Factors contributing to preterm birth in patients presenting at tertiary care hospitals in Punjab

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Abstract

Objective: To determine the various causes and factors leading to preterm birth in women presenting at tertiary care hospitals.

Method: The cross-sectional, prospective study was conducted from June 19, 2021, to January 19, 2022, at the Central Park Teaching Hospital, Lahore, Pakistan, in collaboration with other tertiary care teaching hospitals in Lahore, and comprised pregnant women aged 15-45 years with preterm birth. Demographic and obstetric data was collected. Depending on the factors contributing to preterm birth, the subjects were categorised as spontaneous labour group A, preterm prelabour rupture of membrane group B, and iatrogenic preterm birth group C. Data was analysed using SPSS 25.

Results: Of the 1,300 recorded births, 200 (15.38%) were preterm. Group A had 86 (43%) women with mean age 28.55±4.68 years, group B had 43 (21.5%) women with mean age 27.14±3.25 years, and group C had 71 (35.5%) women with mean age 28.28±3.74 years (p>0.05). There was significant difference among the groups with respect to body mass index (p=0.001) and parity (p=0.021). Vaginal and urinary tract infections were significantly higher in group A compared to the other groups (p<0.05). In group C, pre-eclampsia was the main reason for preterm birth 45 (63.38%).

Conclusion: Medically indicated preterm birth rate was found to be high, and pre-eclampsia was noted as the main cause in iatrogenic preterm birth.

Keywords: Preterm, Labour, Reproductive age, PPROM, Pre-eclampsia, Obstetrical complications. (JPMA 74: 504; 2024)

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Introduction

Preterm birth is a health issue seriously affecting neonates and their families, and has a global preterm birth rate of 11%. It is a leading cause of perinatal morbidity and mortality worldwide, being the second leading cause of neonatal death.1,2 Those who survive suffer lifelong disability in terms of learning abilities due to hearing and visual impairments.3 Preterm birth is not only associated with increased burden of perinatal morbidity, but it affects the whole family as it has been reported that mothers of preterm babies find difficulties in handling the newborn, and suffer from posttraumatic stress disorders (PTSD).3,4 The major burden of preterm births is shared by countries in Asia and sub-Saharan Africa, accounting for up to 81%.4 Pakistan ranks fourth in the prevalence of preterm births in the world, with prevalence ranging 11.4-22.8%.5

In spite of much efforts done to reduce the incidence, the rate of preterm birth has shown a raising trend in many countries, and a major contributory factor to this rise is increase in the incidence of multiple pregnancy and hypertensive disorders of pregnancy.4,6 On the other hand, the rate of spontaneous preterm labour is seen to be reduced by improvements in some factors, including low parity, better antenatal care services and higher education level.6 Other contributory factors to preterm birth are preterm prelabour rupture of membrane (PPROM), spontaneous preterm labour, previous preterm births, cervical incompetence, vaginal infections, urinary tract infections (UTIs), smoking, nutritional status of mother, and maternal conditions leading to iatrogenic preterm delivery, such as pre-eclampsia, eclampsia and antepartum haemorrhage.7,9 Maternal anaemia and poor oro-dental hygiene are also contributory factors to preterm labour.10,11 The role of vitamin D deficiency has been studied in the pathogenesis of many disease processes and its deficiency is also seen to be associated with preterm labour.12

It is important to implement effective research strategies to know the magnitude and determinants of the problem to prevent preterm birth and provide care to the born-too-soon babies to reduce the survival gap between high-income and low-income countries.1

Unfortunately, despite the magnitude of the problem, data from Pakistan is insufficient. The current study was planned to fill the gap by determining the various causes and
factors leading to preterm birth in women presenting at tertiary care hospitals in an urban setting.

Patients and Methods
The cross-sectional, prospective study was conducted from June 19, 2021, to January 19, 2022, at the Central Park Teaching Hospital, Lahore, Pakistan, in collaboration with other tertiary care teaching hospitals in Lahore. After approval from the institutional ethics review board, the sample size was calculated using the World Health Organisation (WHO) calculator with 95% confidence interval (CI) and 15% prevalence.13 The sample was raised using non-random convenience sampling technique. Those included were pregnant women aged 15-45 years with preterm birth. Preterm birth was defined as a baby born alive with 25-37 weeks of gestation. Patients with complications like anomalous babies and intrauterine deaths were excluded.

After taking informed consent from the subjects, data was collected. Demographic characteristics included age and socioeconomic status (SES), while obstetric variables included parity, gestational age at delivery, and inter-pregnancy interval. Gestational age of the foetus was confirmed on the basis of last menstrual period combined with ultrasound scan done before 20 weeks of gestation.

The factors that contributed to spontaneous preterm labour and PPROM were also recorded. Data included the number of previous preterm births, if any, and the gestational ages in each case, vaginal infection (high vaginal swab for culture and sensitivity), UTI (symptomatology, pus cells in the urine and if present, culture and sensitivity), smoking and alcohol consumption, nutritional status of the mother assessed by body mass index (BMI), anaemia (intake of iron, haemoglobin [Hb] level) and hyperemesis gravidarum. Factors that contributed to uterine over-distension were assessed on ultrasound and included the number of foetuses, and the amount of liquor assessed by amniotic fluid index. In case a patient presented with PPROM, duration of membrane rupture till delivery as well as signs and symptoms of chorioamnionitis (pulse, temperature, total leukocyte count [TLC]) were recorded. Medical indications, such as pre-eclampsia (blood pressure [BP] >140/90mmHg after 20 weeks of pregnancy with proteinuria and/or signs and symptoms including headache, blurring of vision, right hypochondrial pain and vomiting), diabetes (fasting blood sugar [FBS] >100mg/dl in pregnancy), chronic hypertension (HTN) (BP >140/90mmHg diagnosed before 20 weeks of pregnancy), placental abruption and placenta previa, were noted.

Depending on the factors contributing to preterm birth, the subjects were categorised as spontaneous labour group A, PPROM group B, and iatrogenic preterm birth group C.

Data was analysed using SPSS 25. Data was presented as mean±standard deviation and frequencies and percentages, as appropriate. One-way analysis of variance (ANOVA) and post-Hoc Tukey’s test were used to assess the mean intragroup and intergroup differences. For categorical variables, Pearson’s chi-square and Fisher’s exact test were used, as appropriate. P<0.05 was considered significant.

Results
Of the 1,300 recorded births, 200(15.38%) were preterm. Group A had 86(43%) women with mean age 28.55±4.68 years, group B had 43(21.5%) women with mean age 27.14±3.25 years, and group C had 71(35.5%) women with mean age 28.28±3.74 years (p>0.05). In group A, there were 38(44.2%) women with low SES, 47(54.6%) with middle SES and 1(1.2%) with high SES. In group B, there were 14(32.6%) with low SES and 29(67.4%) with middle SES, and the corresponding values in group C were 15(21.1%) and 56(78.9%). There was significant difference among the groups with respect to BMI (p=0.001) and parity (p=0.021), but there was no significant difference for gestational age (p>0.05) (Table 1).

Table 1: Demographic characteristics.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A (n=86)</th>
<th>Group B (n=43)</th>
<th>Group C (n=71)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>28.55±4.68</td>
<td>27.14±3.25</td>
<td>28.28±3.74</td>
<td>0.175</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>25.56±0.674</td>
<td>25.64±2.74</td>
<td>28.05±3.88</td>
<td>0.001*</td>
</tr>
<tr>
<td>Parity</td>
<td>2.24±0.75</td>
<td>1.88±0.66</td>
<td>2.06±3.88</td>
<td>0.021*</td>
</tr>
<tr>
<td>Gestational Age (weeks)</td>
<td>33.19±2.84</td>
<td>33.47±2.48</td>
<td>33.80±2.65</td>
<td>0.365</td>
</tr>
</tbody>
</table>

SD: Standard deviation, BMI: Body mass index.

Figure 1: Distribution of the sample in relation to the cause of preterm birth.
With respect to BMI, the mean difference between groups A and C was -2.492 ($p=0.0001$), and between groups B and C it was -2.411 ($p=0.002$). With respect to parity, the mean difference between groups A and B was 0.360 ($p=0.019$) suggesting that higher parity was associated with spontaneous labour.

With respect to gestational age 10(11.6%) women in group A had gestational age <28 weeks, 37(43%) had gestational age 28-34 weeks, and 39(45.4%) had gestational age >34 weeks. In group B, the corresponding values were 4(9.3%), 19(44.2%) and 20(46.5%), and in group C the values were 6(8.4%), 21(29.6%) and 44(62%), respectively.

Vaginal infections and UTIs were significantly higher in group A compared to the other groups ($p<0.05$) (Table 2). In group C, pre-eclampsia was the main reason for preterm birth 42(59.0%) (Figure 2).

**Discussion**

In the current study, the prevalence of preterm birth was 15.38%. About 90% of world’s burden of preterm birth rates is shared by low-income countries. The reported rate is >18% in low-income countries and as low as 4% in high-income countries. A 2011 study in Karachi showed a prevalence of 11.4%. Another study in Karachi done in 2015 showed a prevalence of 17.9%. In Kenya, the prevalence of preterm birth was 18.3% in Ethiopia 15.5% and in China 7.3%. The prevalence noted in the current study was similar to earlier reports from Pakistan.

In the current study, 86(43%) of the cases had spontaneous labour, 71(35%) had medical indications, while PPROM was observed in 43(22%) cases. Metquin et al. described reported 25% medically indicated preterm births, 25% PPROM and 50% spontaneous preterm labour. The raising trend of preterm births in cases of iatrogenic medically-indicated births noted in the current study was similar to Chen et al. who reported it to be 42.7%. The persistent or increasing rates of preterm birth may be attributed to increase in the number of medically-indicated preterm births. The frequently seen conditions leading to medically-indicated preterm births are severe pre-eclampsia, antepartum haemorrhage, intrauterine growth restriction and foetal distress. In the current study, the most common indication for preterm birth on medical grounds was pre-eclampsia, followed by placenta previa, placental abruption and multiple pregnancy. Pre-eclampsia as a significant factor contributing to preterm birth has also been reported by other studies.

The factors significantly associated with spontaneous preterm labour are personal obstetrical history (previous preterm labour, over-distended uterus), lifestyle (strenuous physical conditions, stress, smoking), UTI, vaginal infection and social factors (low SES, anaemia, low BMI). In the current study, among patients who had spontaneous preterm labour, anaemia was present in 29.9% of women. Anaemia was seen as a significant risk factor for spontaneous preterm labour in other studies as well. Some studies did not find it significant.

The current study showed previous preterm birth in 28.8% of the subjects. Previous preterm birth was also a significant factor and seen in 13%, 35% and 65% of cases in earlier studies. Hyperemesis gravidarum was demonstrated as a factor contributing to preterm delivery. In the current study, it was seen in 28.8% of the patients. Low maternal BMI is significantly associated with preterm labour. However, in the current study, the result was contradictory, and patients who had spontaneous preterm labour had normal BMI, while patients who had preterm birth due to medical indications had mean BMI 28.05 kg/m² with the highest incidence of pre-eclampsia suggestive of possible correlation of higher BMI and pre-eclampsia. The finding was in line with those of Motedayen et al.

The current study showed non-significant association of smoking with preterm delivery, and had frequency of only 1%. UTI and vaginal discharge were significantly associated

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A (n=86)</th>
<th>Group B (n=43)</th>
<th>Group C (n=71)</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaemia</td>
<td>28 (32.6)</td>
<td>9 (20.9)</td>
<td>21 (29.6)</td>
<td>0.387</td>
</tr>
<tr>
<td>Hyperemesis gravidarum</td>
<td>28 (32.6)</td>
<td>11 (25.6)</td>
<td>14 (19.7)</td>
<td>0.191</td>
</tr>
<tr>
<td>bleeding in 1st trimester</td>
<td>8 (9.3)</td>
<td>2 (4.7)</td>
<td>13 (18.3)</td>
<td>0.064</td>
</tr>
<tr>
<td>Previous preterm birth</td>
<td>21 (24.4)</td>
<td>7 (16.3)</td>
<td>9 (12.7)</td>
<td>0.154</td>
</tr>
<tr>
<td>UTI</td>
<td>17 (19.8)</td>
<td>6 (14)</td>
<td>2 (2.8)</td>
<td>0.006*</td>
</tr>
<tr>
<td>Vaginal Infections</td>
<td>22 (25.6)</td>
<td>15 (34.9)</td>
<td>10 (14.1)</td>
<td>0.033*</td>
</tr>
</tbody>
</table>

UTI: Urinary tract infection.
with preterm birth. Wagura et al demonstrated UTI as a notable factor causing preterm birth.\textsuperscript{15} Multiparity increases the risk of preterm birth\textsuperscript{13,15} but in the current study, multiparity was not significantly associated with preterm birth.

The current study has its limitations, including its descriptive, cross-sectional design with a small sample size, and lack of comparison with term births. Besides, the impact of preterm birth on neonatal morbidity and mortality was also not recorded. The results, as such, cannot be generalised.

However, in the light of the findings, better antenatal management and early diagnosis of pre-eclampsia are recommended. Prenatal and antenatal reduction in BMI may be beneficial in reducing the incidence of medical disorders during pregnancy. The prevalence of placenta previa is increasing due to increase in the number of caesarean births. Attention needs to be given on the indication of first-time caesarean birth.

**Conclusion**

The most common factor for preterm birth used to be spontaneous preterm labour in the past, but medically indicated preterm birth rate is now increasing. The most common reason for iatrogenic preterm birth was pre-eclampsia.

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**References**


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Author Contribution:
FAB: Conceptualization of project, data collection, literature search, writing manuscript, final approval.
NS: Conceptualization of project, statistical analysis, drafting, revision, writing manuscript, final approval.
AS: Conceptualization of project, data collection, literature search, final approval.
AR: Data collection, literature search, final approval.
MZS: Statistical analysis, drafting, revision, writing manuscript, final approval.