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To find incidence and factors associated with preterm birth at tertiary care teaching hospital

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Abstract
Introduction: Preterm birth is a global problem with prevalence ranging from 6 – 12% all over the world. Various risk factors associated with preterm births have been widely studied in developed countries and identified certain obstetric and non-obstetric factors that are correlated with occurrence of preterm births. The present study aimed to find incidence of preterm delivery in our institute and to identify the various factors associated with preterm birth.
Material and Method: 100 consecutive women, who were willing to participate, with singleton live pregnancy and gestational age between 24 – 40 weeks admitted in labour room for delivery were included and monitored till delivery. Data were analyzed.
Results: The incidence of preterm in our center was 19%. Prior history of preterm birth (OR 15) and abortions (OR 3.7), APH (OR 9.4118), Tobaco/alcohol use (OR 7.4063), UTI (OR 5.133) and illiteracy (OR 4.2115) were strongly associated with an increased risk of preterm labor. Other risk factors identified were maternal age >35 years (OR 2.1), interpregnancy interval <3 years (OR 3), inadequate ANC visit (OR 2.9951), unplanned pregnancy (OR 2.4136), PROM ((OR 2.9545) and anemia (OR 2.5714).
Conclusion: Preterm delivery is still a challenging maternal health problem. Most of the factors found to be associated with preterm birth, are modifiable. Early identification of these factors and appropriate and innovative preventive intervention, customized individual's need may prevent preterm births and improve foetal outcomes.

Keywords: incidence, Various risk, Obstetric, pregnancy

1. Introduction

Preterm birth is a significant causative factor of infant and child morbidity and mortality and the second most leading cause of under –five death in the world [1, 2]. Comparing with children born at term, preterm infants are at higher risk of several disabilities [3]. The morbidity associated with preterm birth often extends to later life resulting in physical, psychological, and economic costs [4, 5]. Preterm birth (PTB) is a global problem with prevalence ranging from 6 – 8% in Europe, Australia and Canada[6] to 9 – 12% in Asia, Africa and United States [4]. Over 80% of the world's 1.1 million neonatal deaths annually due to complications related to preterm birth and 50% of long term morbidity in the surviving infants [7, 8].

Preterm birth is defined as gestational age (GA) at birth of less than 37 completed gestational weeks. It can be sub grouped as extreme (less than 28 weeks), severe (between 28 and 32 weeks), and moderate or "near-term" (32 to 36 weeks). Recent decades have seen a great increase in the survival of preterm infants, linked to technological advances in neonatal intensive care. The rate of preterm birth has also increased worldwide, largely driven by increases in late preterm birth, often associated with obstetric interventions designed to reduce maternal and fetal complications [9].

The reasons for the occurrence of preterm births are not understood, although spontaneous idiopathic preterm labour is considered the principle cause. The risk factors associated with late preterm births have been widely studied in developed countries and identified certain obstetric and non-obstetric factors that are correlated with occurrence of preterm births [10]. Non-obstetric risk factors include: poor socio-economic status, maternal malnutrition, illiteracy, maternal age <20 and >35 years, heavy manual work, cigarette smoking, long distance travel and trauma. Obstetric risk factors associated with PTB include: cervical incompetence, multiple gestations, short birth intervals, abortion, pre-labour premature rupture of membrane (PPROM) and previous PTB. A number of other medical conditions have also been associated with PTB including Diabetes mellitus, urinary and genital tract infections and psychological stress [11]. There have been a number of previous studies attempting to identify risk factors associated with preterm birth in different countries. The occurrence of preterm births and associated risk factors has not been well studied in developing countries like India and in particular Rajasthan state, and there may be difference in the risk factors for preterm births in developed and underdeveloped regions. Department of Obstetrics and Gynaecology at S.M.S. Medical College, Jaipur, is the largest referral hospital of Rajasthan which caters many high risk pregnancies, some of which result in preterm birth. The present study aimed to find incidence of preterm delivery in our institute and to identify the various factors associated with preterm birth.

Material and Method

This was a hospital based descriptive cross - sectional study done in the department of Obstetrics & Gynaecology, SMS Medical College & attached group of Hospitals, Jaipur.

Sample size was calculated at 95% confidence level assuming 18.3% prevalence of preterm birth as per result of seed article. At the absolute error of 10% minimum 58 pregnant women required as sample size of present study which was further enhanced and rounded off 100 cases as final sample size for study purpose (considering 30% drop outs/lost to follow up/attrition). So, 100 consecutive women, who were willing to participate, with singleton live pregnancy and gestational age between 24 – 40 weeks admitted in labour room for delivery were included. Women with congenital malformation of foetus were excluded. Women were divided in to two groups:

Group A: Women with term Pregnancy

Group B: Women with preterm pregnancy

On admission to labour room detailed clinical history regarding sociodemographic profile, medical disordes, past obstetric outcome was taken. Information regarding antenatal clinic (ANC) attendance and number of visits, Human Immune Deficiency (HIV) status, anemia, HDP, APH, UTI was obtained. Maternal height (centimeter) and maternal weight (kg) were measured and maternal BMI (kg/m^2) was calculated. Vitals were recorded. All routine investigations and USG were done. General, systemic, abdominal, speculum and vaginal examination were done and patients were closely monitored in labour room for progress of labour. Mode of delivery and details of neonate at birth were recorded.

Data entry was done using Microsoft excel sheet. Statistical analysis was done using computer software. Odd ratio was calculated to find association of various factors with preterm birth. In analysis a p-value <0.05 was considered statistically significant.

Results

In our study out of 100 cases, 81 were term pregnancy (Group A) and 19 were preterm pregnancy (Group B). (Fig 1)So incidence of preterm birth was 19%. Table 1 shows distribution of the women according to socio-demographic characteristics. The mean age of women in Group A was 25.1±3.6 years with a range of 20-40 years while in Group B mean age was 25.7±3.4 with a range of 20-40 years. Majority of women (51.85%) in Group A belongs to urban areas while in Group B majority of women (52.63%) were from rural areas. Majority of women in both groups were booked, Hindu, literate and had normal BMI.

Table 2 shows neonatal outcome. The difference in weight of the baby in between two groups was statistically significant (p value 0.00001). In Group A, 62.96% were male and 37.03% were female and in Group B, 56.3% were male and 47.4% were female. APGAR score of 7 or more was seen in 92.6% babies of Group A and 63.2% babies of Group B. The difference in APGAR score of the babies between the two groups was statistically significant (p value 0.002). 12.3% of term babies needed NICU admission while 36.8% of preterm babies needed NICU admission. The difference according to NICU admission between two groups was statistically significant (p value 0.01). RDS was the main reason for NICU admission in both the groups followed by septicemia. Preterm babies had statistically significant higher mortality than term babies (p value 0.014)

Table 3 shows univariate analysis of socio-demographic characteristics of mother and risk of preterm births. Tobaco/alcohol use, illiteracy and low socio-economic status were significantly associated with risk of preterm delivery with a Odd Ratio (OR) of 7.4063; 95% CI (1.1436-47.9661), 4.2115; 95% CI (1.2535-14.1496) and 2.9368; 95% CI (1.0413-8.2832) respectively. Maternal age >35 years was associated with preterm delivery with an odd ratio of 2.1 compared to the maternal age <35 years.

Association of previous pregnancy characteristics with risk of preterm delivery is shown in Table 4. Women with previous history of preterm delivery and abortion had increased risk of preterm delivery with an odd of 15 and 3.7 respectively compared to women with no history of prior preterm or abortion. Parity ≥3 was protective for preterm birth in our study. Women with birth interval of < 3 years were significantly more likely (3 times) to deliver preterm birth.

Table 5 shows association of antenatal characters with risk of preterm pregnancy. Inadequate ANC visit, unplanned pregnancy and anemia were associated with increased risk of preterm pregnancy with an Odd Ratio 2.9951;95% CI (1.0343-8.6731), 2.4136; 95% CI (0.8660-6.7274) and 2.5714; 95% CI (0.9193-7.1925) respectively.

Table 6 shows univariate analysis of obstetric characteristics and risk of preterm delivery.APH, PROM and UTI were strongly associated with preterm delivery with an Odd Ratio of 9.4118; 95% CI (0.8066-109.8228), 2.9545; 95% CI (1.0212-8.5482) and 5.133; 95% CI (1.1543-22.8283) respectively. Hypertensive disorder of pregnancy was associated with preterm delivery with an odd of 1.7 compared to normotensive women. Woman who delivered male child was one and half times more likely to deliver preterm than who delivered female child.

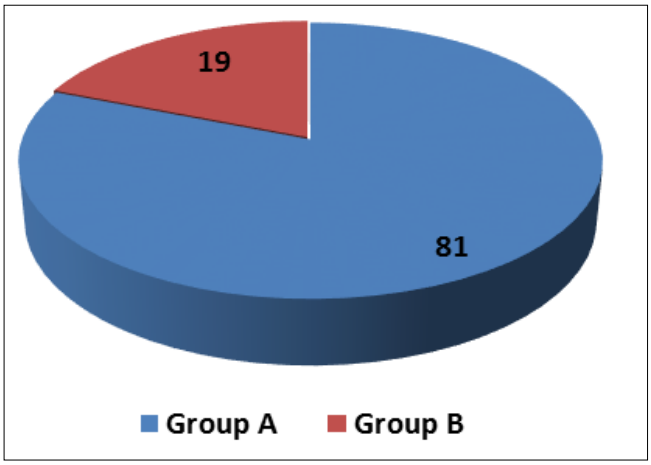

Fig 1: Distribution of the women according to Gestational age

Table 1: Socio-demographic profile of the women

Variables	Group A (n = 81)		Group B (n = 19)		P value
	No.	%	No.	%	
Age					
<25	42	51.9	9	47.4	
≥25	39	48.1	10	52.6	0.8 Not significant
Mean Age					
Residence	25.05	± 3.57	25.74	± 3.41	
Urban	42	51.9	9	47.4	P = 0.8 Not significant
Rural	39	48.1	10	52.6	
Religion					
Hindu	69	85.2	16	84.2	P = 0.9 Not significant
Muslim	12	14.8	3	15.8	
Literacy status					
Literate	73	90.1	13	68.4	P = 0.01 Significant
Illiterate	8	9.9	6	31.6	
Socio-economic status					
Low	19	23.5	9	47.4	
Middle	55	67.9	7	36.8	P = 0.04 Significant
upper	7	8.6	3	15.8	
ANC Booking Status					
Booked	43	53.1	11	57.9	P = 0.7 Not significant
Unbooked	38	46.9	8	42.1	
BMI (Kg/m2)					
18.5-24.9	53	65.4	14	73.7	
25-29.9	13	16.1	1	5.3	P = 0.4 Not significant
>29.9	15	18.5	4	21.0	
Gravida					
Gravida 1	37	45.7	3	15.8	P = 0.07 Not significant
Gravida ≥2	44	54.3	16	84.2	

Table 2: Distribution according to Neonatal outcome

Neonatal outcome	Group A		Group B		Chi-Square P value
	No	%	No	%	
Birth weight (Kg)					
<1.5	1	1.2	3	15.8	X^2 = 39.9945
1.5 – 2.5	15	18.5	15	78.9	P - -<0.00001
>2.5	65	80.3	1	5.3	Significant
Sex of the baby					
Male	30	37.0	10	52.6	X^2 = 1.5595
Female	51	63.0	9	47.4	P- 0.2 NS
APGAR score					
<7	6	7.4	7	36.8	X^2 = 11.8122
≥ 7	75	92.6	12	63.2	p- 0.002 sig
NICU admission					
Yes	10	12.3	7	36.8	X^2 = 6.5451
No	71	87.7	12	63.2	p- 0.01 sig
Perinatal mortality					
Yes	3	3.7	3	15.8	X^2 = 3.9857
No	78	96.3	16	84.2	p- 0.014 sig

Table 3: Association of socio-demographic characteristics of mother with preterm birth

Socio-demographic Factors	Preterm (n=19) No	Term (n=81) No	OR (95% CI)	P value
Maternal Age ≥35 years	1	2	2.1944 (0.1885-25.5441)	0.5
Pre pregnancy weight <45Kg	4	12	1.533 (0.4341-5.4158)	0.5
Height <145 cm	3	11	1.1932(0.2980-4.7778)	0.8
BMI >29.9 Kg/m^2	4	15	1.1733 (0.3405-4.0435)	0.8
Low S E status	9	19	2.9368 (1.0413-8.2832)	0.04
Illiteracy	6	8	4.2115 (1.2535-14.1496)	0.02
Tobaco/alcohol use	3	2	7.4063 (1.1436-47.9661)	0.03

Table 4: Association of previous pregnancy characteristics of mother with preterm birth

Previous pregnancy characteristics	Preterm (n=19) No	Term (n=81) No	OR (95% CI)	P value
Parity ≥3	1	5	0.8444 (0.0929-7.6799)	0.8
Prior abortion	5	7	3.7755 (1.0477-13.6059)	0.04
Prior preterm	3	1	15.000 (1.4653-153.5529)	0.02
Previous SB	1	5	0.8444 (0.0929-7.6799)	0.8
Interpregnancy interval < 3yrs	6	17	2.9368 (1.0413-8.2832)	0.04

Table 5: Association of antenatal characteristics with preterm birth

Antenatal characteristics	Preterm No	Term No	OR (95% CI)	P value
Unplanned pregnancy	9	22	2.4136 (0.8660-6.7274)	0.09
Gravida ≥3	6	21	1.3187 (0.4445-3.9125)	0.6
Inadequate ANC	13	34	2.9951 (1.0343-8.6731)	0.04
Haemoglobin <10g/dl	9	21	2.5714 (0.9193-7.1925)	0.07

Table 6: Association of Obstetric characteristics with preterm birth

Obstetric characteristics	Preterm No	Term No	OR (95% CI)	P value
HDP	3	8	1.7109 (0.4082-7.1709)	0.4
APH	2	1	9.4118 (0.8066-109.8228)	0.07
PROM	8	16	2.9545(1.0212-8.5482)	0.04
UTI	4	4	5.133 (1.1543-22.8283)	0.03
Delivery by LSCS	9	32	1.3781 (0.5046-3.7638)	0.5
Male sex of the baby	10	38	1.2573 (0.4622-3.4202)	0.6

Discussion

Occurrence of preterm birth in our study (19%) is appreciably higher than reported by Theresia B. Temu *et al* and global estimates of 14% and 11% respectively [12]. The number of preterm birth now a day continues to rise and there is no single explanation for this increasing rate. Various factors have been implicated for this increase such as demographic changes, increasing use of infertility treatment, increasing maternal age, increasing obesity and increasing frequency of multiple gestation.

Mean age of the women in our study (25.18 ± 3.53 years) was more than that observed by Ahankari A. *et al* [13]. but lower than that observed by Theresia B Temu *et al* [12]. Women residing in urban areas during pregnancy have been shown to have a less likelihood of having preterm delivery [2]. Similarly, in the present study women who were living in urban areas during pregnancy have a slightly less chance to have preterm delivery. Our results were consistent with the results observed by Chang HH *et al* [2]. and Theresia B Temu *et al* [12]. This may probably be due to easy accessibility to health facilities in urban areas as compared to rural areas which may play an important role in prevention of preterm delivery. Also women living in rural areas are more likely to be involved in hard physical works like farming which increases the risk of preterm delivery particularly in women having other risk factors for preterm delivery. Our results were in contrast with the results observed by H Xu *et al* [14]. They observed that the incidence of preterm birth in urban areas was about 1.5 times that of rural areas. Difference in the literacy status of both the groups was statistically significant (p value 0.01) showing that literacy is dependent variable. Percentage of illiterate women in our study was much higher than that observed by Theresia B Temu *et al* [12]. This difference can be attributed to rural dwelling and low literacy rate in our state. In our study 21.05% women with preterm pregnancy group had BMI more than 29.9 Km/m [2]. Our results are consistent with results of W Yuan *et al* [15]. They observed that 20.5% women with preterm pregnancy group had BMI more than 29.9 Km/m^2.

We observed that preterm births were higher in women with multigravida (15.78% in primigravida v/s 84.19% in multigravida). Our results were comparable with that observed by Alijahan *et al* [16]. but in contrast with the observation made by Ahankari A *et al* [13]. who observed that preterm delivery was more in primigravida. In our study female babies were less likely to be born premature compare to male babies. Our findings were similar to that observed in previous studies [18]. who found that female sex was a preventive factor for preterm delivery. In a study done by Khalil MM *et al* (2013) [18]. they observed that male sex infant were two times more likely to be born preterm as compared to female counterparts. Admission to NICU in our study (36.8% for preterm and 12.3% for term babies) was comparable with that observed by Melamed *et al* [19]. Perinatal deaths in our study were more in both the groups as compare to that observed by Melamed *et al* [19]. This may be due to better neonatal intensive care available there and difference in gestational age of preterm babies.

We evaluated various risk factors associated with preterm births. Maternal age >35 years was associated with preterm delivery with an odd ratio (OR) of 2.1 compared to the maternal age <35 years. Observation of our study were similar to L Lu *et al* [10]. study they observed a odd ratio of 1.872 for preterm birth of mother >35 years. In our study pre pregnancy weight and height were not found to have a statistically significant association with occurrence of spontaneous preterm labor. However pre pregnancy weight <45 Kg has 1.5 times increase risk of preterm delivery and height <145 cm had an odd ratio of 1.19 for preterm delivery. Our results were similar to various studies done in the past [16, 18, 20]. Low socioeconomic status in our study was strongly associated with preterm birth (p value 0.04) with an OR of 2.9. Meis *et al* [21]. in their study observed that low socioeconomic class was strongly associated with spontaneous preterm birth. It was postulated that low socioeconomic class is associated with factors such as younger maternal age, low maternal weight, nutritional

deficiency, insufficient health care, low education, greater likelihood of smoking and alcohol consumption, domestic violence which in turn are more directly associated with preterm birth [21, 22]. In present study also women who were illiterate had 4.2 times odd of preterm delivery compared to mothers who were literate. This is due to limited access to services, information and knowledge about different health prevention measures. Our results were consistent with that of Theresia B Temu *et al* [12]. who observed that women who did not attend school had 20% odd of preterm delivery compared to mothers who reached primary education level or higher. Alcohol use was significantly associated with preterm delivery with an odd of 7.4 compared to women who were nonalcoholic. Our results were consistent with the previous studies done by Arash M *et al* [24]. and in contrast with studies done by Purvi K Patel [20]. and Theresia B Temu *et al* [12]. Who reported that alcohol use was not significantly associated with preterm delivery.

One of the strongest clinical risk factors for preterm birth is a prior preterm birth. Women with previous history of preterm delivery and abortion had increased risk of preterm delivery with an odd of 15 and 3.7 respectively compared to women with no history of prior preterm or abortion. This is in line with the findings of previous studies done by various authors where women with previous preterm delivery were at increase risk o preterm birth in their next pregnancy. [1,12,19]

The observed increased odds of preterm delivery associated with abortion in our study was higher than that reported with previous studies.[1,16,12] This may be due to difference in the demographic profile and clinical setting between studies. Though the exact mechanism for this is not well established, it may be due to persistence of unidentified factors such as subclinical infections as well as underlying disorders such as hypertension, obesity or diabetes in some women precipitating preterm delivery.[5] Women with birth interval of < 3 years were significantly more likely (3 times) to deliver preterm birth. Our results were similar to previous studies [16, 24].

Inadequate antenatal care had approximately 3 times more risk of having preterm delivery in our study. Our results were consistent with observation of Feresu A *et al* [25]. In our study anemia was found to be a risk factor for preterm delivery with OR of 2.5. Our results were in contrast with results of Wagura *et al* [8]. where no association between preterm delivery with anemia and number of antenatal visits was found. Women with gravida 3 or more have 1.3 times more risk having preterm delivery. Our results were similar to that of Wagura *et al* [8]. They demonstrated that mothers with the parity of more than 4 were 4 times more likely to deliver preterm.

Hypertensive disorder of pregnancy was associated with preterm delivery in our study with an odd of 1.7 compared to normotensive women. Our results were consistent with previous studies [8, 16]. Hypertension decreases uteroplacental blood flow leading to IUGR and preterm delivery [16].

In our study women presented as APH (Placenta previa and abruptio placenta) were 9.4 times more likely to have preterm delivery as compared to those without APH. This is consistent with previous studies who reported high risk of preterm delivery among women with placenta previa or abruption placenta as compared to those without [1, 12, 16, 26]. In placenta previa uterine contractions cause separation of low lying placenta which can lead to heavy bleeding which require immediate delivery while in abruption placenta, separation of a normally implanted placenta from the uterine wall before term can cause vaginal bleeding, haemorrhagic shock and fetal death requiring immediate preterm delivery. We observed that PROM was a significant risk factor for preterm birth (odd ratio 2.9). Our results were similar to the observation made by L Lu *et al* [10], Alijahan *et al* [16].

Women having UTI during pregnancy had a five times more risk of delivering preterm baby. Our results were consistent with results of Wagura *et al* [8] and Alijahan *et al* [16]. Due to the physiological and morphological changes in genitourinary system during pregnancy, stasis of urine occurs with favors UTI. Like other infection, UTI stimulates production of inflammatory chemokines and cytokines such as interlukins and tumor necrosis factors. Microbial endotoxins and pro-inflammatory cytokines stimulates production of prostaglandins and matrix degradating enzymes and results in stimulation of uterine contraction, preterm rupture of membrane and preterm birth [27].

In our study, women who delivered via Caesarean section were nearly one and half times (OR 1.378) more likely to deliver preterm than those who delivered vaginally. Our observations were similar to previous studies [8, 12]. This may be explained by the fact that women who deliver by cesarean section had other pregnancy complications such as fetal distress, HDP or APH. In our study it was observed that women who delivered male child were one and half times (OR 1.5) more likely to deliver preterm than who delivered female child. Our observations were similar to the observations made by Park M *et al* [17]. and Theresia B Temu *et al* [12]. who found that female sex was a preventive factor for preterm delivery. Several mechanisms have been proposed to explain why pregnancies carrying male fetuses could have a higher risk of preterm birth. First, heavier body weight of the male fetus increases the probability of having preterm labor. Second, there is a greater susceptibility to gestational hypertension or infection which are associated with preterm birth. Third, male and female fetuses may have different sex-linked biochemical processes, including estrogen production from androgen precursors or by interleukin-1 [28].

Conclusion

The present study demonstrates that preterm delivery is still a challenging maternal health problem. Prior history of preterm birth and abortions, Infections, APH, UTI and PROM in mothers are strongly associated with an increased risk of preterm labor. Majority of these risk factors, found to be associated with preterm birth, are modifiable. Risk factors like previous preterm birth, multiple pregnancies and placental abnormalities cannot be modified hence preventive efforts should be directed towards modifying working conditions during current pregnancy. Therefore early identification of these factors during prenatal care and appropriate and innovative preventive interventions, customized individual's need may prevent preterm births and improve foetal outcome

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