

Cross Sectional Study to Determine Incidence of Various Phenotypes of Preterm Labour at Tertiary Care Centre

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Abstract: Preterm birth (PTB) is an important health concern and a leading cause of infant mortality and morbidity worldwide. This review article determined potential risk factor (s) associated with PTB and evaluated the overall trend of PTB prevalence in India. This is one year cross sectional study was conducted on a total of 210 pregnant women who delivered between 24 - 36 weeks and 6/7 days at Department of Obstetrics and Gynaecology, Government Medical College, Nagpur, Maharashtra from July 2021 to June 2022. The maternal and perinatal outcome were assessed. We have taken 70 subjects of each clinical phenotype for comparison study purposefully. At tertiary care centre, in a allotted period of data collection for a study we found that total 10, 200 deliveries done. Out of which 4284 i. e., 40% were preterm deliveries. The maternal and perinatal outcome were assessed. Most of the women 108 (51.42%) were aged 21 to 25 years. Primi para was noted in 88 (41.90%) of the women and low socio economic class were 74 (35.24%) due to poor nutrition, lack of cleanliness which leads to nutritional anemia and infection respectively. We have taken 3 main clinical phenotypes of preterm labour which are spontaneous preterm labour, premature preterm rupture of membrane and induced preterm labour subjects. In those with indicated labour, 155 (73.80%) underwent vaginal delivery while 55 (26.20%) had emergency LSCS. Antepartum eclampsia and postpartum eclampsia were noted in 28 (13.33%). Most of the babies 95 (45.23%) had birth weight between 1 to 1.5 Kgs. There were 160 (76.19 %) of babies who required NICU admission and mortality was observed in 98 (61.25%) which is high rate. Hence managing late preterm births needs judicious decision making to reduce the mortality and morbidity.

Keywords: Induced preterm birth, spontaneous preterm birth, PPROM, IUGR, Neonatal outcome

1. Introduction

The term preterm birth (PTB) is defined by the World Health Organization (WHO) as babies born alive before completing 37 weeks of gestational age. (1) It is one of the leading causes of neonatal morbidity and mortality in children below five years of age. (1) In India, report released by the ministry of health indicates that out of 1.5 million live births annually, 188, 000 are born preterm which means that one out of every eight children born in the country is a preterm and this is a concern since preterm birth is the major contributor of neonatal mortality in the country. (2) A significant proportion of preterm births are preventable by adequate antenatal care, female literacy and health education, which increase the awareness about antenatal care. So, our study aims to find out the main risk factors related to preterm births specially those which can be intervened upon so that proper measure can be undertaken to decrease the preterm birth rate and neonatal morbidity and mortality associated with prematurity. (2)

2. Materials and Methods

2.1 Study Design and setting

This is a cross sectional study to determine incidence and perinatal outcome of various phenotypes of preterm labour at inpatient department of Obstetrics and Gynaecology Ward at Tertiary Care Hospital.

2.2 Study Population

The study population was women presenting preterm birth with various clinical phenotypes admitted in ward at tertiary

care hospital satisfying inclusion and exclusion criteria between study periods. Estimated sample size were 210 which fulfils inclusion criteria.

Inclusion criteria

All pregnant women admitted for preterm labour in labour ward having

- 1) Spontaneous Preterm Labour
- 2) Preterm Pre - Labour Rupture of Membranes
- 3) Medically Indicated Preterm Labour
- 4) Pregnancy >24 Weeks
- 5) Pregnancy <37 Weeks
- 6) Patients Who are willing to participate in study

Exclusion criteria -

- 1) Pregnancy Beyond 37 completed Weeks
- 2) Pregnancy Before 24 Weeks
- 3) Patients referred with intra uterine fetal demise were excluded due to inadequate information.
- 4) Patients who were initially admitted as threatened preterm labour and responded to management and were subsequently discharged or delivered at term were excluded from further analysis.

2.3 Ethical Approval

The permission from institutional ethics committee was taken on - - - - (appendix B) Synopsis approval from MUHS university was received on 10/05/2022

2.4 Method of measurement and data analysis

Observation method and data will be presented in terms of percentages and proportions.

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2.5 Method of data collection and study variables

The Patients fulfilling the inclusion criteria were enrolled during a period January 2021 to September 2022 (18 months). A total of 210 pregnant women were enrolled which were admitted with preterm labour. The incidence of preterm labour in terms of spontaneous preterm labour, induced preterm labour and PPRM assessed. Clinical profile of these patients was then categorised on the basis of age, occupation, residential status, gestational age at delivery, associated risk factors, obstetric history, previous history of preterm labour, cervical length at the presentation, urogenital infection. Patients were then further followed up closely for monitoring progress of labour in terms of mode of delivery, use of antibiotics, tocolytics, magnesium

sulphate, and corticosteroid. Delivered neonates who require further care were managed in NICU. Neonatal outcomes were assessed in terms of survivability, duration of NICU stay. Data collected during study was then analysed for percentages, proportions. Also, individual factors in study were studied for association with preterm labour and their association was tested for statistical significance using chi square, fisher exact test. Associated co - morbidities like anemia, pre - eclampsia, eclampsia, heart diseases were promptly treated if identified. Mode of delivery was planned as per the clinical status of the patients. Caesarean sections were done only for obstetrical reasons.

3. Results

Table 1: Maternal socio - demographic characteristics associated with preterm birth in the study

| Variables | Frequency (N=210) | | | Percentage (%) |
|--------------------------------|--------------------|----------------|--------------|----------------|
| MATERNAL AGE (in years) | Spontaneous | Induced | PPROM | |
| 18 - 20 | 6 | 10 | 5 | 10 |
| 21 - 25 | 36 | 40 | 32 | 51.42 |
| 26 - 30 | 21 | 17 | 28 | 31.42 |
| >30 | 7 | 3 | 5 | 7.14 |
| RESIDENCE | | | | |
| URBAN | 26 | 32 | 42 | 48 |
| RURAL | 44 | 38 | 28 | 52 |
| EDUCATION LEVEL | | | | |
| Informal | 9 | 10 | 6 | 12 |
| Primary level | 24 | 15 | 18 | 27 |
| Secondary level | 30 | 32 | 20 | 39 |
| Tertiary level | 7 | 13 | 26 | 22 |
| SOCIOECONOMIC STATUS | | | | |
| Lower | 26 | 26 | 22 | 35.24 |
| Upper lower | 22 | 20 | 21 | 30 |
| Lower middle | 17 | 17 | 18 | 24.76 |
| Upper middle | 05 | 07 | 09 | 10 |
| PROFESSION | | | | |
| Homemaker | 26 | 24 | 28 | 37.14 |
| Labourer | 30 | 28 | 20 | 37.14 |
| Office work | 14 | 18 | 22 | 25.72 |

Table 2: Obstetric profiles associated with preterm birth in the study

| Variables | Frequency | | | Percentage (%) |
|-----------------------------------|--------------------|--------------|----------------|----------------|
| Gestational Age (weeks) | Spontaneous | PPROM | Induced | |
| extremely preterm (<28 weeks) | 04 (2%) | 05 (2.4%) | 00 (0%) | 4.28 |
| very preterm (28 to <32 weeks) | 19 (9%) | 17 (8%) | 08 (3.8%) | 20.95 |
| moderate preterm (32 to<34 weeks) | 34 (16.20%) | 21 (10%) | 36 (17.14%) | 43.33 |
| late preterm (34 to< 37 weeks) | 13 (6%) | 27 (12.8%) | 26 (12.4%) | 31.42 |
| PARITY | | | | |
| Primi | 28 | 29 | 31 | 41.90 |
| Gravida 2 | 25 | 18 | 21 | 30.47 |
| Gravida 3 | 14 | 12 | 13 | 18.57 |
| Multigravida | 03 | 11 | 05 | 9.06 |
| PRETERM PHENOTYPE | | | | |
| Number of subjects | 70 | 70 | 70 | 33.33 |
| Single births | 62 | 64 | 62 | 89.52 |
| Multiple births | 8 | 6 | 8 | 10.47 |
| ANC VISITS | | | | |
| <4 | 64 | 67 | 64 | 92.86 |
| >/=4 | 6 | 3 | 6 | 7.14 |
| Delivered PretermBefore | | | | |
| no | 66 | 63 | 65 | 92.38 |
| yes | 4 | 7 | 5 | 7.61 |
| History Of Abortion Before | | | | |
| No | 46 | 47 | 50 | 68.09 |
| Yes | 24 | 23 | 20 | 31.91 |

Table 3: Antepartum complications associated with preterm birth in the study

| Clinical Feature | Frequency (N=210) | | | Percentage (%) |
|------------------------|-------------------|-------|-------------|----------------|
| | Induced | PPROM | Spontaneous | |
| Leaking | 8 | 54 | 29 | 44.96 |
| Pain in abdomen | 2 | 14 | 34 | 23.80 |
| eclampsia | 28 | 0 | 0 | 13.33 |
| IUGR | 10 | 0 | 0 | 4.76 |
| HELLP | 6 | 0 | 0 | 2.85 |
| severe oligohydramnios | 4 | 0 | 1 | 2.38 |
| chronic HTN | 4 | 0 | 0 | 1.9 |
| DCDA with | 1 | 0 | 3 | 1.9 |
| heart disease | 3 | 0 | 0 | 1.4 |
| GDM | 2 | 0 | 0 | 0.95 |
| Anaemia | 0 | 1 | 0 | 0.5 |
| MCDA twin | 1 | 0 | 0 | 0.5 |
| overt DM | 1 | 0 | 0 | 0.5 |
| scar tenderness | 0 | 0 | 1 | 0.5 |

Table 4: Management at admission and mode of delivery

| Variable | Frequency (N=210) | | | Percentage (%) |
|-----------------------------|-------------------|-------|---------|----------------|
| | Spontaneous | PPROM | Induced | |
| Admission to delivery time | | | | |
| 6 - 12 hours | 31 | 36 | 32 | 47.15 |
| 13 - 24 hours | 26 | 27 | 28 | 38.57 |
| > 24 hours | 13 | 07 | 10 | 14.28 |
| Mode Of Delivery | | | | |
| Vaginal | 57 | 48 | 50 | 73.80 |
| LSCS | 13 | 22 | 20 | 26.20 |
| Steroids Received | | | | |
| Yes | 62 | 55 | 55 | 82 |
| No | 08 | 15 | 15 | 18 |
| Antibiotics Received | | | | |
| Yes | 70 | 68 | 68 | 98 |
| No | 00 | 02 | 02 | 2 |

Table 5: Perinatal outcome in the study

| Variable | Frequency (N=210) | | | Percentage (%) |
|--------------------------------|-------------------|-------|---------|----------------|
| | Spontaneous | PPROM | Induced | |
| Birth Weight | | | | |
| >1 kg | 03 | 04 | 01 | 3.80 |
| 1 - 1.5 kg | 35 | 25 | 35 | 45.23 |
| 1.6 - 2 kg | 25 | 31 | 23 | 37.64 |
| 2.1 - 2.5 kg | 06 | 09 | 11 | 12.38 |
| 2.6 - 3 kg | 01 | 01 | 00 | 0.95 |
| Not required admission in NICU | 17 | 19 | 14 | 23.80 |
| Required admission in NICU | 53 | 51 | 56 | 76.19 |
| Discharged from NICU | 19 | 16 | 20 | 29.52 |
| Neonatal death | 34 | 35 | 36 | 46.66 |

4. Discussion

Preterm birth is a syndrome with a heterogeneous etiology and underlying factors are usually divided into spontaneous and provider - initiated or medically indicated causes of preterm births. Complications of preterm birth are the single largest direct cause of neonatal deaths, responsible for 35% of such deaths annually, and the second most common cause of under - five deaths [3]. Addressing the global burden of preterm birth is critical to reducing neonatal and childhood mortality and to achieving the United Nations Sustainable Development Goal #3, to ensure healthy lives and promote well - being for all [4]. For a better understanding of the epidemiology of preterm birth and consequent improvement of quality of care to the mother and neonate, there is a need for detailed estimates of the burden of the condition, particularly in low - and middle - income countries where the data are scanty and not population - based [5].

The actual rate of preterm birth remains unexplained in many countries. It is estimated that 23.4% of global preterm births are reported from India making it the biggest contributor to preterm births worldwide [6].

The present study was retrospectively conducted in a tertiary care hospital in Central India over a period of one year. The incidence of preterm birth in our study population was 40%, which is similar to a study in Kenya [7]. Another large longitudinal cohort study from India showed a higher frequency (14.9%) of preterm births [8].

Our study has reported that majority (51.42%) of preterm birth predisposed in age group 21 to 25 years of age. This is similar to a study from Nepal, which showed maximum prevalence (64.98%) in the 20 - 30 years age group [9]. The risk of preterm births is seen to be higher (39%) among

mothers with education upto secondary level and belonging to lower socioeconomic classes [8, 10, 11]. The majority of our study population belonged to the rural community and lower socioeconomic class.

Gestational age at birth is the strongest predictor of neonatal complications and outcomes. In our study gestational age of preterm deliveries was within 32 to 34 weeks. About 43.33% deliveries were in this gestational age group. In an African study, the mean gestation was 33 ± 3 weeks and 62% were late preterms (34 - 36 weeks) [12]. In the present study, about 41.90% women were nulliparous. This finding supported by a study in eastern India [13]. A population - based study observed an increased risk for spontaneous preterm birth at < 37 weeks in nulliparous women and women in their fifth pregnancy compared to women in their second pregnancy [14]. There is conflicting evidence on the association of preterm birth with the number of ANC visits. While some studies showed a correlation between irregular ANC visits and preterm birth [11], While some studies showed a correlation between irregular ANC visits and preterm birth [15], a Belgian team found no substantial correlation between number of ANC visits and preterm birth but rather on the content and timing of care during pregnancy [16]. In our study, 92% of the women with preterm birth had less than 4 ANC visits.

Major factors associated with preterm birth include hypertensive disorders of pregnancy and preeclampsia, premature rupture of membranes, scarred uterus, IUGR, and anemia [17, 18]. Factors associated with increased risk of preterm birth at India sites included severe antepartum haemorrhage, maternal hypertensive disorders, fetal mal presentation, and moderate/severe anaemia recorded anytime during pregnancy [4]. PROM was evident in 44.96% of our study participants; this finding accords with another Indian study from Eastern India [13].

Most deliveries in our study were vaginal (73.80%) and about 26.20% were delivered by Cesarean section (CS). The prevalence of women with preterm birth delivered by CS ranged between 31% and 36.7% in the WHO Global and Multi - country Surveys [19]. The Department of Biotechnology (DBT) India Initiative study in North India showed a lower CS rate of 22.9% among preterm deliveries [16].

A preterm baby is prone to develop birth asphyxia due to an insufficient amount of surfactant in the lungs, which prevents atelectasis and maintains alveolar stability. The average birth weight of preterm babies tends to be significantly lower as compared to the term babies. The most preterm neonates (45.23%) in our study were between 1 to 1.5 kg birth weight, which is similar to study in Kenya.

The effect of preeclampsia, IUGR, and associated anaemia on the birth weight of premature babies has to be taken into consideration. About 76.19% of our preterm neonates required NICU admissions (N=160 out of 210) from which 62 (29.52%) neonates got discharged from NICU and 99 (46.66%) neonatal death occurred. Most of the preterm labour subjects had received antibiotics (98%) and steroids (82%) at tertiary care centre. More than half (51.8%) of the

preterm babies in Kerela required NICU admission [20]. From the literature review, it was found that all neonatal adverse outcomes including lower APGAR scores were significantly more frequent in preterm birth groups than in term groups [21, 22].

APGAR scores predicted the risk of neonatal death among preterm infants across gestational - age strata. The relative risk of neonatal death consistently increased with decreasing APGAR scores in all gestational - age strata [23].

Preterm birth has two major clinical etiologies: iatrogenic and spontaneous preterm birth. Iatrogenic preterm birth, including labour induction and CS delivery without labour, constitutes about 30 - 40% of all preterm births, and preeclampsia/eclampsia and severe intrauterine growth restriction are the common causes [10]. Spontaneous preterm birth can result from multiple causes, chiefly, infection or inflammation, cervical factors, haemorrhage, stress, genetics, and socio - demographic factors.

Preeclampsia/eclampsia and IUGR were more significantly associated in the medically indicated group as compared to the spontaneous group. A Chinese study too revealed hypertensive disorder as the most common indication for early pregnancy termination in the iatrogenic group (72.8%), followed by fetal distress and placental abruption [23].

In the present study, a history of prior preterm birth was not significantly associated with the spontaneous preterm birth group, a finding is contradictory to the preterm Screening and Metabolomics in Brazil and Auckland (SAMBA) study [24]. The rates of CS were significantly higher in the iatrogenic preterm birth group (9.52%) in comparison to spontaneous preterm labour (6.19%). This indicated that vaginal delivery was not preferred for most medically indicated preterm deliveries, which included hypertensive disorders and IUGR. Studies showed a higher risk of almost all adverse neonatal outcomes in medically indicated preterm birth compared to spontaneous preterm birth [24]. In contrast, we did not get any significant difference in the adverse neonatal outcomes between the two groups except for low birth weight, which was more frequent in the iatrogenic preterm birth group. More studies in the future can provide conclusive evidence regarding adverse perinatal outcomes in each subtype.

The limitations of our study included the retrospective study design. Also study did not included a control of term births for comparative analysis. However, we compared the two subtypes of preterm birth as the iatrogenic variety is on the rise due to recent advances in the management of high - risk factors. The first wave of the COVID - 19 pandemic occurred during the data collection of the study period, but it did not affect our research as none of the women or their neonates was found to be positive during the said period in our facility. Although larger multicentric prospective longitudinal studies can better define the association of maternal factors and perinatal outcomes with preterm birth, they are difficult to conduct in resource constraint settings. Further research is needed to analyze the long - term consequences on infant health and childhood neurodevelopment, explore the biochemical mechanism and

genetics of preterm birth, and study the effects of screening and preventive strategies.

5. Conclusion

In conclusion, preterm birth is still a public concern in the study area. Preeclampsia, IUGR, anemia and premature rupture of fetal membranes were significantly associated with preterm birth. Early diagnosis of high risk factors at primary health centre level and timely referring patients to higher centre for further critical management will be helpful to reduce perinatal morbidity and mortality. At higher centre patient should receive antibiotics and steroids timely and proper treatment with well NICU care facility will help to reduce perinatal mortality. Therefore, the concerned administrative body should implement health education programs and improve the quality of health care provided to pregnant mothers to control these risk factors and, consequently, promote public health in the study area

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