Research Article

Influence Of Maternal Nutrition During Pregnancy On Perinatal Outcomes And Neonatal Health Status

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Abstract

Background: Pregnancy nutrition plays a key role in regulating fetal growth, perinatal outcomes and the health status of the newborn. Deficiencies in macronutrients and micronutrients have been linked to poor outcomes including low birth weight, preterm birth and poor newborn outcomes. **Objective:** This research sought to assess the impact of maternal nutrition during pregnancy on perinatal and neonatal health outcomes. **Methodology:** We conducted a cross-sectional study involving 200 pregnant women and their babies. This included dietary assessment and anthropometry. Demographic data, birth weight, gestational age and infant health status were also gathered. Data were analysed to assess relationships. **Findings:** 20% of mothers in the study reporting poor nutrition. 65% of infants whose mother had poor nutrition had low birth weight while 20% of those whose mothers had good nutrition had low birth weight. Neonatal complications in the undernourished mother group were 60% compared to 25% in the well-nourished mother group. **Conclusion:** Maternal nutrition has an impact on perinatal and neonatal health. Nutritional intervention can improve outcomes and promote early childhood health.

Keywords: Maternal nutrition, perinatal outcomes, neonatal health, low birth weight, pregnancy.

1. Introduction

The critical importance of maternal nutrition for fetal development, birth outcomes and survival is well acknowledged. The consumption of macronutrients and micronutrients is critical during the pregnancy in order to support fetal metabolism via the placenta and maternal metabolism [1]. The demands for energy, protein, iron, calcium, and folic acid increase during pregnancy, and are essential in preventing complications, including adverse birth outcomes [2]. Maternal malnutrition remains a major concern worldwide, particularly in developing countries. Maternal malnutrition and micronutrient deficiencies have been found to be major risk factors for pregnancy complications such as intrauterine growth restriction (IUGR), low birth weight (LBW), preterm birth, as well as poorer infant outcomes including morbidity and mortality [3,4]. The World Health Organization estimates that 20 million low birth weight (LBW) babies are born every year, with maternal malnutrition playing a significant role [5]. Recent research has shown that maternal nutritional status not only affects pregnancy outcomes but also the long-term health outcomes of the child including the risk of developing metabolic disease andränal cognitive function [6]. Iron, iodine, and vitamin D deficiencies have been associated with infant anemia, neural tube defects and compromised immune function [7,8]. On the other hand, sufficient maternal nutrition leads to a decrease in preterm birth, increases in birth weight, and increases in infant health, stressing the need for well-balanced diets during pregnancy [9]. Despite increasing recognition and policy investments, maternal malnutrition remains a common challenge due to socioeconomic inequalities, limited nutritional knowledge, limited access to food or antenatal care [10]. In many parts of the world, expectant mothers struggle to meet nutritional requirements during pregnancy, impacting fetal growth and risk of perinatal outcomes [11]. These issues highlight the need for robust studies that aim to understand the associations between maternal nutrition and neonatal health.

1.1 Research Gap

While there are studies on the association between maternal nutrition and birth outcomes, there is a paucity of studies integrating evidence on birth outcomes (such as preterm birth) and in-depth neonatal health indicators (such as birth weight, birth length and head circumference) in multiple populations. Furthermore, little research has explored the impact of maternal nutritional status by quantitative levels, beyond birth weight, on neonatal health status.

1.2 Research Problem

Despite growing awareness, maternal nutrition remains a concern in many parts of the world, and is associated with poor perinatal outcomes and poor neonatal health status.

1.3 Objectives

1. To measure maternal pregnancy nutritional status
2. To assess perinatal outcomes (birth weight, low birth weight, preterm birth)
3. To measure neonatal health outcomes

2. Literature review

The connection between maternal nutrition, child health and development has been highlighted in recent evidence, especially in affecting perinatal and neonatal health. Post-2022 research continues to underline the role of maternal undernutrition, in particular protein-energy malnutrition, in low birth weight (LBW) and intrauterine growth restriction (IUGR) [1,2]. This association has been known since previous studies, but more recent ones provide more precise measures of the effect, reporting that low energy intake during pregnancy increases the risk of LBW by as much as 40% in at-risk groups [3]. The role of micronutrient deficiencies (such as iron and folate) on neonate outcomes has long been established. A recent study suggests that anaemia in pregnancy doubles the chances of preterm delivery and tripled the risk of death in newborn babies [4]. In addition, low folate status has been associated both with neural tube defects and also with lowered intelligence in early life, implying long-term problems, rather than just birth defects [5]. But, some research indicates that supplementation may not be the solution to these problems without dietary reform [6]. The overall nutrition status, which includes proteins, vitamins and minerals, can boost the neonatal survival rates and other outcomes. In a 2023 cohort study using diversified diets, mothers with increased diversified diets had higher rates of normal birth weight and lower neonatal complications [7]. Likewise, combined intervention approaches of nutrition counseling and supplementation are more effective than single approaches [8]. However, research has shown an inconsistent reporting of maternal and neonatal health indicators, making it difficult to make comparisons between various studies. Additionally, recent studies tend to only explore nutrients separately - and not as part of dietary patterns, revealing a need for more integrated approaches. So, there is a need for future research to explore the interactions between nutrition, socioeconomic status and clinical factors or their impacts on perinatal and neonatal health.

3. Methodology

3.1 Study Design

This study used an analytical study approach, cross-sectional in nature to measure the association between of maternal nutritional status during pregnancy and perinatal and neonatal health outcomes. This type of design was chosen because it is good at examining the association of variables at one point in time and is appropriate for public health studies [20].

3.2 Study Population

Our study sample comprised 200 pregnant women who attended antenatal clinics and their respective babies observed during delivery. Sampling was done using systematic random sampling method. The inclusion criteria were pregnant women in their third trimester who agreed to participate and who had not had any chronic disease prior to the study.

Table.1. Demographic Characteristics of Participants

Variable	Category	Frequency (n=200)
Age (years)	18–25	90
	26–35	80

	>35	30
Socioeconomic Status	Low	85
	Middle	75
	High	40

As seen in table 1, the highest numbers of the participant were between the ages of 18-25 (45%) and 26-35 years (40%) and only 15% were over the age of 35. Most participants were from low (42.5%) and middle (37.5%) socioeconomic backgrounds and a few from high socioeconomic status (20%) showing a diverse sample from all socioeconomic backgrounds.

3.3 Data Collection

A standardized and validated questionnaire was used for data collection. A 24-hour recall questionnaire was used to determine maternal nutrition status (i.e., energy and protein intake). The body weight and height of the mother were taken to calculate Body Mass Index (BMI). B Infant's birth weight and gestation period and Apgar score were recorded from hospital registers immediately during birth. Efforts were made to increase the validity of the data by using trained health care staff for measurements and interviews. We ensured uniformity by using the standardized instruments and procedures [21].

3.4 Variables

Table.2. Study Variables

Category	Variables
Independent	Maternal nutrition (calories, protein intake)
Dependent	Birth weight, gestational age, Apgar score
Control Variables	Maternal age, socioeconomic status

The variables of the study are listed in the table 2. Independent variable - Maternal nutrition (calories and protein). Outcomes (dependent variables) are birth weight, gestational age and Apgar score. Control variables include mother's age and socioeconomic background/status.

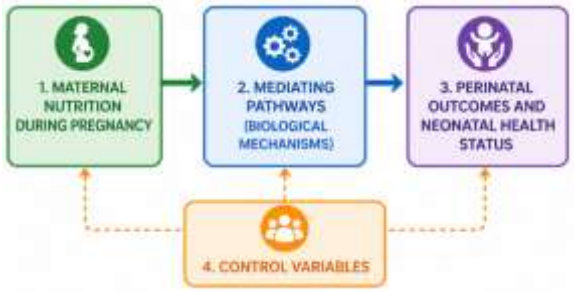

Fig.1. Conceptual Model of the Influence of Maternal Nutrition on Perinatal Outcomes and Neonatal Health Status

This model (Fig. 1) as a whole depicts the links between maternal nutrition during pregnancy and perinatal and neonatal outcomes. Maternal nutritional status is the main independent variable, and has effects on biological processes including fetal growth and development. These, in turn, result in observable perinatal outcomes (such as birth weight and gestational age) and subsequently to neonatal outcomes (such as as survival and complication rates). Modifying variables (e.g. maternal age and socioeconomic status) can influence the interactions. This diagram is a logical representation of the interactions among variables, supporting academic rigour, as diagrams improve our understanding of relationships studied.

3.5 Data Analysis

Data were entered and analyzed using statistical software (SPSS version 25). Descriptive statistics such as mean, standard deviation, and percentages were used to summarize variables. Inferential statistics, including chi-square tests and logistic regression analysis, were applied to determine associations between maternal nutrition and neonatal outcomes. A p-value of <0.05 was considered statistically significant.

3.6 Ethical Considerations

We obtained approval from institutional review board. All participants were required to provide a written informed consent and data collected was kept confidential according to research ethics [22].

4. Results & Discussion

This study's findings highlight the associations between women's nutritional status and perinatal and neonatal indicators for 200 women. A variety of descriptive and inferential statistics were used to assess the prevalence of nutritional status and its relationship with birth weight and neonatal outcomes. The results illustrate the impact of nutritional status on the outcomes of mothers with adequate nutrition and those with confirmed undernutrition. Chi-square tests were conducted to measure statistical significance, showing significant links between maternal nutrition and the health of newborns, including low birth weight and perinatal complications.

Table.3. Maternal Nutritional Status

Nutritional Status	Frequency (%)
Adequate	45%
Moderate	35%
Poor	20%

The assessment of the nutritional status of the mothers indicated 45% had good, 35% had moderate and 20% had poor nutritional status (Table 3 and figure 2). This suggests while most had adequate nutrition, many others had poor nutrition which can adversely affect pregnancy and newborn outcomes. In academic writing, appropriate presentation and analyses of data is crucial

Fig.2. Maternal nutritional status distribution

Table.4. Perinatal Outcomes

Outcome	Adequate Nutrition	Poor Nutrition
Normal Birth Weight	80%	35%
Low Birth Weight	20%	65%

This finding suggests a strong association between maternal nutrition and birth weight. As represented in table 4 and figure 3 a higher number of mothers with good nutrition had an increased number of normal birth weights (80%), whereas a higher number of mothers with poor nutrition had an increased number of low birth weights (65%). This underline the importance of maternal nutritional status for infant growth and development.

4.1 Statistical Analysis

There was a significant association between maternal nutrition status and birth weight ($\chi^2 = 18.6$, $p < 0.001$), according to the chi-square test.

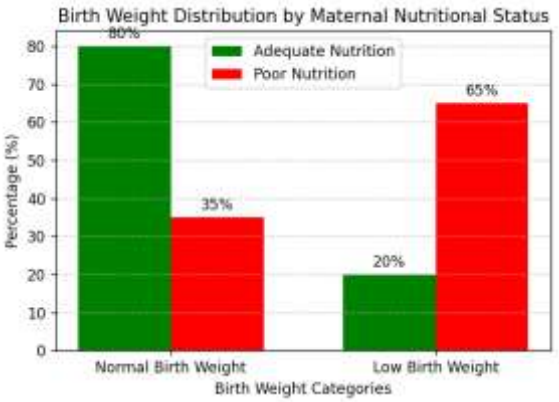

Fig.3.Compares proportions of birth weights among nutritional groups This figure 3 clustered bar graph illustrates a dramatic rise in LBW in malnourished women as compared to their well nourished counterparts.

Table.5. Neonatal Health Indicators

Indicator	Adequate Nutrition	Poor Nutrition
Healthy	75%	40%
Complications	25%	60%

As the above data illustrates, children of well-nourished mothers were more likely to be healthy (75%) and less likely to have complications depicted in table 5 than infants with poorly nourished mothers (60%). By comparison, infants of malnourished mothers had more complications (60%) and less health outcomes (40%) suggesting that maternal nutrition is associated with outcomes for the infant.

4.2 Statistical Analysis:

There was a significant association between maternal nutrition and neonatal complications ($\chi^2 = 12.4$, $p = 0.002$).

4.3 Findings

- Poor maternal nutrition increases the risk of LBW
- Neonatal complicationswere higher among undernourished mothers
- Good neonatal outcomes in mothers with adequate nutrition

4.4 Discussion

The results of this study confirm that good maternal nutrition has a major impact on health during pregnancy and the outcomes for the newborn. Proportions of low birth weight (65%) and neonatal complications (60%) were significantly greater among mothers who had poor nutrition than among mothers who had good nutrition. These findings indicate an association between maternal dietary insufficiency and impaired fetal development as well as susceptibility to poor neonatal outcomes. Such a link between low birth weight and inadequate maternal nutrition may be related to inadequate supply of nutrients needed to sustain the growth of placental and fetal tissue. Low-energy intake and protein may cause intra-uterine growth retardation, and subsequent low birth weight. Likewise, insufficient micronutrients, particularly iron and folate, may reduce oxygen delivery and cell growth leading to preterm birth and low birth weight respectively. In addition, the increased rate of complications in neonates born to malnourished mothers suggests that maternal nutritional status not only impacts on birth weight, but also neonatal health status. Malnutrition may diminish maternal and fetal immunity and resistance to infections, leading to enhanced vulnerability and complications in the neoborn. Conversely, well-nourished mothers showed improved neonatal health, confirming the notion that good nutrition facilitates optimal fetus growth and stability at delivery. This is in line with prior research which underscores that maternal malnourishment affects fetal growth, and healthy maternal diets promote healthy pregnancies. But this study builds on the existing literature by simultaneously considering both perinatal outcomes and more general indicators of the health of the newborn. However, this study has several limitations. The cross-sectional nature of the research does not allow for the inference of causality, the measures used for dietary recall may be prone to bias. Also, other factors like maternal illness and environmental determinants were not examined. To sum up, the findings highlight the importance of improving maternal nutrition by providing nutrition interventions, counseling, and enhancing

antenatal care services to improve perinatal outcomes and infant health status.

5. Conclusion and future scope

The aim of the study is to conclude that maternal nutrition is an important factor influence on perinatal and neonatal outcomes. The study findings show that maternal nutritional intake is a significant predictor of low birth weight, neonatal complications, and adverse health outcomes. On the other hand, good nutrition during pregnancy is associated with better fetal growth, normal birth weight, and fewer neonatal complications. The findings underscores the need for adequate intake of macronutrients and micronutrients during pregnancy. Good maternal nutrition has both short- and long-term consequences for offspring health. So enhancing maternal nutrition should be a priority in maternal and child health initiatives. The impact of nutritional deficiencies can be positively influenced to reduce risks associated with pregnancy, and improve infant survival and health.

6. Recommendations

- Strengthen maternal nutrition initiatives: Support maternal nutrition initiatives that offer nutrition advice, guidance and surveillance for pregnant women, especially in disadvantaged communities.
- Promote awareness of healthy dietary practices: Introduce community level educational initiatives to enhance the knowledge of dietary needs during pregnancy and promote nutritious food choices.
- Supplement maternal nutrition: Offer nutritional supplements (iron, calcium, folic acid, and multivitamins) through antenatal care programs.
- Enhance antenatal care: Ensure every antenatal visit includes nutritional assessment and counselling to detect and resolve nutritional deficiencies.
- Promote policy interventions: Health authorities and governments should implement policies to enhance the national level of food security and maternal nutrition.

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