

## Preterm Birth: Analysis of Risk Factors and Neonatal Outcome

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### Abstract

**Objective:** To identify different associated risk factors and to assess the neonatal mortality and morbidity in preterm births.

**Study design:** It is a retrospective observational study conducted in the Departments of Obstetrics and Gynecology and Pediatrics in our hospital for a period of 5 years from January 2008 to January 2013.

**Results:** The incidence of preterm birth is found to be 10.23%. When we looked at the onset of preterm labour, it is found that incidence of spontaneous preterm labour is 56.05%, Preterm Premature Rupture of Membranes is 21.82% and iatrogenic preterm birth is 22.1%. It is found that the most common risk factor associated with preterm births is first trimester bleeding, amounting to 40% of total preterm births. On analyzing the neonatal outcome, hyperbilirubinemia is seen in 80% of the babies born between 28-32 weeks of gestation and Hyaline Membrane Disease in 49% of them. Overall neonatal mortality in our study is 20.48%, of which maximum (45.53%) is between 28-32 weeks of pregnancy.

**Conclusion:** Mostly, the risk factors of preterm births are modifiable and hence preventable. Therefore, preconceptional counseling has a great role to play in bringing down the incidence of preterm labour.

**Keywords:** Preterm births; Spontaneous preterm birth; Iatrogenic; PPROM; Neonatal outcome

**Abbreviations:** PROM: Premature Rupture of Membrane; NEIGRIHMS: North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences; APGAR: Appearance Pulse Grimace Activity Respiration; UTI: Urinary Tract Infection; HMD: Hyaline Membrane Disease

**Received:** Sep 09, 2015, **Accepted:** Sep 29, 2015, **Published:** Oct 05 2015

### Introduction

Preterm birth, defined as birth at less than 37+0 weeks of gestation, is the most important single determinant of adverse infant outcome in terms of both survival and quality of life [1]. Preterm birth rates have been reported to range from 5% to 7% of live births in some developed countries, but are estimated to be substantially higher in developing countries [2]. Each year, more than 1 in 10 of the world's babies are born preterm, resulting in 15 million babies born too soon. Preterm birth has been the leading cause of neonatal mortality worldwide for about a decade. However, during 2012 new global estimates placed preterm birth as the number two cause of child mortality, behind pneumonia,

with more than a million deaths each year [3]. Risk of death or neurosensory disability increases with decreasing gestational age [1]. Approximately 45-50% of preterm births are idiopathic, 30% are related to preterm rupture of membranes (PROM) and another 15-20% are attributed to medically indicated or elective preterm deliveries [4,5].

### Materials and Methods of Study

It is a retrospective observational study conducted in the Departments of Obstetrics and Gynecology and Pediatrics in NEIGRIHMS (North Eastern Indira Gandhi Regional Institute of Health & Medical Sciences) for a period of 5 years from January 2008 to January 2013. The aim of the study is to identify different

associated risk factors and to assess the neonatal mortality and morbidity in preterm births. All the preterm birth records were collected and were subdivided into 3 groups, viz. spontaneous preterm labour, preterm premature rupture of membrane and iatrogenic preterm birth. On reviewing the records, risk factors associated with preterm labour were analysed. Prognosis in terms of morbidity and mortality of preterm neonates were also analysed according to gestational age at birth, viz. 28-32 weeks, 32-34 weeks and 34-37 weeks. Statistical analysis method used is Chi square method.

## Results and Observation

In our study, the incidence of preterm birth is found to be 10.23%. Out of a total number of preterm births of 1040, gestational age at birth of >34 weeks accounts for 65%, <32 weeks accounts for 19.2% of preterm birth and 32-34 weeks accounts for rest 15.8% of preterm births. Again, when we looked at the onset of preterm labour, it is found that incidence of spontaneous preterm labour is 56.05%, PPROM (Preterm Premature Rupture of Membranes) is 21.82% and iatrogenic preterm birth is 22.1%.

We also analysed the associated risk factors in preterm births in accordance with spontaneous preterm birth, PPROM and iatrogenic preterm (**Table 1**). The details of risk factors are retrieved from the records. It is found that the most common risk factor associated with preterm births is first trimester bleeding, amounting to 40% of total preterm births. In our study, the next common risk factors are tobacco chewing (35.1%), lower socio economic class of Kuppuswamy IV and V (27.88%), frequent births (24.6%) and hard physical work (24.4%). We also found many other risk factors that contributed to preterm births, viz. psychological factor, familial, prior preterm births, infection, extremes of maternal age and maternal weight <50 kgs. The maternal infections we looked into are basically urinary tract infection (confirmed by urine routine, microscopy and culture), bacterial vaginosis (confirmed by high vaginal swab) and Group B streptococcus infection (confirmed by lower vaginal and perennal swab). We tried to find out the statistical significance of each of the risk factors that contributed to spontaneous preterm births, PPROM and iatrogenic preterm births by Chi square method.

In our study, we also analyzed the features of preterm babies like birth weight and APGAR score at 5 minutes (**Table 2**). In a total of 1040 preterm babies, 71.5% are with birth weight 1.5-2.5 kg. Also APGAR score at 5 minutes >8 in a maximum of 75.2%.

As we know, preterm births are associated with increased perinatal morbidity and mortality. More so, this worsening perinatal morbidity and mortality decreases with advancing gestation. In our study, we analyzed the neonatal outcome in terms of gestational age groups of 28-32 weeks, 32-34 weeks and 34-37 weeks (**Table 3**).

## Discussion

The incidence of preterm birth varies from country to country. According to Mathews and Macdorman, National Vital Statistics data 2008 the incidence of preterm birth in USA was 12.6%, [6] whereas according to Bibby E, Stewart A. 2004-2005, it was 10% in United Kingdom [7]. In India the incidence of preterm birth was 20.9% according to Singh Uma, Singh Nisha, Seth Shikha [8]. In our study, we found the incidence to be 10.23%. Again, the percentage distribution of preterm birth in USA 2004 was late preterm birth 71.2%, 33-34 weeks 12.7% and 28-32 weeks 10% and <28 weeks 6%. In our study 19.2% of total preterm births are between 28-32 weeks of gestation, 15.8% preterm babies are between 32-34 weeks of gestation and 65% babies are 34-37 weeks of gestation. According to a study conducted by Mc Intire and Leveno, 35% preterm birth was due to spontaneous rupture of membrane, 45% preterm birth was due to spontaneous preterm labour and 20% preterm birth was due to iatrogenic reason [9]. Again, according to Singh Uma, Singh Nisha, Seth Shikha 27.3% preterm delivery was due to iatrogenic reason. Whereas, in our study, spontaneous preterm birth was 56.05%, PPROM was 21.82% and iatrogenic was 22.11%.

The risk factors for preterm labor are many. Patients with first trimester bleeding are more likely to experience PPROM (OR 1.78, 95% CI 1.28, 2.48), preterm delivery (OR 2.05, 95% CI 1.76, 2.4) [10]. In our study also, a maximum of 40% women with preterm birth had bleeding per vaginum in first trimester. Though, association of psychological factor like anxiety, depression and stress during pregnancy leading to preterm birth is in controversy,

**Table 1** Risk factors of preterm birth.

Risk factors	Spontaneous (n=583)	PPROM (n=227)	Iatrogenic (n=230)	Total preterm births (n=1040)	P value
1 <sup>st</sup> trimester bleeding	223	87	106	416 (40%)	0.1023
Tobacco chewing	210	82	74	366 (35.1%)	0.5542
Psychological factor	68	27	31	126 (12.1%)	0.5233
Hard physical work	138	57	59	254 (24.4%)	0.7698
Familial	15	7	8	30 (2.8%)	0.8085
Birth interval <2 yrs	152	60	44	256 (24.6%)	0.908
Prior preterm birth	78	32	24	134 (12.8%)	0.3978
Maternal infection	93	57	26	176 (16.9%)	0.0003
Maternal age >35 years	73	27	34	134(12.88%)	0.6050
Maternal age <20 years	69	29	34	132(12.69%)	0.5234
Kuppuswamy IV and V	164	59	67	290(27.88%)	0.7409
Maternal weight <50 kgs	129	49	44	222(21.34%)	0.6402

**Table 2** Birth weight and APGAR score in preterm.

Birth weight	No.of preterm births	Percentage
<1.5 Kg	202	19.4%
1.5-2.5 kg	743	71.5%
>2.5kg	95	9.1%
APGAR score at 5 minute		
<5	23	2.2%
5-8	235	22.6%
>8	782	75.2%

**Table 3** Neonatal outcome.

Neonatal morbidity and mortality	28-32 weeks (n=200)	32-34 weeks (n=164)	34-37 weeks (n=676)	p value
Neonatal jaundice	160	62	243	<0.0001
H.M.D.	98	48	74	<0.0001
Sepsis	87	11	72	<0.0001
Mean duration of hospital stay (in days)	38.5	18.2	8.9	
Mortality	97	27	89	<0.0001

Copper RL 1996 reported stress was associated with spontaneous preterm birth [11] but Littleton 2008 reported that there is no evidence of an association of anxiety symptoms with adverse perinatal outcomes among those studied thus far [12]. But, in our study 12.1% women with preterm birth had psychological problems. The second most common risk factor responsible for preterm labour (35.1%) we found is the habit of tobacco chewing, that is commonly seen in women of this region of Meghalaya. US Department of Health and Human Services Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health April 2004 concluded that that there is a poor correlation between long working hours and preterm labour, whereas, The Cochrane Collaboration published in The Cochrane Library 2010 that there is no evidence, either supporting or refuting the use of bed rest at home or in hospital, to prevent preterm birth. But, in our study 24.4% of the women who had preterm birth are hard working. In this region of Meghalaya, usually female member of the family are the bread earners and work hard in fields. The increased risk of preterm delivery among mothers born preterm is consistent with heritable maternal phenotypes that confer a propensity to deliver preterm [13]. But in our study, the familial contribution is only 2.8%. Interpregnancy intervals shorter than 18 months are associated with increased risks of preterm birth [14]. We found 24.6% preterm births had birth interval <2 years. Carr-Hill and Hall have shown that in women with history of one preterm delivery there is 15% chance of next preterm delivery and after two preterm deliveries there is 32% chance [15]. In our study, only 12.8% women had previous preterm birth. According to Gonclaves et al intrauterine infection is a major cause of preterm labor, with or without intact membranes and accounts for approximately 25% of cases [16]. Lamont concludes that infection is responsible in 40% of cases and earlier the abnormal genital tract colonization is detected the greater is the risk of adverse outcome [17]. Wright et al identified urinary tract infection (UTI) as a significant risk factor contributing to 7% of preterm births [18]. In our study we got

16.9% women had infection (Urinary Tract Infection, Group B Streptococcus, Bacterial vaginosis). Diallo et al in a study found that early and late age of procreation (amounting to 7.95% and 3.9% of preterm), and poor and rich women groups (amounting to 7.34% and 3.84% of preterm) are also important risk factors [19]. Likewise, in our study late age pregnancy (maternal age >35 years) constituted 12.88% and teenage pregnancy constituted 12.69% of preterm births, respectively. Begum et al found that maternal weight <45 kg (OR 4.9), height <150 cm (OR 3.4), BMI <19 kg/m<sup>2</sup> (OR 2.9), educational status <5 years (OR 2.7), monthly income <2000 rupees (OR 5.05) and birth interval <12 months (OR 6.39) are significant risk factors for preterm labor [20]. In our study also, we found that 27.8% preterm births were in women who are from Kuppuswamy classification IV & V. and 21.3% of women who had preterm births, had weight <50 kg. In our study when chisquare test was put in these three groups there is no significant difference, of factors associated with preterm birth, except infection where (p value-0.0003) showing PPROM group has highest occurrence of infection.

Regarding perinatal morbidity and mortality, we found significant differences amongst the 3 groups of gestational age (28-32 weeks, 32-34 weeks and >34 weeks) of preterm births: hyperbilirubinemia (pvalue-<0.0001), sepsis (p=0.0001), HMD (p=0.001) and mortality (p=0.001). According to Sehgal et al., neonatal hyperbilirubinemia (78%) and RDS (65%) are the most common causes of morbidity in 28-32 weeks [21]. Singh et al. also reported that overall mortality amongst preterm delivered at hospital and managed in the nursery is 21% and septicemia constituted 31% of the mortality [22]. In our study, hyperbilirubinemia is seen in 80% of the babies born between 28-32 weeks of gestation and HMD in 49% of them. Overall neonatal mortality in our study is 20.48%, of which maximum (45.53%) is between 28-32 weeks of pregnancy.

## Conclusion

Preterm births require early and prolonged hospitalization posing

great financial and psychological burden on the family and the society at large. Mostly, etiological factors of this condition are modifiable and can be well taken care of by preconceptional counseling. Preconceptional counseling emphasis should be on the risk factors of preterm births like family planning, good

nutrition, safe sex, hygiene, treatment of sexually transmitted diseases, avoidance of tobacco, alcohol, abusive drugs and harmful work conditions and hence reduce the burden of preterm births. All efforts should be made to continue the pregnancy till term for a healthy mother and a healthy baby.

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