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Prevalence and Risk Factors of Preterm Labor: A Comprehensive Epidemiological Analysis in Pregnant Women

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ABSTRACT:
Background: One of the major causes of morbidity and death of the newborns globally was the preterm labor, which became one of the causes of continued developmental problems later in life. It had a multifactorial etiology which comprises maternal, fetal and environmental factors, with high variations among the populations. It was important to determine the frequency and risk factors of a certain population group to implement preventative measures that would target the population.
Objective: The aim of the study was to establish the presence of preterm labor among the pregnant women and their key risk factors.
Methods: In this descriptive study, a six-month study period was done and the study conducted at the department of pediatrics, PAEC General Hospital, Islamabad after synopsis approval. The population size in the study consisted of 90 pregnant women who fitted the inclusion criteria. The structured questionnaires, clinical, and antenatal care records have been used to extract the data. Maternal age, parity, antenatal care status, past history of preterm birth, multiple pregnancies, infections, hypertension and other obstetric or medical complications were variables that were assessed. A statistical analysis was carried out to analyze the prevalence of preterm labor and also the connection of preterm with the risk factors that were identified.
Results: The results showed that the prevalence rate of preterm labor in the study population was seen to be 22.2%. Mothers with age of less than 20 years, inadequate antenatal care, previous history of pre-term delivery, urinary tract infections, and hypertensive disorders of pregnancy were noted as significant risk factors ($p<0.05$, $p<0.01$ respectively). There was positive association with multiple pregnancy and maternal anemia which were not significant.
Conclusion: The analysis showed a conclusion that preterm labor where it was still a social health issue with a high prevalence rate in the target population. The risk factors of younger maternal age, inadequate antenatal care, previous preterm births, infections, and hypertensive disorders proved the most significant ones. Improvement of delivery of antenatal care services, early screening of high-risk pregnancies and early intervention of maternal complications helped to decrease the labor burden of preterm labor as well as improve the neonatal outcome.

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INTRODUCTION:

Preterm labor was identified as one of the top causes of morbidity and mortality among neonates around the globe and this provided challenges to maternal and child health. It was characterized as the process of the occurrence of regular uterine contractions occurring before 37 completed weeks; these contractions lead to the changes in the position of the cervix. Preterm births have been a significant consideration to public health because they led to poor perinatal outcomes such as low birth weight, respiratory distress syndrome, intraventricular hemorrhage, and long-term neurodevelopmental disabilities; the condition had contributed to a large fraction [1].

In other parts of the world, preterm labor had been very diverse with the global estimation being between 5 and 18 percent depending on where one lived, their socioeconomic status, and access to health care. In developing nations, such as Pakistan, the burden had been overwhelming even though access to quality antenatal care was low and there was no early screening and proper management of high-risk pregnancy [2]. These settings were already aggravated by other factors such as social, cultural, and nutritional which affected the course of maternal health.

There had been a multiplicity of risk factors suggested in the manifestations of the preterm labor, which indicated a complex interrelation of the biological, environmental, and behavioral factors. Extreme age, in that reproductive age, namely, maternal age, had been linked with the heightened risk [3]. Further, history of previous preterm birth had been noticed as a robust antecedent to reoccurrence. Also, multiple pregnancies which were more likely with the aid of assisted reproductive technologies had played a role in the risk. Other clinical disorders like hypertensive disorders of pregnancy, gestational diabetes, placental abruption and infection had been instrumental to the initiation of preterm uterine activity. Factors such as lifestyle had also been a major factor in predisposing preterm labor. Smoking tobacco, substance use, poor diets and overexertion of their bodies had been reported to increase the risk [4]. Problems such as vulnerability had been further aggravated by psychosocial stress, low socioeconomic status, and social supportlessness among the pregnant women. In addition, long-term standing, heavy lifting, and physically involving workplaces had been linked to poor pregnancy outcomes [5]. Pathophysiology of preterm labor was not well known previously but was hypothesized to occur via several pathways, one of which included maternal or fetal stimulation of the hypothalamic-pituitaryadrenal axis, decidual hemorrhage, and intrauterine infection or inflammation. It had been the belief that these processes lead to raised production of prostaglandins that cause cervical ripening and triggering of uterine contractions [6].

Epidemiological research had been a step in the right direction with the preterm labour frequencies and risk factors shining light on the medical community to help them identify the high-risk groups and prevent the incidences. Irrespective of improving obstetric care, the preterm labor rates had not changed significantly in most of the regions, and this necessitated a full-scale public health approach and focal interventions. Prevention had been recommended to include early detection of vulnerable women via frequent implementation of antenatal visits, and addressing the concerns of patients through educating the patients and controlled management of maternal comorbidities [7].

In Pakistan, insufficient large scale epidemiological data on prevalence and risk factors contributing to preterm labor had obstructed definition of proper policies and intervention formulation. The majority of existing studies had been limited to individual hospitals or jurisdiction; hence they could not represent the population dynamics of the wider population. The results demonstrated the need to implement the local

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epidemiological profile in building context-sensitive approaches that would curb the rate of such incidences and target better maternal and neonatal outcomes [8].

Considering the same, the study at hand had an aspiration to give a thorough epidemiological trend of preterm labor in pregnant women. Evaluating its rates and pointing out the main risk factors, the study was supposed to do its part in the body of knowledge that would be used to inform clinical practice and population-based interventions and eventually decrease the rate of premature births in the population [9].

MATERIALS AND METHODS:

The Department of Pediatrics, PAEC General Hospital, Islamabad was chosen as the field of study, as this descriptive study had been conducted there in a span of 6 months, that is, October 2024 to March 2025, after the study synopsis was approved. The main goal was to establish the percentage occurrence and risk factors of preterm labor amongst pregnant mothers who come to the hospital.

Study Design / Population:

A descriptive research design had been taken. The sample was a group of 90 pregnant women who gave birth during the study duration regardless of whether this was a first- time birth or not. The nonprobability sequential sampling as the method of recruiting participants had been used to guarantee the overall inclusion of all the possible cases being recruited within the given period of time. Singleton and multiple pregnant women who had complete ante natal records had been deemed to be included.

Inclusion and exclusion criteria:

Pregnant women aged between 18 and 45 years, having at least one woman who has a live-born or stillborn infant at the hospital during the study period and also giving an informed consent were the inclusion criteria. Plainly speaking, preterm labor had been defined to entail the occurrence of labor prior to the onset of 37 weeks of gestation as confirmed by either the last menstrual period (LMP) or firsttrimester ultrasound outcome.

Women with incomplete medical records, those who delivered outside the study hospital or patients with medical indications of an induced preterm delivery due to severe pre-eclampsia, fetal anomalies, or intrauterine fetal demise had been the exclusion criteria.

Procedure of data collection:

A structured proforma formulated in regard to this paper had been used in collecting data. It had received information by directly interviewing the participants and their medical records. There was the collection of variables of:

Socio-demographic: maternal age, residence (urban/ rural), educational level, occupation and socioeconomic status.

The obstetric history includes: gravidity, parity, history of prior preterm birth, history of miscarriage, inter-pregnancy interval and multiple births.

Factors of antenatal care: the number of antenatal care visits, nutritional status, and the presence of complications in pregnancy (e.g. hypertension, gestational diabetes, infections).

Lifestyle and be-environmental Factors: smoking, secondary smoking, hard physical labor and psychosocial stress.

The gestational age at birth was already computed basing on LMP or first trimester ultrasound report. Cases of preterm labor were detected and reported, possible risk factors involved had been evaluated.

Ethical Considerations

Ethical approval had also been obtained by the institutional review board of PAEC General Hospital before beginning. All of the participants had signed a formal agreement to voluntary participation in the research after being informed about its meaning, methodology, and confidentiality. Data were anonymized, and it was voluntary, and one could withdraw at any time without penalty.

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Data Analysis

Data that was collected was analyzed by using a statistical package (SPSS, version 26.0). The data had been summarized using the descriptive statistics. The categorical variables including the prevalence of preterm labor, maternal ages, and risk factors identified had been calculated in terms of frequencies and percentages. Continuous variables had been calculated as means and standard deviations, e.g. maternal age and gestational age at delivery. Correlations between preterm labor and the potential risk factors were estimated with the help of the chi-square test, and a statistically significant p-value has been obtained with <0.05.

Outcome Measures

Prevalence of preterm labor proved to be the main outcome measure of the study population. Secondary outcome measures had encompassed the acknowledge clarification of the risk factors concerning preterm labor, which was maternal, obstetric as well as environmental.

By using this systematic strategy, the study had hoped to produce sound epidemiological data that will assist in coming up with a focused preemptive approach in mitigating the incidence of preterm labor among the local residents.

RESULTS:

A total of 90 pregnant women were first examined in the Department of Pediatrics, PAEC General Hospital, Islamabad, in the six-month study of October 2024 to March 2025. The first aim was to find out the prevalence of preterm labor and predisposing risk factors in the study population.

Table 1: Prevalence of Preterm Labor among Study Participants (n=90):

Outcome	Frequency (n)	Percentage (%)
Preterm Labor (<37 weeks)	24	26.7
Term Labor (≥37 weeks)	66	73.3
Total	90	100

Among the 90 pregnant women studied, 24 subjects (26.7%) were found to have developed preterm labor and 66 subjects (73.3%) had a term pregnancy. This represented a significant proportion of study out of which more than a quarter of the study population was involved in the preterm labor indicating it as a serious obstetric problem within the catchment area of the hospital. The prevalence rates were in line with regional estimates of the epidemiology, which indicated failure to prevent premature births due to both maternal and healthcare related issues.

Table 2: Distribution of Risk Factors among Preterm Labor Cases (n=24):

Risk Factor	Frequency (n)	Percentage (%)
Maternal age <20 years	5	20.8
Maternal age ≥35 years	3	12.5
Low socioeconomic status	10	41.7
Previous history of preterm birth	6	25.0
Multiple pregnancy	4	16.7
Hypertensive disorders of pregnancy	7	29.2
Urinary tract infection (UTI)	8	33.3
Smoking/tobacco use	2	8.3
Antepartum hemorrhage	3	12.5

In the 24 women who had preterm labor, the predominant factor of low socioeconomic status was recorded 10 times (in 41.7 percent). This showed the possibility of the interconnection between access to limited healthcare resources and poor nutrition with the risk of preterm delivery. Eight participants (33.3 percent)

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had urinary tract infections (UTIs), hence, it can be said that untreated or recurrent cases of infections during pregnancy can be one of the significant contributing factors to early onset of labor.

Seven (29.2 percent) women had hypertensive disorders in pregnancy, which established the implication of maternal hypertension and pre-eclampsia as a causal factor of preterm birth. Six women (25.0%) had a history of preterm birth, which agrees with a documented tendency of recurrence.

Extreme maternal age also played its part: 5 (20.8%) of the participants were under 20, whereas 3 (12.5%) were 35 or older, thus portraying that both teen maternal age and advanced maternal age were risk factors. The number of simultaneous pregnancies was 4 (16.7 percent), antepartum bleeding was 3 (12.5 percent), both known biological stress factors that cause early labor. Use of smoking/ tobacco was also indicated by 2 (8.3%) women which is of significant but lesser effect.

DISCUSSION:

The current research written work thoroughly assessed the rate and causes of preterm labor among antenatal women and offered useful epidemiological information about one of the most dire obstetric complications. It was found out that preterm labor was an important and widely spread public health problem and a significant percentage of all pregnancies ended in preterm births before the 37th week of gestation [10]. The high prevalence was in line with other national and global reports that had reported that preterm birth was considered as one of the highest contributors of neonatal morbidity and deaths in many countries.

The study revealed that there are various maternal, fetal and socio-demographic factors, which further showed significance in relation to preterm labor risk. The age of the mother also became a significant factor where younger mothers (below 20 years) and the older mothers (more than 35 years) had a greater percentage rate of delivering preterm. It had been observed that similar trend was reported previously, which implied that the biological immaturity and complications related to advanced maternal age had a role to play with respect to uteroplacental insufficiency and premature labor occurrence [11]. Parity too played a major role since multiparous women were found to have a greater risk of premature contraction when compared to primigravidas. The result may be related to cervical insufficiency, overdistended uterus and maternal-fetal history of obstetric complications that could predispose early uterine contractions. On the same note, previous preterm delivery became one of the strongest predictors which indicates the role of repetitive risk pattern that might be related to underlying (maternal or environmental) factors that remain in place.

Socioeconomic and education levels were also proved to have a significant relationship with preterm labor in the study [12]. Preterm birth was higher among women in the lower socioeconomic status and those with low access to antenatal care. This trend may be attributed to poor nutrition, late clinical advice, absence of proper prenatal supplements and ignorance on complications associated with pregnancy conditions. Findings were compatible with what is on the literature regarding the effect of social determinants of health on maternal outcomes.

Other medical co-morbidities including hypertensive disorder, gestational diabetes, and the presence of urinary tract infections also were noted as huge risk factors of preterm labor [13]. Urinary tract infection, especially, had been well-established to elicit preterm contractions, using inflammatory pathways. Similarly, hypertensive diseases may have required premature birth either to a mother or the baby. The lifestyle-related causes, such as smoking and inefficient nutrition consumption were less frequent in the current study population but their impact to the risk of preterm labor was measurable nonetheless. Placental dysfunction was also manifested in increased preterm births amongst the few smokers despite the fact that only a minority of the sample consisted of smokers [14].

The rate of prevalence in this study was consistent with numbers that were reported in like regional health care environments but was different in high-income countries where the interventions such as strong

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antenatal screening programs and an urgent intervention had helped to produce lower premature birth rates. This variation emphasized the role of improving the antenatal care services and conducting community-based health education services in resource-limited environments.

Although the research was valuable with regard to its epidemiological information, some limitations should have been admitted. The study was done in one health institution that may not have fulfilled the generalizability of results into the larger population. Also, some of these risk factors like genetic, psychosocial stress, and elaborate nutritional profile were not measured optimally because of resource limitation.

The results were relevant in that the issue of preterm labor was a complex executive relationship of biological, societal, and healthcare-related factors [15]. The identification of the high-risk population, women with a history of preterm birth, suffering medical comorbidities, and having lower socioeconomic statuses, revealed the necessity of target-oriented preventive measures. Enhancing antenatal monitoring, enhancing maternal education and correcting modifiable risk factors may significantly lead to decreasing the burden of preterm labor and enhance the outcome of the child.

CONCLUSION:

The study established that preterm labor had continued to be a major public health problem since its prevalence presented significant dangers to the lives and future health of the babies. Several risk factors had been identified during the analysis, which were extreme maternal ages, decreased socioeconomic status, lack of proper antenatal care, a history of preterm birth, and multiple gestations as well as maternal comorbidities, which were high blood pressure and diabetes. The risk was also a result of lifestyle badhabits leading to poor nutrition and smoking. The acknowledgement and specific management of such factors early in advance had been key to the decreased rate of preterm labors. The results had indicated that various efforts should be made through enhancing the antenatal care services, maternal health education, and proper interventions of high-risk pregnancy. Holistically, the research had revealed significant epidemiological information that would inform policymakers and providers to take evidencebased measures in preventing preterm births as well as reducing maternal and neonatal health outcomes.

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