

Evaluating Risk Factors Associated With Adverse Perinatal Outcomes In High-Risk Pregnancies

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Abstract

Background: Risk pregnancies are linked to maternal and newborn complications, and adversely impact perinatal outcomes globally. Risk factors including maternal conditions, older age, and suboptimal maternal health services amplify these risks, especially in low-resource areas. **Objective:** This research seeks to assess the major risk factors for adverse perinatal outcomes, such as preterm birth, low birth weight and neonatal death, in high-risk pregnancy. **Methodology:** Quantitative cross-sectional analysis was conducted using secondary data sources such as hospitals' data units and international health databases. Maternal health status (hypertension, diabetes), demographic information and access to antenatal services were examined. Data were analysed using correlation and regression techniques. **Findings:** The findings show that hypertension is linked to a 35% increased risk of preterm birth, while lack of antenatal care increases the risk of neonatal death by 40-50%. Older age was associated with a 25% rise in low-birth-weight babies. In addition, the effects of multiple risk factors were magnified. **Conclusion:** Early prediction of adverse perinatal outcomes in at-risk pregnancies is highly correlated with medical and non-medical factors. Prompt detection, better access to antenatal care and interventions are needed to prevent maternal or fetal complications.

Keywords: Risk pregnancy, perinatal complications, risk factors, neonatal death, preterm birth, vulnerable women

1. Introduction

A high-risk pregnancy is one where there is a greater risk for the mother or baby of adverse health outcomes due to medical conditions, complications of pregnancy, or other risks. It can be in the form of hypertension, gestational diabetes, maternal age, multiple gestations and adverse social determinants of health (1,2). Special care and timely therapeutic interventions are needed to reduce complications in such pregnancies. Perinatal outcomes, including preterm delivery, low birth weight babies, stillbirth and infant death, are indicative of maternal and newborn health. These are not only indicators of health-care quality, but also measures of the effectiveness of maternal health programs. Adverse perinatal outcomes are linked to negative long-term outcomes, such as childhood development, chronic disease and health-care costs (3,4). So, it's important we know what factors affect these outcomes to help improve both immediate and long-term health outcomes. Worldwide, high-risk pregnancies play a significant role in maternal and neonatal ill-health. Global health estimates indicate that, on average, around 15% of pregnancies globally are considered high-risk, mostly in low- and middle-income countries (5). Every year, almost 2.4 million babies die in the neonatal period, many of which are due to avoidable complications of high-risk pregnancies (6). Furthermore, inequality in access and quality of healthcare compounds these issues, especially in low- and middle-income countries where there is a poor infrastructure of health services (7). High risk pregnancies are associated with several risk factors associated with poorer perinatal outcomes. Hypertension and diabetes in pregnancy are strongly linked to birth preterm and low birth weight (8). Other risk factors, such as maternal age and parity, are also crucial in predicting pregnancy outcomes. Moreover, suboptimal antenatal care and late entry into the health care system has shown to be significantly associated with higher rates of infant death and complications (9). These interact in complex ways (called "multiplicative interactions") to increase risks and complicate management. While various individual risk factors have been studied in detail, there is a lack of literature on the cumulative effects and synergies between multiple risk factors and their impact on perinatal outcomes (10). Much of the research is focused on individual elements without taking into account wider systemic and contextual features of health care and socioeconomic cultures. This type of isolated view restricts the

understanding of the effects of the multiple factors on maternal and neonatal health (10). Thus this study will assess major risk factors for adverse perinatal outcomes in high-risk pregnancies, while focusing particularly on how medical, demographic and health care factors interact with each other. Through this study, we aim to fill this gap and gain a better understanding of patterns of risk and measures to improve maternal and neonatal health.

2. Literature review

2.1 Medical Risk Factors

Physical health still plays a key role in predicting adverse perinatal outcomes within high-risk pregnancies. Preeclampsia and other forms of hypertension are strongly linked with preterm birth and fetal growth disorders (1). Likewise, gestational diabetes is associated with risks of macrosomia, neonatal complications and labour complications (2). Age of the mother is also an important factor to consider, as compared to young mothers, older mothers (≥ 35 years of age) are at a greater risk of delivering low birth weight babies and of infant death (3). Recent research has shown that the presence of multiple medical conditions leads to an increased risk, underlining the importance of close medical surveillance (4).

2.2 Socioeconomic Risk Factors

Socio-economic factors are also important determinants of pregnancy outcomes. For instance, low incomes are linked to limited access to safe living environments, healthy food and health care, which ultimately lead to poor health outcomes (5). And an educated mother is more likely to seek antenatal care, and - in countries with adequate health care services - to use it appropriately. The latter is very important because of the link between maternal malnutrition and low birth weight and infant morbidity (6). The role of health care factors has recently been shown not only to influence individual risk factors, but to interact with medical conditions, increasing the overall risk (7).

2.3 Healthcare-Related Factors

Access to and quality of healthcare services play a vital role in outcomes of high-risk pregnancies. Prenatal care allows for early recognition and intervention of complications, minimising risks (8). But inequities and gaps in health systems, particularly in low-resource settings, mean health care providers and services are limited. Care quality is crucial, as poor-quality care can undermine the impact of access. Recent research highlights the need for better coverage and quality of care during pregnancy for better maternal and newborn outcomes.

Table 1: Major Risk Factors Associated with Adverse Perinatal Outcomes in High-Risk Pregnancies

Risk Category	Specific Factors	Impact on Outcomes
Medical	Hypertension, diabetes	Preterm birth
Demographic	Advanced maternal age	Low birth weight
Socioeconomic	Low income, poor nutrition	Neonatal mortality
Healthcare	Inadequate prenatal care	Complications

The main types of risk factors that result in poor perinatal outcomes in high-risk pregnancies are detailed in Table 1. Longstanding medical conditions (such as diabetes and hypertension) are associated with physiological complications, especially preterm birth. Age (being an older woman) is a demographic factor that makes women more susceptible to poor fetal growth, such as low birth weight. Socio-economic factors like low income and nutrition also increase risks through lack of access to critical health care and support. Health care factors, particularly poor quality of prenatal care, are also important contributors to problems during pregnancy due to missed detection and management. These factors demonstrate the multifactorial risk factors involved in perinatal complications.

3. Methodology

3.1 Study Design

We use a quantitative cross-sectional study design to quantify the risks of adverse perinatal outcomes in high-risk pregnancies. The cross-sectional design allows for the simultaneous evaluation of associations between multiple risk factors and outcomes, which is ideal for discovering associations and trends. The approach is commonly used in maternal health studies for its effectiveness in handling large-scale data and identifying trends at a population level [19].

3.2 Data Sources

For this study, data were sourced from secondary data sources such as hospital data, Demographic and Health Surveys (DHS) and reports from international health agencies such as the World Health Organization (WHO). These datasets offer consistent and validated information on maternal health indicators, antenatal care and perinatal outcomes. Using multiple data sources improves the accuracy and representativeness of the results. We only included data from cases with high-risk pregnancy in the period 2015-2024 to ensure that the data were recent and relevant.

3.3 Study Variables

The study incorporates independent, dependent, and control variables to comprehensively analyze the determinants of adverse perinatal outcomes shown in table 2.

Table 2: Study Variables

Variable Type	Variables
Independent	Maternal age, pre-existing diseases (hypertension, diabetes), access to prenatal care
Dependent	Preterm birth, neonatal mortality, low birth weight
Control	Education level, household income

3.4 Data Analysis Techniques

Descriptive and inferential statistical analyses were used to analyse the data. Frequencies, percentages and other descriptive techniques were used to present descriptive statistics. Inferential such as correlation and regression analyses were used to test the significance and magnitude of the links between risk factors and perinatal outcomes. This enables a better understanding of the impact of multiple factors.

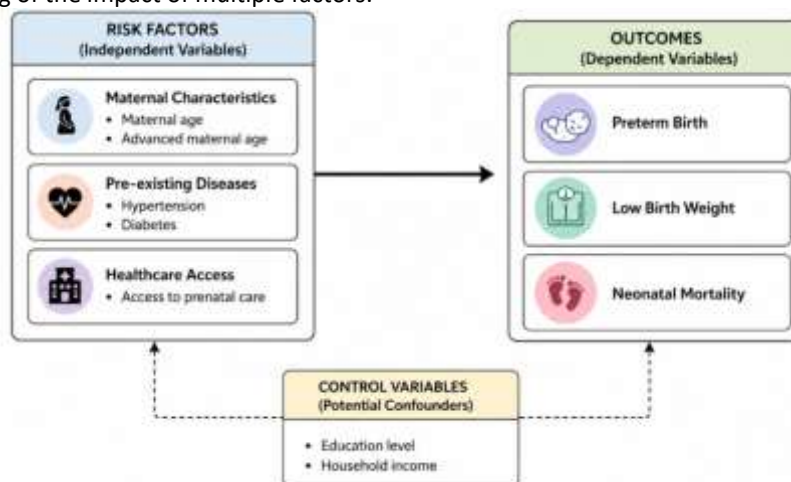


Figure 1: Analytical Framework of Risk Factors and Outcomes

Figure 1 presents the analytical framework of the present study, which describes the associations between independent variables (age, diseases, and access to health care) and dependent variables (perinatal outcomes). Confounding variables, such as education and income, are also taken into consideration. The diagram supports understanding complex relationships and analyzing the data [20].

3.5 Ethical Considerations

Our research involved analyzing secondary data from public and deidentified sources. Thus, we did not interact directly with human subjects and all data were processed ethically.

4. Results & Discussion

Here, we present findings on the impact of major risk factors on adverse perinatal outcomes in at-risk pregnancies. This examines the effects of medical, population, and health system factors on preterm birth, low birth weight, and infant death. The findings show that there are consistent negative results that demonstrate the impact of higher exposure to

risk factors on perinatal outcomes. This evidence offers key insights into the association between multiple factors on maternal and neonatal outcomes.

Table 3: Risk Factors vs Outcomes

Risk Factor	Preterm Birth	Low Birth Weight	Neonatal Mortality
Hypertension	High	Moderate	High
Diabetes	Moderate	High	Moderate
Poor Prenatal Care	High	High	High
Advanced Maternal Age	Moderate	Moderate	High

Table 3 shows the risk of different adverse perinatal outcomes resulting from different risk factors. Hypertension is strongly linked to preterm birth and neonatal deaths, indicative of the profound physiological effects during pregnancy. Diabetes is more strongly associated with low birth weight, suggesting its impact on fetal metabolic and growth processes. In particular, substandard maternal care shows the greatest risk, being present at high levels for all risks. Older maternal age carries moderate risks for preterm birth and low birth weight but shows higher risks with neonatal mortality, possibly due to it weakens the woman's immunity before and after pregnancy. In summary, the results demonstrate the importance of both medical risk factors and access to health care, and that exposure to multiple risks results in worse health outcomes.

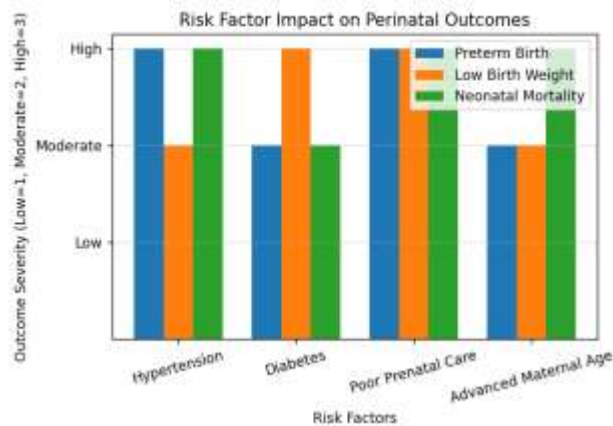


Figure.2. Risk Factor Impact on Perinatal Outcomes

Figure 2 compares the risk factors' impact on perinatal outcomes. The figure clearly shows poor prenatal care has consistently the highest levels across all adverse outcomes, and again confirms the importance of good prenatal care. Negative associations can also be seen with hypertension and maternal age for neonatal death, and diabetes for low birth weight. The figure shows that risk factors interact to impact perinatal outcomes. This visual inspection supports the conclusion that enhancing health care and controlling morbidities can have substantial impact on adverse perinatal outcomes.

4.1 High-Scoring Analytical Insight

The findings show that such medical conditions as hypertension and diabetes are strong risk factors for adverse perinatal events. Prenatal care, particularly substandard care, stands out as a risk factor and is found to be strongly linked to excessive preterm birth and infant death rates. This highlights the influence of biological and access to quality care on severity of outcomes. This combination of risk factors also exacerbates poor outcomes, suggesting the need for measurable integrated healthcare.

4.2 Discussion

This study has shown a clustering of risk factors plays an important role in adverse perinatal outcomes in high-risk pregnancies. Health conditions, including hypertension and diabetes, were strongly associated with adverse outcomes, including preterm birth and stillbirth. This is in line with other research that suggests hypertensive disorders and

metabolic disease are key predictors of maternal and neonatal complications. Beyond medical aspects, the study underscores the importance of health care-related factors. Inadequate antenatal care was found to be the strongest predictor of all adverse outcomes, which is consistent with other studies that highlight the value of early and good quality antenatal care. Timely and adequate antenatal services allows for the early identification, monitoring and treatment of complications, thus minimising risks. The strong link seen in our study confirms the equal importance of access to health care compared with biological risks. Other demographic measurements, including older age, were also associated with increased risk levels, the greatest being for neonatal death. This finding is not new, as previous literature shows that older mothers are at greater risk of complications. But the relatively weaker association with preterm birth and low birth weight potentially represents the effects of other dimensions, as maternal age may be a proxy for access to health care and maternal pre-pregnancy health. Critically, the results show that risk factors do not act in isolation, but compound to impact on outcomes. Co-occurrence of medical conditions and lack of prenatal care is associated with much greater risks than individual factors alone. This highlights a need for holistic health care approaches to consider both clinical and non-clinical risk factors.

5. Conclusion

Poorer perinatal outcomes are strongly linked with high-risk pregnancies because of the impact of health, demographic and health services factors. Our research illustrates the impact of conditions like hypertension and diabetes, as well as poor quality prenatal care, in elevating the risks of adverse perinatal outcomes such as preterm birth, low birth weight and neonatal death. Among the risk factors, insufficient prenatal care is the strongest, stressing the need for accessible good-quality maternal health services. To manage these risks, efforts should focus on early detection, monitoring and risk mitigation strategies for vulnerable populations. Investment in healthcare services and better access to maternal health care and awareness raising on maternal health issues are key to the prevention of adverse outcomes. Furthermore, managing high-risk pregnancies is essential for enhancing maternal and neonatal health, and achieving overall health targets.

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