

Epidemiological study of maternal risk factors influencing the incidence of preterm birth in developing countries

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ABSTRACT

Preterm birth (PTB) remains a significant public health challenge in developing countries, contributing to high neonatal morbidity and mortality rates. This qualitative literature review aims to explore the maternal risk factors influencing the incidence of preterm birth in these regions. By examining existing studies, the review identifies key maternal characteristics such as age, nutritional status, socioeconomic factors, reproductive history, and healthcare access, which contribute to the risk of PTB. Additionally, the review highlights the role of environmental factors, including stress, pollution, and infections, in increasing preterm birth rates. The findings suggest that improving maternal healthcare, enhancing public awareness, and addressing socioeconomic disparities are essential in reducing the prevalence of preterm birth in developing countries. This study provides a comprehensive understanding of the factors influencing PTB and offers insights for developing targeted interventions aimed at reducing its incidence in resource-limited settings.

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INTRODUCTION

Preterm birth, defined as the birth of an infant before 37 weeks of gestation, remains a significant public health issue worldwide, particularly in developing countries. It is a leading cause of neonatal morbidity and mortality, contributing to a high burden on healthcare systems and families. According to the World Health Organization (WHO), approximately 15 million babies are born preterm each year, and this number continues to rise, with the majority of preterm births occurring in low- and middle-income countries (LMICs) (Pusdekar et al., 2020). In these regions, preterm birth is not only a major cause of neonatal death but also a contributor to long-term health complications, including developmental delays, cerebral palsy, and respiratory disorders.

Maternal health plays a crucial role in determining the outcomes of pregnancy, and several maternal risk factors have been identified as influencing the likelihood of preterm birth. These factors range from socio-economic conditions, nutritional status, and access to quality healthcare, to more direct medical and obstetric conditions such as hypertension, diabetes, infections, and maternal age (Wastnedge et al., 2021). In many developing countries, the interplay between these

risk factors is complex and multifaceted, making it essential to understand the unique epidemiological context of preterm birth in these settings.

The increasing prevalence of preterm births in developing countries is of particular concern due to the lack of adequate healthcare infrastructure and the limited availability of skilled medical professionals to manage such high-risk pregnancies (Ohuma et al., 2023). Furthermore, many of the maternal risk factors contributing to preterm birth are modifiable or preventable, which presents an opportunity for intervention and targeted healthcare strategies aimed at reducing the incidence of preterm birth and improving maternal and neonatal outcomes. For instance, maternal malnutrition, poor prenatal care, and untreated infections are common in developing countries and significantly increase the risk of preterm delivery. Additionally, cultural factors, gender inequality, and limited access to health education and family planning resources exacerbate the impact of these risk factors.

Despite the recognition of preterm birth as a critical issue in maternal and child health, there is a gap in the epidemiological understanding of the specific risk factors affecting preterm birth in developing countries (Alim et al., 2024). While studies have been conducted in high-income countries, less attention has been paid to the socio-economic, cultural, and environmental factors that disproportionately affect women in resource-limited settings. This knowledge gap underscores the need for comprehensive epidemiological studies that explore the various maternal risk factors contributing to preterm birth in developing countries, as well as the identification of effective interventions tailored to these regions.

The aim of this study is to investigate the maternal risk factors that influence the incidence of preterm birth in developing countries, with a focus on both direct and indirect contributors. By examining the socio-demographic, behavioral, and medical factors that predispose women to preterm birth, this research seeks to provide valuable insights for healthcare providers, policymakers, and public health practitioners in their efforts to mitigate the impact of preterm birth (McElroy et al., 2022). Through a detailed understanding of the risk factors at play, we can better inform prevention strategies, improve maternal care, and ultimately reduce the burden of preterm birth in these vulnerable populations.

This study will also explore the role of prenatal care, the availability of healthcare resources, and the accessibility of interventions that can reduce the risk of preterm birth. Additionally, it will examine the challenges women in developing countries face in accessing and utilizing maternal health services, such as economic barriers, cultural attitudes, and lack of education, all of which can influence their likelihood of experiencing preterm birth. With the findings from this study, there is potential to develop context-specific policies and programs aimed at addressing the root causes of preterm birth, thereby contributing to improved maternal and neonatal health outcomes in developing countries.

This study positions itself within the existing literature by addressing the significant gap in the epidemiological understanding of preterm birth between high-income and low- to middle-income countries (LMICs). While substantial research has been conducted in high-income countries, where healthcare infrastructure is more robust and access to medical interventions is more widespread, the unique socio-economic, cultural, and environmental factors influencing preterm birth in LMICs have not been fully explored. In these regions, the interplay between maternal health risks is far more complex due to factors such as poverty, lack of access to quality healthcare, gender inequality, malnutrition, and cultural attitudes, which all contribute to the rising rates of preterm births.

This research aims to bridge this knowledge gap by investigating maternal risk factors in developing countries, with a focus on both direct and indirect contributors, such as socio-demographic conditions, behavioral patterns, and medical factors. The study will not only explore how these risk factors impact preterm birth but will also examine challenges unique to LMICs, including economic barriers, limited healthcare access, and cultural perceptions around prenatal

care and family planning. By focusing on these factors, the study seeks to provide a comprehensive understanding of preterm birth in resource-limited settings, a perspective that has been underrepresented in existing epidemiological research.

Furthermore, the study highlights the need for context-specific interventions that address the root causes of preterm birth in developing countries. Given the preventable nature of many risk factors—such as poor prenatal care and untreated infections—this research aims to provide actionable insights that can inform healthcare policies and public health strategies. In doing so, it will contribute to reducing the burden of preterm birth, improving maternal care, and ultimately reducing neonatal morbidity and mortality in these vulnerable populations. Thus, this study fills an important gap in the literature by focusing on the specific challenges faced by women in developing countries and identifying tailored solutions to mitigate the impact of preterm birth.

RESEARCH METHOD

The aim of this literature review is to explore the maternal risk factors influencing the incidence of preterm birth (PTB) in developing countries, and to identify the gaps and challenges in understanding and addressing this issue. Preterm birth, defined as birth before 37 weeks of gestation, is a leading cause of neonatal morbidity and mortality, especially in developing countries. By employing a qualitative literature review methodology, this study seeks to provide a comprehensive understanding of the epidemiological evidence, explore the relationships between maternal health conditions, socio-economic factors, and healthcare infrastructure, and examine how these factors contribute to preterm birth incidence in low- and middle-income countries (LMICs) (Pusdekar et al., 2020).

Research Design and Approach

This literature review adopts a qualitative research design to synthesize existing evidence from published studies, reports, and academic articles (Khanam et al., 2022). Qualitative research is particularly well-suited for reviewing complex, multi-dimensional phenomena like preterm birth, which are influenced by various biological, social, cultural, and healthcare-related factors. In this approach, the focus is on gaining a deep, nuanced understanding of the factors that contribute to preterm birth in developing countries, rather than quantifying them or generalizing findings to larger populations.

Inclusion and Exclusion Criteria

To ensure relevance and rigor in the literature review, the following inclusion and exclusion criteria were established:

Inclusion Criteria: a) Peer-reviewed journal articles, theses, and dissertations; b) Studies published between 2000 and 2024; c) Articles focusing on maternal risk factors, including both biological and socio-economic determinants; d) Research studies conducted in low- and middle-income countries (developing countries); e) Studies that focus on the epidemiology of preterm birth, maternal health, and associated outcomes.

Exclusion Criteria: a) Articles not focusing on maternal risk factors; b) Research conducted exclusively in high-income countries; c) Non-English publications or those not available in full text; d) Studies that do not focus on preterm birth or maternal health outcomes.

Search Strategy

A comprehensive and systematic search strategy was employed to identify relevant literature. The following academic databases were searched: a) PubMed for peer-reviewed journal articles related to maternal health, preterm birth, and epidemiology; b) Google Scholar for gray literature, including conference papers and government reports; c) Scopus for studies on public health and epidemiology in developing countries; d) Cochrane Library for systematic reviews and meta-analyses on preterm birth and maternal risk factors.

The search terms included combinations of keywords such as: a) "Preterm birth"; b) "Maternal risk factors"; c) "Epidemiology of preterm birth"; d) "Developing countries"; e) "Socioeconomic factors and preterm birth"; f) "Maternal health and preterm birth"

In addition to the initial database search, backward and forward citation tracking was employed to identify additional relevant studies from references and citations of key articles.

Data Collection and Analysis

Data Collection: Once the relevant studies were identified, data was extracted from each article to answer the research question: What maternal risk factors influence the incidence of preterm birth in developing countries? The data collection process focused on: a) Study characteristics (authors, publication year, study design, and location); b) Maternal risk factors identified by the study (e.g., maternal age, nutrition, prenatal care, infections, socio-economic status, environmental factors, etc.); c) Preterm birth outcomes (incidence rates, complications, and mortality); d) Socio-economic and healthcare factors (access to healthcare, education, income, and health policies).

Data Analysis: The data was analyzed using a thematic synthesis approach, which is common in qualitative literature reviews. The steps involved in the analysis are: a) Familiarization with the data: Reading and re-reading the selected studies to gain a comprehensive understanding of the key findings; b) Coding the data: Identifying key themes and concepts within the studies. This process involved categorizing maternal risk factors and preterm birth outcomes into distinct groups; c) Theme development: Grouping related codes into broader themes related to the factors influencing preterm birth, such as biological, socio-economic, and healthcare-related factors; c) Synthesis: Synthesizing the identified themes into a coherent narrative that reflects the complex relationship between maternal risk factors and the incidence of preterm birth in developing countries; d) Comparative analysis: Comparing and contrasting findings across studies from different geographic regions to identify common patterns or disparities.

Ethical Considerations

As this study is a qualitative literature review, there were no ethical concerns related to data collection, as all data were derived from existing, publicly available literature. However, the research adhered to ethical standards regarding citation and proper attribution of all sources. Furthermore, the research respects the confidentiality of individuals mentioned in the studies, as no primary data was collected from human subjects.

RESULTS AND DISCUSSIONS

The epidemiological study on maternal risk factors influencing the incidence of preterm birth in developing countries revealed several significant findings regarding the underlying causes and contributing factors to preterm deliveries (Khanam et al., 2022). Among the most common maternal risk factors identified were inadequate prenatal care, low socioeconomic status, and nutritional deficiencies, which were prevalent in the studied populations. It was observed that women with limited access to healthcare services were more likely to experience complications during pregnancy, which increased the risk of preterm birth. The study found that maternal age also played a crucial role, with both younger (adolescent) and older (over 35 years) mothers having a higher incidence of preterm births compared to those in the optimal age range of 20 to 34 years.

Furthermore, maternal health conditions such as hypertension, diabetes, and infections were strongly associated with a higher risk of preterm labor. It was evident that pre-existing medical conditions, if not well-managed, significantly contributed to adverse pregnancy outcomes, including preterm birth (Vyawahare et al., 2023). Another key finding was the high prevalence of poor maternal nutrition, which exacerbated the risk of preterm birth. Malnutrition, including iron and folic acid deficiencies, was commonly observed, leading to poor fetal development and an increased likelihood of premature delivery.

The study also highlighted the impact of social determinants of health, including lack of education, poor living conditions, and limited social support, all of which were linked to higher preterm birth rates (Preda et al., 2023). Women with limited education and those from rural or impoverished areas were found to have fewer resources to manage pregnancy complications effectively, which directly affected birth outcomes. Additionally, stress and mental health factors, including depression and anxiety during pregnancy, were found to have a notable influence on preterm birth rates.

Overall, the findings of this study underscore the multifactorial nature of preterm birth in developing countries, where a combination of socioeconomic, medical, nutritional, and psychological factors contribute significantly to the incidence of premature deliveries (Ayub et al., 2024). These results call for a comprehensive approach to prenatal care that addresses not only medical conditions but also the broader social and economic factors that affect maternal health and, consequently, pregnancy outcomes. The study advocates for improving access to healthcare, better education on prenatal nutrition, and mental health support to reduce the incidence of preterm birth in these regions.

Preterm birth, defined as the birth of a baby before 37 weeks of gestation, remains a significant global health concern, particularly in developing countries. The incidence of preterm birth in these regions is higher compared to developed nations, and understanding the maternal risk factors associated with preterm birth is crucial for effective intervention and prevention strategies. This discussion explores the key maternal risk factors influencing the incidence of preterm birth in developing countries, based on the findings from various epidemiological studies.

Socioeconomic Factors and Access to Healthcare

One of the primary risk factors associated with preterm birth in developing countries is inadequate access to quality maternal healthcare (Wainwright et al., 2023). Women in these regions often face barriers to accessing prenatal care, including financial constraints, geographical isolation, and limited healthcare infrastructure. Lack of prenatal care is closely associated with higher rates of preterm birth, as essential screenings and timely interventions are missed. In many low-resource settings, women may only seek care when complications arise, increasing the risk of preterm labor.

Furthermore, socioeconomic status plays a significant role in the incidence of preterm birth. Women living in poverty are at a higher risk of preterm delivery due to factors such as poor nutrition, inadequate housing, high levels of stress, and exposure to environmental hazards. Low-income women may also have limited access to educational resources, contributing to less awareness of the importance of prenatal care, nutrition, and lifestyle choices that can reduce the risk of preterm birth (Khekade et al., 2023).

Table 1. On primary risk factors associated with preterm birth in developing countries, emphasizing maternal healthcare access and socioeconomic status

Risk Factor	Description	Impact on Preterm Birth Risk	Example Challenges in Developing Countries
Inadequate Access to Quality Maternal Healthcare	Barriers such as financial constraints, geographic isolation, and limited healthcare infrastructure hinder prenatal care access	Missed essential screenings and interventions increase preterm birth rates	Rural women unable to reach clinics; lack of trained healthcare providers
Lack of Prenatal Care	Women often delay or forego prenatal visits, especially until complications emerge	Delays detection of risks leading to preterm labor	Late or no prenatal visits due to cost, transportation, or cultural barriers
Low Socioeconomic Status	Poverty leads to poor nutrition, inadequate housing, high stress, and exposure to environmental risks	Elevates physiological and psychosocial stressors linked to preterm birth	Malnutrition, overcrowded living conditions, and exposure to pollutants
Limited Education and Awareness	Reduced knowledge about prenatal care, nutrition, and healthy lifestyle	Low uptake of preventive measures	Lack of education on pregnancy care and risk

Risk Factor	Description	Impact on Preterm Birth Risk	Example Challenges in Developing Countries
	practices	and healthy behaviors	factors in low-income communities

Nutrition and Maternal Health Conditions

Maternal nutrition is a critical determinant of pregnancy outcomes, and poor nutrition during pregnancy is a known risk factor for preterm birth (Desta et al., 2021). In developing countries, malnutrition is a significant concern, with many women experiencing inadequate intake of essential nutrients such as folic acid, iron, and protein (Pusdekar et al., 2020). Maternal undernutrition and anemia are linked to an increased risk of preterm birth, as they can lead to complications such as low birth weight, placental insufficiency, and fetal growth restriction, all of which are associated with preterm delivery.

In addition to malnutrition, maternal health conditions such as hypertension, diabetes, and infections are common risk factors for preterm birth. In developing countries (Lis et al., 2023), these conditions may be underdiagnosed or inadequately managed due to limited healthcare infrastructure. Hypertensive disorders of pregnancy, including preeclampsia, are a leading cause of preterm birth and maternal morbidity in low-resource settings. Similarly, untreated infections such as urinary tract infections, sexually transmitted infections, and bacterial vaginosis have been linked to an increased risk of preterm labor and delivery (Gao et al., 2021).

Reproductive Health Factors

Previous preterm birth is one of the strongest predictors of recurrent preterm birth in future pregnancies. Women who have experienced preterm birth in a previous pregnancy are at a higher risk of having another preterm birth, especially in developing countries where healthcare support for high-risk pregnancies may be limited (Organization, 2023). This creates a vicious cycle of preterm births that exacerbates the overall burden on maternal and neonatal health in these regions (Owens et al., 2020).

Other reproductive health factors, such as young maternal age (especially adolescents) and advanced maternal age, are also associated with an increased risk of preterm birth. Adolescent mothers may experience biological immaturity (Daskalakis et al., 2023), which can increase the risk of pregnancy complications leading to preterm birth. On the other hand, women over the age of 35 may face an increased risk of preterm birth due to age-related factors such as reduced uterine capacity, higher rates of chronic conditions, and complications during pregnancy.

Environmental and Occupational Factors

In many developing countries, environmental and occupational factors also contribute significantly to the incidence of preterm birth (Siddiqui et al., 2025). Women working in physically demanding jobs, such as agriculture or manufacturing, may face increased risks due to exposure to harmful substances, physical stress, and long working hours. Additionally, environmental pollution, particularly in urban areas with high levels of air and water pollution, has been shown to adversely affect maternal health and increase the risk of preterm birth.

In rural and informal sectors, women may be exposed to environmental hazards such as poor sanitation, inadequate housing conditions, and limited access to clean water, all of which can contribute to maternal stress, infections, and other complications leading to preterm labor (Vanderlaan & Hall, 2020).

Psychosocial Factors and Stress

Psychosocial stress, including factors such as domestic violence, poor mental health, and social isolation, is a significant risk factor for preterm birth. Women in developing countries often face heightened levels of stress due to poverty, gender inequality, and the lack of social support. Chronic stress can affect the hormonal balance of the body, leading to premature labor (Hunter et

al., 2023). Moreover, women experiencing mental health disorders such as depression and anxiety are at an increased risk of preterm birth, as these conditions may go unrecognized and untreated in many low-resource settings.

Cultural and Behavioral Factors

Cultural practices and health behaviors play a critical role in influencing maternal health outcomes in developing countries (Mitku et al., 2020). In some regions, cultural norms may discourage women from seeking early prenatal care or adhering to medical recommendations during pregnancy. Traditional birth attendants, although an important part of the healthcare system in many developing countries, may not have the necessary training to identify and manage complications that can lead to preterm birth.

Moreover, lifestyle behaviors such as smoking, alcohol consumption, and drug use are prevalent in some developing countries and are known risk factors for preterm birth (Xi et al., 2020). While public health campaigns to reduce smoking and alcohol consumption during pregnancy have been successful in some areas, they remain a challenge in others where these behaviors are deeply ingrained in cultural practices or socioeconomic conditions.

Prevention and Intervention Strategies

Addressing the maternal risk factors influencing preterm birth in developing countries requires a multifaceted approach (Farajallah & Farajallah, 2024). Strengthening healthcare infrastructure and improving access to quality prenatal care are critical steps in preventing preterm birth. This includes providing antenatal care services that offer timely screenings, early detection of maternal health conditions, and education on nutrition and lifestyle choices (Volkow & Blanco, 2023). Additionally, efforts to reduce poverty and improve living conditions, such as access to clean water, sanitation, and housing, are essential for reducing the incidence of preterm birth.

Improving maternal nutrition, particularly through supplementation programs and education on healthy eating during pregnancy (Ghimire et al., 2021), can also reduce the risk of preterm birth (Dadi et al., 2020). Health systems should prioritize the management of chronic conditions like hypertension and diabetes, ensuring that women receive appropriate care and monitoring during pregnancy.

Finally, addressing the psychosocial determinants of health, including providing mental health support and protecting women from violence and discrimination, is crucial for reducing stress-related preterm births.

CONCLUSION

The epidemiological study of maternal risk factors influencing the incidence of preterm birth in developing countries highlights the complexity of this global health challenge. A combination of socioeconomic, nutritional, environmental, and psychosocial factors contribute to the higher incidence of preterm births in these regions. Comprehensive strategies, including improving access to healthcare, addressing social determinants of health, and promoting education and awareness, are vital to reducing the burden of preterm birth and improving maternal and neonatal outcomes in developing countries.

Penelitian ini memberikan kontribusi baru terhadap kebijakan kesehatan ibu di negara berkembang dengan mengidentifikasi faktor risiko spesifik seperti kemiskinan, malnutrisi, dan ketidaksetaraan akses layanan kesehatan, serta memberikan rekomendasi kebijakan yang lebih kontekstual, seperti peningkatan perawatan prenatal dan pencegahan infeksi. Penelitian ini juga menyoroti pentingnya penguatan infrastruktur kesehatan dan pendidikan kesehatan untuk ibu hamil. Dalam hal kesenjangan literatur, studi ini mengisi celah antara penelitian di negara maju dan berkembang dengan fokus pada faktor risiko yang dipengaruhi oleh kondisi sosial-ekonomi, budaya, dan infrastruktur yang lebih terbatas di negara berkembang, serta mengusulkan pendekatan preventif yang relevan dan dapat diterapkan di konteks lokal negara berkembang.

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