Original Research Article

A retrospective analytical study of the epidemiology and causes of preterm birth

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ABSTRACT

Background: Preterm birth is the leading cause of perinatal morbidity and mortality. The incidence of preterm birth in India is 7-9%, and the rates are constantly rising. The main cited reasons for this trend are increasing indicated preterm births and rising rates of artificially conceived pregnancies. Major causes for indicated preterm births are hypertensive disorders of pregnancy, foetal growth restriction, antepartum haemorrhage and PPROM. Risk factors for spontaneous preterm birth include obstetrical complications like multifetal gestation, malpresentations and infections, poor antenatal care, having history of previous preterm delivery, and history of bleeding in the index pregnancy.
Methods: This is a retrospective analytical study, done in the department of Obstetrics and Gynecology over a period of two years (January 2015-December 2016). All singleton preterm live births were included in the study. The records of all the included patients were studied from the medical records department of the hospital, after obtaining permission for the same. The results were analysed and obtained by percentage method.
Results: A total of 2564 pregnancies were analysed in present study. The number of preterm deliveries was 436 in two years. Out of 2564, the number of live births was 2365, making an incidence of 18.4%. Maximum preterm deliveries were observed in the teenage group (27%) and elderly gravidas (23.9%), both the groups falling into high risk categories for preterm birth. Multiparity was an independent risk factor observed in our study and was found to be associated with 47.5% cases. Level of antenatal care received was also directly related to the number of preterm deliveries. As high as 58.4% of the females landed into preterm birth, who never sought antenatal care, the commonest risk factor for preterm birth was PPROM (26.6%) followed by hypertensive disorders of pregnancy (18.6%). We observed a labor induction rate of 23.4% and Caesarean delivery was performed in 146 (33.5%) cases, thus indicating a high induction and caesarean rates in such pregnancies.
Conclusions: Preterm birth continues to challenge obstetricians despite much efforts being executed at all levels. Many of the risk factors are identifiable and can be addressed with a specialised antenatal care program. Screening of genitourinary infections and initiation of treatment can cut down the rates. Early referral and NICU equipped institutional delivery should be promoted to prevent neonatal morbidity and mortality.

Keywords: Indicated preterm deliveries, Neonatal morbidity, Neonatal mortality, Preterm birth

INTRODUCTION

Complications of preterm birth puts a humongous burden on the limited resources on a developing nation as ours. Around 15 million of babies are born prematurely, which is responsible for >50% of neonatal death.[1] Scenario is no different in India which experiences around 3.1 million preterm births annually and approximately one million are dying each year.[2] Gestational age at birth and

availability of intensive neonatal care facilities bears a direct relationship with adverse outcomes.

Not only a birth that has occurred prematurely, burdens health care facilities, but also leaves a long term negative impact on human potential because it associates with cerebral palsy and learning impairment.

WHO defines the birth prior to 37 completed weeks as preterm birth. Preterm birth can be the final result of a multitude of factors. It has traditionally been divided into spontaneous and indicated or provider initiated preterm labor, the latter worrying us more than ever. For prognostication it has been further divided into extremely preterm (<28 weeks), very preterm (28-<32 weeks), moderate preterm (32-<34 weeks) and late preterm (34-<37 weeks). Gestational age at birth correlates directly with the neonatal outcome. Setting the lower limit of gestational age and reporting all births including still births before 37 completed weeks, will give a true insight into the gross burden afflicted by preterm birth.

In some of the cases, the reason for preterm is clear like adolescent pregnancy, infections, stress, multifetal gestation, congenital anomalies and APH. Rising trend of artificially conceived pregnancy, increasing maternal age, substance abuse, medical disorders, domestic violence are the reasons that are responsible for an abnormal increase in preterm births and burdening health care facilities. Continuous strategies at all levels are being implemented to bring down the rates of preterm births. The overall decline in the rates of preterm deliveries is still meagre, so introspection and retrospection become mandatory, because, the etiology of around 50% of preterm births yet remains unidentified. Understanding the causative aetiology of preterm birth becomes the core strategy to estimate the risks and formulate preventive protocols.

Most of the reasons are avoidable to some extent and WHO has developed new guidelines with recommendations for reducing preterm births and improving outcomes of premature babies. The guidelines include simple and inexpensive key interventions as antenatal corticosteroids, antibiotics for PPROM, Kangaroo mother care and magnesium sulfate for improving neurological outcome.[1]

Majority, 85%, of preterm births occur in Asia and Africa. In the last 10 years, preterm rates have risen in the United States from 10.6% in 1990 to 12.6% in 2000.[3] India shares the largest burden of preterm births in Asian region and contributes to two thirds of such births in the region. So, a complex analysis of region specific risk factors is imperative to lay out an empowered action plan, especially for a tertiary care setting as of ours. Newer insights leading to new discoveries for prevention and management of preterm births are the need of the hour. We describe the risk factors and burden of preterm births in a referral centre in North India in the current study.

Objective of present study were to investigate the risk factors of preterm birth, to study the trend of indicated preterm deliveries at our centre and to evaluate the neonatal outcome in terms of NICU admissions and early neonatal deaths.

METHODS

We analysed retrospectively collected data of all live preterm births, over a period of two years (January 2015-December 2016). The study was conducted in the department of Obstetrics and Gynecology, SMS and R, Greater Noida, which is a tertiary referral centre, catering to majority of the high risk cases in the area.

Inclusion criteria

All reported singleton live births prior to 37 weeks of gestation, either by last menstrual date or first trimester scan in case the dates were not known, were included.

Exclusion criteria

Pregnancies terminating before 28 weeks, multifetal gestation, known congenital anomaly in the fetus and Intra Uterine Fetal Demise were excluded from the study. The patients, for which complete records were not available, were also excluded, to minimise the bias.

Preterm births were further categorised as very preterm (28-31/6 weeks), moderate preterm (32-33/6 weeks), and late preterm (34-36/6weeks). All singleton deliveries before 37 completed weeks were included in the study. The demographic profile, level of antenatal care sought, mode of preterm labour, complications and neonatal outcome were studied. Hypertensive disorder of pregnancy was defined as BP >140/90, with or without proteinuria. Fetal growth restriction was defined as birth weight <5th percentile for that gestational age. Diabetes in pregnancy was defined according to DIPSI guidelines. Anaemia in pregnancy was defined according to CDC guidelines. Spontaneous labor was defined as cervical dilatation of >3 centimetres and effacement of >80%, along with tocographic documentation of uterine contractions. Early neonatal death was defined as death occurring within first 7 days of life. NICU admission was defined as stay in nursery for >24 hours.

The data was collected from Medical Records Department of the hospital. The demographic profile, level of education, place of admission (elective or emergency) was studied. The details of investigations done, and ultrasonography were also obtained. Incomplete documentation or records were excluded from the analysis.

We estimated the incidence by dividing all live preterm births by all live births in the study period; other results were calculated by percentage method.

RESULTS

A total of 2564 pregnancies were analysed in our study. The number of preterm deliveries was 436 in two years. Out of 2564, the number of live births was 2365, making an incidence of 18.4%.

Table 1: Demographic profile.

Characteristics	Preterm births, n	Percentage
Age at the time of delivery		
< 20	118	27.0
20-25	87	19.9
26-30	79	18.1
31-35	48	11.1
>35	104	23.9
Level of education		
Nil	56	12.8
Primary	206	47.2
Graduation or more	174	40.0
Birth order		
First	54	12.4
Second	72	16.5
Third	207	47.5
More than three	103	23.6
Period of gestation		
28-31/6 weeks	90	20.6
32-33/6 weeks	115	26.4
34-36/6 weeks	231	53.0

Maximum preterm deliveries were observed in the teenage group (27%) and elderly gravidas (23.9%), both the groups falling into high risk categories for preterm birth. Multiparity was an independent risk factor observed in our study and was found to be associated with 47.5% cases. Level of antenatal care received was also directly related to the number of preterm deliveries. As high as 58.4% of the females landed into preterm birth, who never sought antenatal care as opposed to the 14.8% of the cases who had at least two visits with the health care provider (Table 1).

Table 2: Association of level of ANC care and risk of preterm birth.

Characteristics	Preterm births, n	Percentage
ANC visits		
No visits	255	58.4
At least one	117	26.8
>2 visits	64	14.8
Iron supplementation		
No iron taken	201	46.1
< 60 days	173	39.7
>60-100 days	62	14.2
TT immunisation		
Yes	427	97.9
No	9	02.1

As depicted in our results, risk decreased proportionately in females according to the duration of IFA supplementation. Only 14.2 % faced preterm birth when they took iron for >60-100 days in contrast to 54.6% of females who were not taking IFA supplementation (Table 2).

Table 3: Risk factors and mode of delivery.

Obstetric history	Preterm births, n	%
Medical disorder		
HDP	81	18.6
FGR	54	12.4
Anaemia	55	12.6
Others	22	05.0
Obstetric complications		
PPROM	116	26.6
Malpresentation	41	09.4
APH	39	08.9
H/O abortion or preterm delivery in previous pregnancy	28	06.5
Mode of labor		
Spontaneous	252	57.7
Caesarean	82	18.9
Indicated induction	102	23.4
Urogenital infections		
High vaginal swab	184	42.3
UTI	173	39.6
Sterile	79	18.1
Mode of delivery		
Vaginal	329	75.4
Caesarean	103	23.7
Assisted	4	00.9

At our centre, the commonest risk factor for preterm birth was PPROM (26.6%). Out of 116 cases of PPROM, 42.3% cases turned out to be high vaginal swab positive, 39.6% had UTI and rest, (18.1%) were culture negative. The commonest organisms in culture specimen were, *E. coli*, *Staphylococcus aureus*, *Proteus*, *Klebsiella*, *Candida* and others (Table 3).

Other risk factors were hypertensive disorders of pregnancy (18.6%), foetal growth restriction (12.4%). Anaemia was found to be associated with 12.6% of the case (Table 3).

Maximum patients delivered at a period of gestation between 34-36.6 weeks i.e late preterm group (53%), followed by moderate preterm 26.4%. But early preterm deliveries also had a high proportion of 20.6%, and most of these cases were due to severe preeclampsia or eclampsia (80.6%) (Table 1).

We observed a labor induction rate of 23.4% and Caesarean delivery was performed in 146 (33.5%) cases, thus indicating a high induction and caesarean rates in such pregnancies (Table 3).

Neonatal outcome

As per our observation and analysis, 48.9% neonates were admitted to NICU for >24 hours, carrying a high economic burden, although the fact was not directly analysed in our study. Though the observed rate of still birth was 4.2%, the number of early neonatal death was quite high, i.e., 17.4%. Nonetheless, 190 (29.6%) cases had to be admitted to intensive care for observation for around <24 hours. Neonatal deaths were directly related to the birth weight (Table 4).

Table 4: Neonatal outcome.

Neonatal outcome	Number, n	Percentage
Birth weight (kg)		
<1.5	85	19.5
1.5-2	143	32.8
>2	208	47.7
Sex		
Male	193	44.3
Female	243	55.7
NICU admission		
<24 hours	129	29.6
>24 hours	213	48.9
Still birth	18	4.13
Early neonatal death	76	17.4

DISCUSSION

WHO has reported an incidence of around 9-12% for preterm birth, which leads to an estimated birth of 15 million of such babies.[1] India has an incidence of around 11% and she shares two thirds of the global burden of preterm births.[2] The incidence of preterm rates is perceived to be decreasing on one hand due to better antenatal care and increased institutional delivery rates in India. But on the other hand, owing to increase in artificially conceived pregnancies, late procreation and better obstetric interventions, the numbers are constantly rising. In the current study, we found an incidence of 18.4% at our centre, which is quite high. The increased incidence is due to the fact that ours is a tertiary care centre and caters to the high risk cases sent from the adjoining remote areas.

Births occurring due to spontaneous preterm labor and PPROM, are parts of a single syndrome and may result due to a multitude of factors like infection, inflammation, over distention of the uterus etc. As observed by Goldenberg RL et al, premature ruptured membrane was the major contributory factor for all cases of preterm labor and births.[4] Present study also revealed PPROM as the major associated factor, claiming 116 of the total cases. An exhaustive work up plan should be a routine part of antenatal care to identify cause and prevent such cases. At our centre, we routinely do a high vaginal swab and urine specimen for culture and sensitivity in cases presenting with PPROM, as intrauterine and genito-

urinary infections can cause preterm prelabor rupture of membranes. We observed, high vaginal swab was culture positive in 42.3% of the cases and UTI was detected in 39.6% cases. In a similar clinical study by Giraldo PC et al, UTI was responsible for 36.7% cases of preterm labor, Bacterial Vaginosis and Candidiasis were responsible for 28.9% of the cases.[5] However in present study, most commonly isolated organisms were *E. Coli*, Staph aureus, and Candida species. Screening for genital infections and UTI can be done in patients with high risk of preterm birth.

Our centre has a high proportion of patients with hypertensive disorders of pregnancy. This was associated with 18.6% cases of preterm birth in present study. A study Meis PJ concluded that pregnancies complicated with severe preeclampsia and eclampsia tend to have poor outcomes and the rate of indicated preterm is higher in such cases.[6] In a large study by Brown et al, for identifying the causes of medically indicated preterm deliveries, it was observed that the rates of medically indicated late preterm and early term delivery was 2.7% and 13.3% respectively.[7] At our centre the rate of indicated preterm deliveries was 23.3% and around 15% induction was in pregnancies with hypertensive disorders. It is similar to the results obtained by study done by Das A, who reported the rate of indicated preterm birth to be 22.1%, in all live births.[8] Early detection of hypertension and proteinuria and timely interventions to control the disease can bring about a reduction in rates of provider initiated induction and overall rates of preterm births in this group of patients.

Extremes of maternal age have been associated with poor fetomaternal outcomes, including higher rates of preterm births. Cavazos PA in their study, using age as an independent variable, concluded that the antenatal and labor delivery complications, low birth weight and preterm birth are higher in teenage and elderly gravida group.[9] Present study also depicted the same observation, as we had 23.9% preterm in elderly mothers and 27% in teenage group, higher than other reproductive age group. Females who sought antenatal care experienced less preterm rates (14.8%) as compared to the patients who never sought antenatal care (58.4%). A prospective cohort study by Beeckman K et al also concluded that timely and accurate antenatal screening is believed to be an important factor in preventing preterm birth.[10] Multiparity was an independent risk factor for higher rates of preterm birth in our study, as 47.5% multiparous females had preterm deliveries. Sabiri N in her study summarised that the risk factors for preterm birth were, low level of maternal education (p <0.004), absence of pregnancy monitoring (<0.001), multiparity (p <0.001) and maternal chronic disorders (p <0.001).[11] Thus better application of contraception programs to prevent teenage and unintended pregnancies and to maintain healthy interpregnancy interval appears to be the key intervention strategy to prevent such births.

In the current study, maximum neonates delivered in the gestational age group of late preterm (53%) and had birth weight of >2 kg (47.7%). Das A et al reported an incidence of 65% late preterm deliveries in their study.[8] Nonetheless, keeping in mind the grave consequences associated even with late preterm deliveries, ACOG has issued guidelines to prevent late preterm and even early term deliveries also.[12] A high neonatal morbidity and mortality is associated with preterm birth. Prematurity is the second most leading cause of under-five mortality. At our centre the rate of neonatal death was 17.4%. Singh U et al reported a neonatal mortality rate of 12.7% and Das A reported an incidence of 20.48%.[13,9] The rates of neonatal death remain high irrespective of the type of intensive care facilities. Prolonged hospital stays and NICU admission add to the cost and impose a burden on existing health care facilities. In the present study, 48.9% of the preterm neonates had an NICU stay of longer than 24 hours. Although the cost factor was not evaluated in this study, it remains high. Now the focus for perinatal interventions should be to develop strategies to reduce long term morbidity, specially the prevention of brain injury. WHO has recommended magnesium sulphate administration for neuroprotection in preterm birth. Further studies are warranted to develop key intervention strategies to prevent both short and long term effects of preterm births.[1]

CONCLUSION

Preterm birth continues to challenge obstetricians and burden health care facilities. The risk factors of preterm birth can be identified in antenatal period, to a large extent. Specialised antenatal care for the patients, who are thought to be at risk of preterm birth, can bring down the incidence to some extent. Adolescent health education, counselling for contraception, to reduce unintended pregnancies and birth spacing can yield miraculous results in this direction. Screening for genital infections, for urinary tract infections and treating them can also achieve the target for diminishing the rates. Provider initiated preterm birth can be minimised by early detection of risk factors and prompt intervention to minimise their effects. Above all, early booking and promotion for institutional deliveries with NICU set up, should be promoted. Following the directions from WHO, antenatal steroids, KMC, magnesium sulphate for neuroprotection should be strongly recommended.

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