Prevalence and Risk Factors of Preterm Labor among Pregnant Women: A Prospective Cohort Study

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Abstract:
Background: Preterm labor is a significant public health concern due to its association with adverse neonatal outcomes. Understanding the prevalence and risk factors of preterm labor is essential for targeted interventions and improved maternal and neonatal health. This prospective cohort study aimed to determine the prevalence of preterm labor and identify the associated risk factors among pregnant women. **Methods:** A prospective cohort study was conducted on a sample of pregnant women attending prenatal clinics in a specific region. Data on maternal characteristics, medical history, lifestyle factors, and obstetric factors were collected through interviews and medical record reviews. Participants were followed up until delivery, and cases of preterm labor were identified. Statistical analysis, including multivariate regression, was performed to assess the association between potential risk factors and preterm labor. **Results:** Maternal age, previous preterm birth, and multiple pregnancies exhibited strong associations with preterm labor, as indicated by odds ratios of 1.52, 2.86, and 2.09, respectively (all with p-values <0.001). Maternal smoking, low maternal BMI, and socioeconomic disadvantage also showed statistically significant associations. Other risk factors, such as history of infections, maternal hypertension, maternal diabetes, maternal stress, and maternal substance abuse, had weaker or non-significant associations. These findings highlight the significance of these risk factors in predicting preterm labor in the studied cohort. **Conclusion:** This prospective cohort study provides valuable insights into the prevalence and risk factors of preterm labor among pregnant women. The findings suggest that targeted interventions addressing modifiable risk factors such as maternal age, smoking, and medical conditions may help reduce the incidence of preterm labor. Further research and implementation of preventive strategies are warranted to improve maternal and neonatal outcomes associated with preterm birth.
Keywords: preterm labor, prevalence, risk factors, prospective cohort study, pregnancy outcomes.
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Introduction:
Preterm labor, defined as the onset of labor before 37 completed weeks of gestation, is a significant global health concern associated with adverse maternal and neonatal outcomes. It remains a leading cause of neonatal mortality and morbidity, contributing to long-term developmental disabilities and healthcare costs. Understanding the prevalence and risk factors of

preterm labor is essential for early identification, targeted interventions, and improved outcomes for both mothers and infants.

Several studies have investigated the prevalence and risk factors associated with preterm labor in diverse populations and settings. Some studies have identified maternal characteristics, including young and advanced maternal age, low socioeconomic status, and racial or ethnic disparities, as potential risk factors for preterm labor [1,2]. Other studies have explored the impact of medical conditions such as gestational diabetes, hypertension, and infections on the incidence of preterm labor [3,4]. Lifestyle factors such as tobacco smoking, alcohol consumption, and inadequate prenatal care have also been linked to an increased risk of preterm labor [5,6].

However, the prevalence and risk factors of preterm labor may vary across populations due to variations in demographics, healthcare systems, and socioeconomic factors. Therefore, conducting region-specific studies is crucial to identify local risk factors and develop targeted interventions.

Aim:
To determine the prevalence of preterm labor and identify associated risk factors among pregnant women.

Objectives:
1. To determine the prevalence of preterm labor among pregnant women in the study population.
2. To identify the risk factors associated with preterm labor, including maternal characteristics, medical conditions, lifestyle factors, and socioeconomic factors.
3. To investigate the temporal relationship between identified risk factors and the occurrence of preterm labor.

Material and Methodology:
Participants: A diverse group of pregnant women aged 18-45 years, without a history of preterm labor or major medical complications, were recruited from antenatal clinics and obstetric hospitals. Informed consent was obtained from each participant before enrollment.

Data Collection: Baseline data on maternal characteristics, including age, ethnicity, socioeconomic status, medical history, and lifestyle factors, were collected through structured interviews and self-administered questionnaires. Additional data on obstetric history, current pregnancy details, and prenatal care utilization were obtained from medical records.

Follow-up and Outcome Assessment: Participants were followed throughout their pregnancy, and regular follow-up visits were scheduled to monitor their progress. The occurrence of preterm labor was assessed using established clinical criteria, including gestational age at delivery and onset of regular uterine contractions. Other pregnancy outcomes, such as preterm birth, neonatal morbidity, and maternal complications, were also recorded.

Inclusion Criteria:
1. Pregnant women aged 18-45 years.
2. Women attending antenatal clinics and obstetric hospitals.

Exclusion Criteria:
1. Women who are unable or unwilling to provide informed consent for participation in the study.

Sample size: n = (Z^2 * p * (1-p)) / E^2
Where:
n is the required sample size
Z is the Z-score corresponding to the desired level of confidence (e.g., 1.96 for a 95% confidence level)
p is the expected prevalence or incidence of the outcome (expressed as a proportion)
E is the desired level of precision (expressed as a proportion)
n = (1.96^2 * 0.10 * (1 - 0.10)) / 0.05^2
n ≈ 138.2976
Rounding up to the nearest whole number, the required sample size would be approximately 150 participants.

Statistical Analysis: Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. The prevalence of preterm labor was calculated as the proportion of cases among the total cohort. Multivariable logistic regression analysis was conducted to identify independent risk factors associated with preterm labor, adjusting for potential confounders. Statistical significance was set at $p<0.05$.
Ethical Considerations: The study protocol was approved by the Institutional Review Board, ensuring the protection of participants' rights, privacy, and confidentiality.

Observation and Results:
Table 1: Prevalence of Preterm Labor and Associated Risk Factors

Risk Factors	Prevalence (%)
Maternal Age	25.6
Previous Preterm Birth	15.2
Multiple Pregnancies (e.g., twins)	10.9
Maternal Smoking	8.3
History of Uterine/Cervical Infections	6.7
Maternal Hypertension	5.1
Maternal Diabetes	4.9
Low Maternal BMI	3.2
Maternal Stress	2.8
Maternal Substance Abuse	1.5
Others	9.5

Table 1 found that maternal age had the highest prevalence at 25.6%, followed by previous preterm birth at 15.2%, and multiple pregnancies (e.g., twins) at 10.9%. Other notable risk factors included maternal smoking at 8.3%, history of uterine/cervical infections at 6.7%, and maternal hypertension at 5.1%. The prevalence of maternal diabetes, low maternal BMI, maternal stress, and maternal substance abuse were relatively lower, ranging from 1.5% to 4.9%. The "Others" category accounted for 9.5% of the prevalence, which likely included additional risk factors not specifically listed in the table. These prevalence percentages provide valuable insights into the frequency of different risk factors among pregnant women and their potential association with preterm labor in the studied cohort.

Table 2: Temporal Relationship between Risk Factors and Preterm Labor

Risk Factors	Preterm Labor Cases	Odds Ratio (95% CI)	p-value
Maternal Age	80	1.52 (1.17-1.98)	<0.001
Previous Preterm Birth	45	2.86 (2.12-3.86)	<0.001
Multiple Pregnancies	32	2.09 (1.57-2.78)	<0.001
Maternal Smoking	27	1.91 (1.38-2.64)	0.002
History of Infections	18	1.39 (0.98-1.97)	0.066
Maternal Hypertension	14	1.23 (0.86-1.75)	0.205
Maternal Diabetes	12	1.09 (0.75-1.58)	0.636
Low Maternal BMI	10	1.71 (1.13-2.59)	0.010
Maternal Stress	8	1.05 (0.68-1.62)	0.825
Maternal Substance Abuse	4	2.15 (0.97-4.75)	0.060
Socioeconomic Disadvantage	23	1.88 (1.35-2.62)	<0.001
Other Factors	25	1.28 (0.90-1.82)	0.161

Table 2 includes the number of preterm labor cases for each risk factor, along with the corresponding odds ratios and p-values. The findings indicate that several risk factors are significantly associated with preterm labor. Maternal age, previous preterm birth, and multiple pregnancies showed the highest odds ratios of 1.52, 2.86, and 2.09, respectively, all with statistically significant p-values (<0.001). Maternal smoking, low maternal BMI, and socioeconomic disadvantage also exhibited statistically significant associations with preterm labor. Other risk factors, such as history of infections, maternal hypertension, maternal diabetes, maternal stress, and maternal substance abuse, showed weaker or non-significant associations. These results provide valuable insights into the temporal relationship between risk factors and the occurrence of preterm labor in the studied cohort.

Discussion

The table 1 presents the prevalence of preterm labor and associated risk factors among pregnant women. Maternal age stands out as a significant risk factor, with a prevalence of 25.6%. This finding is consistent with previous studies that have shown advanced maternal age to be associated with an increased risk of preterm labor (Smith et al., 2019; Johnson et al., 2020)[7][8]. Another important risk factor is a previous preterm birth, with a prevalence of 15.2%. Numerous studies have confirmed that women with a history of preterm birth are at higher risk for subsequent preterm labor (Blackwell et al., 2018; Reddy et al., 2019)[9][10]. Multiple pregnancies, such as twins, have a prevalence of 10.9% and are consistently identified as a risk factor for preterm labor (Luke & Brown, 2017; Ananth et al., 2018)[11][12].

Maternal smoking, with a prevalence of 8.3%, is another significant risk factor for preterm labor. Extensive research has shown that smoking during pregnancy increases the likelihood of preterm birth (Leonard et al., 2018; Hilmert et al., 2020)[13][14]. History of uterine/cervical infections (6.7%), maternal hypertension (5.1%), maternal diabetes (4.9%), low maternal BMI (3.2%), maternal stress (2.8%), and maternal substance abuse (1.5%) are all associated with an increased

risk of preterm labor, as documented in various studies (Jensen et al., 2017; Zhang et al., 2019; Rodrigues et al., 2020; Choi et al., 2021).[15][16][17][18]

The table 2 presents the temporal relationship between various risk factors and the occurrence of preterm labor. Maternal age, with 80 cases of preterm labor, shows a significant association with a higher risk of preterm birth, as evidenced by an odds ratio of 1.52 (95% CI: 1.17-1.98, p<0.001). This finding aligns with previous research indicating that advanced maternal age is a recognized risk factor for preterm labor (Smith et al., 2019; Johnson et al., 2020)[7][8]. Similarly, previous preterm birth and multiple pregnancies also exhibit strong associations with preterm labor, as indicated by odds ratios of 2.86 (95% CI: 2.12-3.86, p<0.001) and 2.09 (95% CI: 1.57-2.78, p<0.001) respectively. These findings are consistent with studies that have consistently identified these factors as significant predictors of preterm labor (Blackwell et al., 2018; Reddy et al., 2019; Luke & Brown, 2017; Ananth et al., 2018)[9][10][19][20].

Maternal smoking, with an odds ratio of 1.91 (95% CI: 1.38-2.64, p=0.002), is another important risk factor associated with preterm labor. Numerous studies have highlighted the detrimental effects of smoking during pregnancy on the risk of preterm birth (Leonard et al., 2018; Hilmert et al., 2020)[21][22]. History of uterine/cervical infections, maternal hypertension, maternal diabetes, low maternal BMI, maternal stress, and maternal substance abuse also demonstrate associations with increased preterm labor risk, although some of these associations did not reach statistical significance in this particular study. Nonetheless, other research has supported the relationship between these factors and preterm birth (Jensen et al., 2017; Zhang et al., 2019; Rodrigues et al., 2020; Choi et al., 2021)[23][24][25][26].

Furthermore, socioeconomic disadvantage is identified as a risk factor for preterm labor, with an odds ratio of 1.88 (95% CI: 1.35-2.62, p<0.001). This finding aligns with the existing literature that highlights the impact of social determinants of health on pregnancy outcomes (Mason et al., 2018; Collins et al., 2020)[27][28]. Finally, the table includes a category labeled "Other Factors," which indicates a prevalence of 25 cases of preterm labor and an odds ratio of 1.28 (95% CI: 0.90-1.82, p=0.161). These factors may encompass additional variables not specifically listed in the table, which could include less common risk factors or potential confounding factors.

Conclusion:

The prospective cohort study on the prevalence and risk factors of preterm labor among pregnant women provides important insights into the frequency and associations of various factors with preterm labor. Maternal age, previous preterm birth, and multiple pregnancies were identified as the most prevalent risk factors for preterm labor, with statistically significant associations. Maternal smoking, low maternal BMI, and socioeconomic disadvantage also showed significant associations with preterm labor. Other risk factors, such as history of infections, maternal hypertension, maternal diabetes, maternal stress, and maternal substance abuse, exhibited weaker or non-significant associations.

These findings emphasize the importance of identifying and addressing these risk factors during prenatal care to reduce the incidence of preterm labor. Strategies targeting maternal age, previous preterm birth, and multiple pregnancies should be considered, along with interventions to support smoking cessation, promote healthy maternal BMI, and address socioeconomic disparities. Further research and implementation of preventive measures are warranted to mitigate the risks associated with these factors and improve maternal and neonatal outcomes.

Limitations of Study:

1. **Generalizability:** The study's findings may be specific to the population and setting in which the research was conducted. The demographics, healthcare practices, and environmental factors in the study population may differ from other regions or populations, limiting the generalizability of the results.
2. **Selection Bias:** The study's cohort may not be representative of the overall population of pregnant women. There could be potential biases in participant recruitment or retention, which could affect the validity and generalizability of the findings.
3. **Recall Bias:** The study may rely on self-reported information, such as maternal smoking or substance abuse, which can be subject to recall bias. Participants may not accurately recall or report their behaviors, leading to misclassification or underestimation of certain risk factors.
4. **Measurement Bias:** The accuracy and reliability of measuring risk factors and outcomes can influence the study results. Inaccurate or imprecise measurement of variables, such as gestational age or preterm labor, can introduce measurement bias and affect the validity of the findings.
5. **Confounding Factors:** The study may not have accounted for all potential confounding factors that could influence the relationship between the identified risk factors and preterm labor. Unmeasured or uncontrolled confounders could affect the observed associations.
6. **Temporal Relationship:** While the study identifies associations between risk factors and preterm labor, it may not establish a causal relationship. The temporal sequence of events and the directionality of the associations may not be fully explored or established.
7. **Missing Data:** Incomplete or missing data on certain risk factors or outcomes could introduce bias and limit the analysis. The missing data may result from participant attrition, non-response, or other reasons, potentially affecting the precision and validity of the study findings.
8. **Study Design:** Although the study is prospective in nature, other study designs, such as randomized controlled trials, may provide stronger evidence for causality. The prospective cohort design, while useful for identifying associations, has inherent limitations in establishing causation

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