in a uniform, consistent and reliable manner by trained qualified doctors with the use of standard definitions. Stringent quality assurance measures were followed at various stages of data handling so as to ensure completeness, accuracy and reliability of the data. The stillbirth rate, early neonatal mortality rate, perinatal mortality rate were calculated. Data entry and consistency check were done manually.

Statistical analysis

Statistical analysis was done using the SPSS version 16 for Windows (SPSS Inc, Chicago, IL, USA) software.

RESULTS

Table 1: Perinatal mortality in relation to gestation.

		Preterm (<37 weeks)	%	Term (37-42 weeks)	%	Post-term (>42 weeks)	%	Total
1	No. Of babies delivered	476	12.37	3297	85.70	74	1.93	3847
2	Live births	393	10.72	3202	87.34	71	1.94	3666
3	Still births	83	45.85	95	52.50	3	1.65	181
4	Early neonatal death	120	80.53	27	18.13	2	1.34	149
5	Perinatal deaths(PND)	203	61.6	122	36.9	5	1.5	330
6	Still birth rate (SBR)	74.3/1000		28.81/1000		40.5/1000		47/1000
7	Early neonatal mortality rate (ENMR)	305.3/1000		8.43/1000		28.1/1000		40.6/1000
8	Perinatal mortality rate (PNMR)	426/1000		37/1000		68/1000		86/1000

Table 2: Causes of perinatal morbidity in preterm.

	Causes	Total	Percent
1	Hyperbilirubinemia	24	5
2	Birth asphyxia	19	4
3	RDS	86	18
4	Sepsis	86	18
5	Feeding problems	9	2
6	LBW	331	69.5
7	CHD	9	2
8	Neonatal convulsions	14	3
9	IUGR	33	7

Table 3: Causes of early neonatal deaths in preterm labour.

	Causes	Number N=120	%
1	Extreme prematurity	17	14.16
2	Birth asphyxia	26	21.66
	Respiratory distress	22	18.3
	Hyaline Membrane Disease	9	7.5
	Aspiration Pneumonia	8	6.66
	Pulmonary Haemorrhage	5	4.16
3	Sepsis	34	28.3
	Septicemia	27	22.5
	Encephalitis	7	5.83
	Tetanus Neonatorum	0	0
4	Hyperbilirubinemia	6	5
5	Hypothermia	3	2.5
6	Intra Cranial Haemorrhage	12	10

Table 4: Causes of perinatal mortality in preterm in relation to obstetric factors.

Factors	Still Births		Early Neonatal Deaths		Total	
	No.	%	No.	%	No.	%
Pregnancy Induced Hypertension	31	37.34	38	31.66	69	33.99
Foetal distress	8	9.63	19	15.83	27	13.30
Antepartum Hemorrhage	23	27.71	24	20	47	39.16
Malpresentations (Breech/ Transverse lie)	5	6.02	13	10.83	18	15
Obstructed labours/ Rupture uterus	3	3.61	2	1.66	5	4.16
Multiple pregnancy	2	2.40	8	6.66	10	8.33
Maternal jaundice	1	1.20	1	0.83	2	1.66
Idiopathic	8	9.63	3	2.5	11	9.16
PROM	2	2.40	12	10	14	11.66

Table 5: PNMR with respect to the birth weight and gestational age.

Gestational Age	Birth weight							No. of live birth	No. of deaths	Early NMR
	<1.25	<1.5	<1.75	<2	<2.25	<2.5	>2.5			
28-29.6	16	7						23	13	565
30-31.6	2	19	6					27	11	407
32-33.6	1	26	48	3				78	31	397
34-35.6			3	43	55	9		110	60	545
36-36.6				7	56	79	13	155	05	32
No. of live births	19	52	57	53	111	88	13	393		
No. of deaths	11	31	22	27	21	7	1		120	305
PNMR	579	596	386	509	189	80	77			

Table 6: Profile of a woman.

	No. of women (n1) No. of preterm babies delivered(n2)	No. of still births	No. of neonatal deaths	Perinatal mortality	PNMR	P value
Socio-economic status						
Low	228 (235)	43	65	108	490	P=0.860 (NS)
Middle	167 (181)	33	39	72	431	
High	53 (60)	7	16	23	434	
ANC type						
Booked	180 (204)	25	46	71	398	P=0.0441 (S)
Un-booked	268 (272)	58	74	132	492	

Distance travelled in reaching hospital						
<20 km.	280 (298)	29	51	80	285	P<0.0001 (S)
>20 km.	168 (178)	54	69	123	732	
Mode of delivery						
Vaginal	296 (304)	73	75	170	574	P<0.0001 (S)
LSCS	154 (172)	10	45	33	214	

where NS= non significant and S= significant

DISCUSSION

There is a paucity of data on preterm birth prevalence and mortality and almost complete

Absence of data on acute morbidity and long-term impairment associated with prematurity in LMICs and many high-income countries[2]. Similarly, there is scarcity of data on preterm birth in India despite having highest number of births and neonatal deaths in the world. The available data indicate that 15% of all neonatal deaths are caused by prematurity and its complication.[4]

White Paper on Preterm Births: Key Findings

- An estimated 28% of the 4 million annual neonatal deaths are due to preterm birth.
- Approximately 12.9 million babies are born preterm ever year, with a global prevalence of 9.6%.
- The regional toll of preterm birth is particularly heavy for Africa and Asia where over 85% of all preterm births occur.
- Rates of preterm birth by regional level of development are highest for low resource regions (12.5%), moderate for middle resource regions (8.8%) and lowest for high resource regions (7.5%). The highest rate of preterm birth is in Africa, followed by North America, Asia, Latin America and the Caribbean, Oceania, and Europe.

In our study the prevalence of preterm birth was 12.2 % after excluding the lethal congenital anomalies. Higher prevalence in our study may be because ours is a referral teaching institute and large number of referrals from the Primary health centers and nearby private hospitals. Though the prevalence of preterm birth is 12.2% in our study it contributed disproportionately to the overall perinatal mortality as it accounted for the 61.5% of the total perinatal mortality. Hence a slight reduction in the prevalence or aggressive management of preterm babies will have a large impact over the perinatal mortality due to preterm birth.

Neonatal deaths and stillbirths have many common causes and determinants. For the last 50 years, the term "perinatal mortality" has been used to include deaths that might somehow be attributed to obstetric events, such as stillbirths and neonatal deaths in the first week of life.

The perinatal mortality rate is an important and unique health status indicator since it addresses the two related issues of late fetal deaths and early infant deaths many of which are considered preventable. The perinatal mortality indicator also plays an important role in providing the information needed to improve the health status of pregnant women, new mothers and newborns. That information allows decision-makers to identify problems, track temporal and geographical trends and disparities and assess changes in public health policy and practice.

Table 7: PNMR global scenario and our results.

	Live births	Perinatal Mortality rate (/1000 birth)	Stillbirth Rate (/1000 birth)	Early neonatal Mortality rate (/1000 live birth)
World	132882	47	24	23
More developed regions	13160	10	6	4
Less developed regions	119721	50	26	25
Least developed countries	26639	61	31	31
Present Study(overall)	3666	86	47	41
Present Study(Preterm)	393	426	174	305

Source: WHO Library Cataloguing-in-Publication Data Neonatal and perinatal mortality: country, regional and global estimates. World Health Organization. ISBN 92 4 156320 6 (NLM classification: WS 16) ISBN 978 92 4 156320 8.

The above results show the term perinatal mortality with respect to developed, less developed and least developed country and present study. It also compares the preterm PNMR, still birth rate and early neonatal mortality rate in term and preterm groups.

Table 1 of results show the still birth, early neonatal mortality and perinatal mortality in preterm deliveries, term and post term babies. Babies born preterm had mortality rates in higher percentages than those with term and post term. The overall prevalence of perinatal mortality in our study was 86 per 1000 deliveries. When compared to term births, preterm births had 3.7 times stillbirth rate (p-value < 0.0001), 7.4 times early neonatal death rate (p-value < 0.0001) and 4.95 times high perinatal mortality (p-value < 0.0001).

Preterm babies are likely to have more than one morbidities simultaneously and presence of multiple co-morbidities also increases chance of poor perinatal outcome. The main cause of perinatal morbidity was LBW (69.5%), followed by RDS (18%), sepsis (18%) and IUGR (7%). For morbidity, other strongest associations were seen for hyperbilirubinemia, birth asphyxia, feeding problems and neonatal convulsions (Table 2).

Table 3 shows the most important cause of mortality which contributed to neonatal death in our study. Sepsis (28.3%), Birth Asphyxia (21.6%), Respiratory distress (18.3%) and Extreme prematurity (14.16%) contributed to large extent for neonatal death in our study other causes of perinatal mortality in our study were intracranial hemorrhage (10%), Hyperbilirubinaemia (5%) and hypothermia (2.5%).

Globally main causes of neonatal deaths are thought to be preterm birth (28%),sepsis or pneumonia (26%) and birth asphyxia (23%).[1,2] In south East Asia region WHO has attributed 30% of neonatal deaths to preterm births, 27% to sepsis or pneumonia, 23% to birth asphyxia, 6% congenital anomalies, 4% tetanus,3% diarrhea and 7% to other causes.[7] However most of still birth or neonatal death occur at home and vital registration systems are incomplete[5,6,7] and as such current estimates have been generated from the limited sets of data.[8,9,10]

The factors like PIH (pregnancy induced hypertension), fetal distress, APH (ante partum hemorrhage), malpresentations, obstructed labour and ruptured uterus contributed to a major chunk of perinatal deaths. Obstetric factors like APH (39.16%), PIH (33.99%), malpresentations (15%), fetal distress (13.30%) were most commonly associated with high perinatal mortality (as shown in table 4). Other less common obstetric factors contributing to perinatal mortality were multiple pregnancy, obstructed labour/rupture uterus, maternal jaundice etc. However in 9.16% of cases were idiopathic where no high risk obstetric factor was present. Preterm PROM contributed as cause of perinatal mortality in 11.66% of cases in our study (Table 4).

Table 5 shows the PNMR with respect to the birth weight and gestational Age. As the birth weight increases the PNMR decreases hence birth weight has influence on the outcome of the baby in neonatal period this is consistent with most of the studies conducted in the past. Table 5 also shows the PNMR with respect to the gestational age, as the gestational age at the time of delivery is more towards term (37 weeks) the PNMR is less. Highest PNMR 562/1000 in the g. age group 28-29.6 week and lowest with 36-36.6 weeks group 32/1000. This shows that not only the birth weight but the g. age also has influence on the perinatal outcome. Most of the studies done in the past have taken in account only the birth weight but here we have considered both g. age and birth weight and its effect on PNMR.

In addition as shown in table 6, the mortality of preterm babies in rural area was strongly associated with unregistered and referred cases (booked Vs unbooked cases and PNMR, p-value 0.0441). Also distance of referral has effect on perinatal mortality especially when the referral distance is more than 20km, PNMR associated with such cases is high as compared to referral distance less than 20 Km (p-value < 0.0001).

Mode of delivery vaginal and caesarean route when compared for PNMR, it is found that caesarean delivery has low PNMR (214/1000 preterm birth) as compared to vaginal mode of delivery (PNMR 574/1000 preterm birth) this also showed the statistical significance (p-value <0.0001). These findings of our study like unregistered cases and referral distance with >20km and vaginal route of delivery are associated with High PNMR which are consistent with previous studies conducted by various authors. However our study did not show any statistical difference in PNMR with respect to socioeconomic class though studies conducted in past have shown the high PNMR in low socioeconomic class.

Strengths of the Study

This study was conducted in a rural medical college it is representative of the rural perinatal mortality rate (PNMR) in India.

The findings of this study will help in forming intervention strategies in reducing perinatal mortality and morbidity due to preterm deliveries.

By defining gestational age of the newborn in weeks, term IUGR newborns were excluded from the preterm group.

Weakness

Follow up beyond one week is not available and hence burden of infant mortality and morbidity in preterm deliveries cannot be calculated.

This study focuses on etiological factors responsible for perinatal mortality and morbidity in rural areas, but does not suggest specific strategies to reduce preterm deliveries. This would require a multidisciplinary action plan with obstetrician, neonatologist, administrative department and healthcare policy makers.

Psychological, emotional and financial burden on family due to preterm labour is not reflected in our study though it was not our objective.

CONCLUSION

Perinatal mortality is taken as index of the efficacy of not only antenatal and intranatal care but also of the socioeconomic condition of the community. According to World Health Report 2001 perinatal conditions account for more than 4% (2.4 million) of the deaths in the world, most of them in developing countries. Reduction in perinatal deaths could be facilitated by increasing awareness for registration of pregnant women for antenatal care. Early registration during pregnancy can certainly help to prevent future consequences of preterm birth babies, still births, and neonatal deaths. Every teaching institute should have at least level 2 neonatal care facilities to make a significant dent in early neonatal deaths. Universal antenatal care is an important means of reducing perinatal mortality and achieving our target of PNMR of 35 per 1000 births envisioned in RCH policy of India.

High risk mothers with previous history of perinatal mortality should be prophylactically admitted from 28.34 weeks. Aggressive management of PIH/APH in all patients, aggressive use of steroids and minimum pervaginal examination in patients with Premature Rupture of Membrane (PROM) is essential. Overdiagnsois of preterm is better than otherwise.

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