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### Challenges and Consequences of Preterm Birth

<sup>1</sup>Sribas Goswami<sup>2</sup>Manjari Sahai<sup>1</sup>Serampore College, Dist- Hooghly, West Bengal, India

PhD, Assistant Professor in Sociology

E-mail: [sribasgoswami@gmail.com](mailto:sribasgoswami@gmail.com)<sup>2</sup>ESIS, Government of Chhattisgarh, India

M.B.B.S, DNB

Medical Officer

#### Abstract

Preterm births have been a challenge to obstetricians and paediatricians. Preterm births affect all population irrespective of age, race and economic status due to lack of seriousness and awareness among the pregnant women. Preterm birth is one of the leading causes of infant morbidity and mortality, amounting to billions of dollars each year, thus increasing the cost for health care. Proper awareness programs about preterm birth may help the women population to know and understand better the signs and symptoms of preterm labour. Preterm birth is a complex cluster of problems with a set of overlapping factors of influence. Its causes may include individual-level behavioral and psychosocial factors, neighborhood characteristics, environmental exposures, medical conditions, infertility treatments, biological factors and genetics. Many of these factors occur in combination, particularly in those who are socioeconomically disadvantaged or who are members of racial and ethnic minority groups. The empirical investigation was carried out to draw correlation between preterm birth and eventuality through this study.

**Keywords:** maternity; pregnancy; septicemia; prenatal mortality; prematurity.

#### Introduction

The present study is hospital based observational (analytical) cohort study of prospective (longitudinal) type. The cases admitted during emergency hours through casualty and through outer patient department, were admitted for planning of termination, observation and monitoring. Patients were interrogated for detailed history according to proforma and followed for a week after delivery. Data was analyzed using Chi square test to find out significant variables.

The study comprises of 343 cases presenting with preterm labour and delivered preterm. The incidence of preterm births was 6.05 %. Majority of patients resided in rural area, belonged to lower socioeconomic class, belonged to the age group 21-25 years. Predisposing factors associated with preterm births were lack of antenatal checkups, low socio economic status, extremes of age, history of previous preterm births, history of 2 or more abortions, family history of preterm births.

The most common cause of neonatal morbidity was neonatal jaundice. Other causes were neonatal septicaemia, feeding problems, neonatal encephalitis and seizures.

The most common cause of neonatal mortality was respiratory distress syndrome. Other causes were neonatal septicaemia, intra-ventricular haemorrhage, birth asphyxia with hypoxic ischaemic encephalopathy, neonatal jaundice, disseminated intravascular coagulation, meconium aspiration, aspiration of feeds and fetal congenital anomaly. The most common cause of maternal morbidity was post partum haemorrhage, followed by puerperal pyrexia, wound infection, retained placenta, perineal tear.

### **Materials and Methods**

The present prospective study: “Foeto-Maternal Outcome in Preterm Births” at Jawaharlal Nehru Hospital and Research Centre was conducted in the Department of Obstetrics and Gynecology, Jawaharlal Nehru (JLN) Hospital and Research Centre, Sector-9, Bhilai (Chhattisgarh, India).

JLN Hospital and Research Centre, Bhilai is 860 bedded multidisciplinary tertiary and referral hospital in the state of Chhattisgarh. The hospital caters free medical care to employees of Bhilai Steel Plant and their dependents. It also looks after referred employees of other associated industries, referred cases from local nursing homes, private practitioners, district hospitals, health centers and nearby rural areas on payment basis. Obstetrics and Gynecology Department has total of 117 beds with 2 maternity and one gynecology ward. 12 beds in labour room, 70 beds in obstetric ward and 35 beds in gynecology ward.

### **Findings from the study:**

#### **Consequences of Preterm Birth**

The complications of preterm birth arise from immature organ systems that are not yet prepared to support life in the extrauterine environment. The risk of acute neonatal illness decreases with gestational age, reflecting the fragility and immaturity of the brain, lungs, immune system, kidneys, skin, eyes, and gastrointestinal system. These outcomes are also influenced by the etiology of the preterm birth; maternal and family risk factors; and the extrauterine environment, including the neonatal intensive care unit (NICU), home, and community.

#### **Mortality**

Infants born preterm are more likely than infants born full term to die during the neonatal period (first 28 days) and infancy (first year), and mortality rates increase proportionally with decreasing gestational age or birth weight.

#### **Complications of Preterm Birth**

Developmental immaturity affects a wide range of organ systems. The complex interplay of the mechanisms involved in preterm delivery, including inflammation and cytokine injury, has also been implicated in the pathogenesis of chronic lung disease, necrotizing enterocolitis, retinopathy of prematurity (ROP), and brain white matter injury in the preterm infant.

#### **Respiratory Distress Syndrome**

Neonatal Respiratory Distress Syndrome (RDS) is a condition characterized by grunting, intercostal retraction, nasal flaring, cyanosis in room air and the requirement of oxygen to maintain adequate arterial oxygen pressure. Causes of neonatal RDS are:

- a) Transient tachypnoea of newborn, caused by wet lungs or by transient intrapartum asphyxia.
- b) Congenital pneumonia resulting from intra-amniotic infection.
- c) Pulmonary hypertension
- d) Congenital defects such as diaphragmatic hernia or pulmonary hypoplasia secondary to Potter's syndrome.

Table 1: Distribution of Preterm Neonates According to Sex

S. No	Sex of Neonate		Gestational Age (in completed weeks)				Total	Percentage
			Very Preterm (28-32 weeks)		Moderately Preterm (33-36 weeks)			
			No.	%	No.	%		
1.	Males	Live born	40	60.61%	164	53.07%	204	54.4%
		IUFD	5	7.57%	20	6.47%	25	6.67%
2.	Females	Live born	17	25.76%	112	36.25%	129	34.4%
		IUFD	4	6.06%	13	4.21%	17	4.53%
	Total		66	100%	309	100%	375	100%

IUFD-Intra-uterine Fetal Demise

The above table shows that maximum number of preterm neonates were males i.e. 229 (61.07%), out of which 204 (54.4%) were live born and 25 (6.67%) were intrauterine fetal demise. The difference between both the groups is not statistically significant. (p value 0.4206, CC 0.0864) (NS)

Table 2: Overall Sex Ratio of Preterm Neonates

S. No.	Sex of baby	No.	Percentage
1.	Males	229	61.07%
2.	Females	146	38.93%

The above table shows that majority of preterm babies are males i.e. 229 (61.07%).

Table 3: Prenatal Outcome Associated With Preterm Births

S. No.	Prenatal Outcome	Gestational Age (in completed weeks)				Total (n=375)	Percentage
		Very Preterm (28-32 weeks)		Moderately Preterm (33-36 weeks)			
		No. (n=66)	%	No. (n=309)	%		
1.	Live births	57	86.36%	276	89.32%	333	88.8%
2.	Still births	9	13.64%	33	10.68%	42	11.2%
3.	Early Neonatal Deaths	26	45.61%	29	10.51%	55	16.52%
4.	Prenatal Mortality	35	61.40%	62	22.46%	97	29.13%

ENND-Early Neonatal Death

Prenatal Mortality is defined as late fetal deaths (occurring at 28 weeks of gestation or more) and early neonatal deaths (occurring within the first 7 days of birth).

The above table shows that the total number of preterm babies was 375, out of which 333 were live births and 42 were still births. In the very preterm group, total number of preterm babies was 66 and that in the moderately preterm group was 309.

The incidence of still births was more 9 (13.64 %) in very preterm babies as compared to moderately preterm babies 33 (10.68 %). The number of early neonatal deaths (i.e. neonatal deaths within 7 days of birth) was also more in the very preterm babies i.e. 26 (45.61 %) as compared to moderately preterm babies i.e. 29 (10.51 %). Survival after the early neonatal period was also less in very preterm babies i.e. 31 (46.97 %) as compared to moderately preterm babies i.e. 247 (79.94 %).

There is higher incidence of prenatal mortality in very preterm babies (61.40 %) as compared to moderately preterm babies (22.46 %). The prenatal mortality rate in this study was 291 /1000 live births. The difference between the both groups is statistically significant (p value < 0.0001, CC 0.242).

Table 4: Type of Stillbirths

Type of stillbirth	No. of cases	Percentage
Macerated stillbirth	36	85.71%
Fresh stillbirth	6	14.29%

The above table shows that out of 42 stillbirths, 36 (85.71 %) were macerated stillbirths and 6 (14.29 %) were fresh stillbirths.

Table 5: Relationship of Causes of Neonatal Morbidity with Gestational Age

S. No.	Neonatal Morbidity	Gestational Age (in completed weeks)				Total	Percentage
		Very Preterm (28-32 weeks)		Moderately Preterm (33-36 weeks)			
		No. (n=57)	%	No. (n=276)	%		
1.	Neonatal Jaundice	12	21.05%	35	12.68%	47	14.11%
2.	Neonatal Septicemia	7	12.28%	22	7.97%	29	8.71%
3.	Feeding Problems	5	8.77 %	14	5.07%	19	5.71%
4.	Neonatal Encephalitis and Seizures	4	7.02 %	9	3.26%	13	3.90 %
5.	Necrotizing Enterocolitis	-	-	8	2.9%	8	2.40%

The above table shows that among 333 live born babies, the most common cause of neonatal morbidity was neonatal jaundice i.e. 47 (14.11 %) cases followed by neonatal septicemia in 29 (8.71 %) cases, feeding problems in 19 (5.71 %) cases, neonatal encephalitis and seizures in 13 (3.90 %) cases and necrotizing enterocolitis in 8 (2.40 %) cases.

Table 6: Analysis of Various Causes of Neonatal Morbidity

Cause of Neonatal Morbidity	Odds Ratio	95% Confidence Interval	P value	Inference
Neonatal Jaundice	3.82	1.70 – 8.56	0.0011	Highly significant
Neonatal Septicemia	2.98	1.15 – 7.70	0.0240	Significant
Feeding Problems	3.20	1.06 – 9.60	0.0379	Significant
Neonatal Encephalitis and Seizures	3.91	1.13 – 13.58	0.0313	Significant
Necrotizing Enterocolitis	0.44	0.02 – 7.93	0.5835	Not significant

The above table analyzes the relationship between various causes of neonatal morbidity and preterm births. Neonatal jaundice (OR 3.82,95 % CI 1.70-8.56, p value 0.0011), neonatal septicemia (OR 2.98,95 % CI 1.15-7.70,p value 0.024),feeding problems (OR 3.20,95 % CI 1.06-9.60,p value 0.0379) and neonatal encephalitis and seizures (OR 3.91,95 % CI 1.13-13.58,p value 0.0313) were found to be statistically significant.

Table 7: Distribution of Neonates According to Number of Days of Stay in Neonatal Intensive Care Unit

S. N o.	Stay in NICU (in no. of days)	Gestational Age (in completed weeks)				Total	Percent.
		Very Preterm (28-32 weeks)		Moderately Preterm (33-36 weeks)			
		No.	%	No.	%		
1.	1 day	2	6.45%	42	18.26%	44	16.86%
2.	2 days	5	16.13%	64	27.83%	69	26.44%
3.	3 days	-	-	26	11.30%	26	9.96%
4.	4 days	3	9.68%	13	5.65%	16	6.13%
5.	5 days	4	12.90%	22	9.57%	26	9.96%
6.	6 days	-	-	15	6.52%	15	5.75%
7.	7 days and more	17	54.84%	48	20.87%	65	24.90%
	Total	31	100%	230	100%	261	100%

NICU-Neonatal Intensive Care Unit

The above table shows that out of 333 live born babies, 261 (78.38 %) had admissions in Neonatal Intensive Care Unit. In the very preterm group, maximum number of babies i.e. 17 (54.84 %) babies had NICU stay of 7 days or more. In the moderately preterm group, maximum number of babies i.e. 69 (26.44 %) babies had NICU stay of 2 days.

Table 8: Relationship of Causes of Neonatal Mortality with Gestational Age

S. No.	Cause of Neonatal Mortality	Gestational Age (in completed weeks)				Total	Percent age
		Very Preterm (28-32 weeks)		Moderately Preterm (33-36 weeks)			
		No.	%	No.	%		
1.	a.RDS	10	38.46%	6	20.69%	19	34.55%
	b.RDS+BA	1	3.85%	2	6.9%		
2.	a.NNS	3	11.54%	6	20.69%	11	20%
	b.NNS+IVH	2	7.69%	-	-		
3.	IVH	4	15.38%	3	10.34%	7	12.72%
4.	BA+HIE	3	11.54%	2	6.9%	5	9.09%
5.	NNJ	-	-	4	13.79%	4	7.27%
6.	DIC	1	3.85%	3	10.34%	4	7.27%
7.	MAS	-	-	2	6.9%	2	3.64%
8.	Aspiration of feeds	2	7.69%	-	-	2	3.64%
9.	FCA	-	-	1	3.45%	1	1.82%
	Total	26	100%	29	100%	55	100%

RDS-Respiratory distress syndrome, BA-Birth asphyxia, NNS-Neonatal septicemia, IVH-Intra-ventricular haemorrhage, HIE-Hypoxic ischemic encephalopathy, NNJ-Neonatal jaundice, DIC-Disseminated intravascular coagulation, MAS-Meconium aspiration syndrome, FCA-Fetal congenital anomaly.

The above table shows that the most common cause of early neonatal mortality was respiratory distress syndrome (with or without birth asphyxia) in 19 (34.55 %) babies, followed by neonatal septicemia (with or without intra-ventricular haemorrhage) 11 (20 %), intra-ventricular haemorrhage 7 (12.72 %), birth asphyxia with hypoxic-ischemic encephalopathy 5 (9.09 %), neonatal jaundice 4 (7.27 %), disseminated intravascular coagulation 4 (7.27 %), meconium aspiration syndrome 2 (3.46 %), aspiration of feeds 2 (3.46 %) and fetal congenital anomaly 1 (1.82 %).

Table 9: Analysis of Various Causes of Neonatal Mortality

<b>Cause of Neonatal Mortality</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval</b>	<b>p value</b>	<b>Inference</b>
RDS and RDS+BA	8.25	3.15 – 21.60	< 0.0001	Highly significant
NNS and NNS + IVH	4.32	1.27 – 14.70	0.0189	Significant
IVH	6.86	1.49 – 31.57	0.0133	Significant
BA + HIE	7.61	1.24 – 46.64	0.0282	Significant
NNJ	0.52	0.02 – 9.91	0.6685	Not significant
DIC	1.62	0.16 – 15.90	0.6766	Not significant
MAS	0.95	0.04 – 20.15	0.9763	Not significant
Aspiration of feeds	24.90	1.17 – 526.02	0.0388	Significant
Fetal Congenital Anomaly	1.59	0.64 – 39.70	0.7752	Not significant

RDS-Respiratory distress syndrome, BA-Birth asphyxia, NNS-Neonatal septicemia, IVH-Intra-ventricular haemorrhage, HIE-Hypoxic ischemic encephalopathy, NNJ-Neonatal jaundice, DIC-Disseminated intravascular coagulation, MAS-Meconium aspiration syndrome, FCA-Fetal congenital anomaly.

The above table analyzes the relationship between various causes of neonatal mortality and preterm births. Respiratory distress syndrome (with or without birth asphyxia) (OR 8.25,95 % CI 3.15-21.60, p value < 0.0001), neonatal septicemia (with or without intraventricular haemorrhage) (OR 4.32,95 % CI 1.27-14.70, p value 0.0189), intraventricular haemorrhage (OR 6.86,95% CI 1.49-31.57, p value 0.0133), birth asphyxia with hypoxic ischemic encephalopathy (OR 7.61,95% CI 1.24-46.64, p value 0.0282), aspiration of feeds (OR 24.9,95 % CI 1.17-526.02, p value 0.0388) were found to be statistically significant.

Table 10: Maternal Morbidity associated with Preterm Deliveries

S. No.	Maternal Morbidity	Gestational Age (in completed weeks)				Total	Percent.
		Very Preterm (28-32 weeks)		Moderately Preterm (33-36 weeks)			
		No.	%	No.	%		
1.	Postpartum haemorrhage	12	20.34 %	8	2.82%	20	5.83%
2.	Puerperal pyrexia	6	10.17 %	11	3.87%	17	4.96%
3.	Wound infection	2	3.39 %	7	2.46%	9	2.62%
4.	Retained placenta	4	6.78 %	3	1.06%	7	2.04%
5.	Chorio- amnionitis	4	6.78 %	3	1.06%	7	2.04%
6.	Perineal tear	0	-	4	1.41%	4	1.17%

The above table shows that the most common cause of maternal morbidity in preterm deliveries was post partum haemorrhage i. e. 20 (5.83 %) cases, followed by puerperal pyrexia in 17 (4.96 %) cases, wound infection in 9 (2.62 %) cases, retained placenta in 7 (2.04 %), chorioamnionitis in 7 (2.04 %) cases and perineal tear in 4 (1.17 %) cases (p value 0.1323,CC 0.34).

### Conclusion

Educational programmes to increase awareness of signs and symptoms of preterm labour should be encouraged so that women seek early medical attention. Most of the causes of preterm labour are modifiable and could be controlled by pre-conceptional counseling and efficient prenatal care. The most common cause of maternal morbidity was post-partum haemorrhage. So, required measures should be taken to prevent and treat post-partum haemorrhage to reduce maternal morbidity. Educational programmes to increase awareness of signs and symptoms of preterm labour should be encouraged, so that women seek early medical attention. Most of the maternal causes of preterm labour are modifiable and could be controlled by pre-conceptional counseling and efficient prenatal care. Tertiary prevention measures such as maternal transfer to a tertiary care centre for further management and administration of glucocorticoids and tocolytics in selected cases have shown benefit in the overall outcome of preterm births.

The prevention of preterm labour is one of the greatest challenges to the obstetricians and much of it also depends on social and economic factors that have also to be addressed at. Preterm births constitute an enormous medical, social and financial problem. There are multiple determinants of preterm labour. Therefore, intervention programs should target multiple determinants. Adequate support from the pre-conception period, including monitoring for identified causes of previous adverse outcome, adequate nutrition, pregnancy spacing, avoidance of harmful substances/strenuous working conditions/chronic stress, screening and treatment of infections/ medical disorders/ sexually transmitted diseases may help to reduce the risk of subsequent preterm birth. In the present study of 343 cases of preterm births, the incidence of preterm births was found to be 6.05 %.

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