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Maternal Nutrition to Long-Term Cardiometabolic Risk: A Descriptive Analysis of Nutritional Status, Gestational Metabolic Complications, and Long-Term Maternal Health

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Abstract

Background: Maternal nutritional status during pregnancy plays an important role in maternal health, fetal development, and the potential development of long-term cardiometabolic complications. Maternal dietary patterns, obesity, and gestational metabolic disorders may influence health outcomes in both mothers and offspring.

Objective: This study aimed to provide a descriptive overview of published literature concerning maternal nutrition, gestational metabolic complications, and their potential associations with long-term maternal and offspring cardiometabolic health.

Methods: A descriptive literature-based analysis was conducted using publications retrieved from PubMed and Google Scholar. Literature published between January 2016 and 2026 was considered. Relevant information, including publication year, journal, research focus, and major findings, was examined. The selected publications

were organized into major research themes through manual descriptive and thematic classification.
Results: The reviewed literature highlighted several major themes, including maternal nutritional requirements, dietary quality during pregnancy, gestational metabolic complications, maternal obesity, fetal programming, neurodevelopment, and long-term cardiometabolic outcomes. The literature also emphasized the potential relationship between maternal nutritional and metabolic conditions and the future health of offspring. Maternal nutritional education and appropriate dietary interventions emerged as important areas for improving pregnancy-related health outcomes.
Conclusion: Maternal nutrition is an important component of maternal and offspring health. Improving dietary quality, addressing gestational metabolic risk factors, and strengthening nutritional interventions during pregnancy may support better long-term health outcomes. Further longitudinal research is required to understand these associations and guide effective preventive strategies.

Introduction

Pregnancy-related maternal malnutrition is a widespread global health issue. Micronutrient deficiencies, which show impaired neurocognitive functioning processes, are closely associated with adverse child development outcomes. The shortcomings noted have been shown to be empirically related to poor academic performance and economic outcomes. Such an occurrence is due to the vital role that pregnancy plays in setting up the foundation for the development of mental, physical, and socio-emotional skills that develop from childhood to adulthood. As such, it is important to ensure that one maintains a healthy diet so as to assist in the appropriate brain development in the kids (de Matos Reis et al., 2024). An example of the current trend is the use of the “one-size-fits-all” strategy towards addressing the issue of maternal nutrition where individual characteristics that affect overall nutritional status of mothers are not considered. With the help of strategies that cater to dietary needs personalized nutrition allows women to improve their health. Examples of strategies include personalized supplementation, holistic lifestyle interventions, technology applications, and dietary assessments through blood biomarkers and genotyping (Brink et al. 2022).

The process by which an embryo, fetus or one or more offspring grows inside a womans uterus is referred to as "pregnancy." In addition to altering the skin and breasts, pregnancy has an impact on the musculoskeletal reproductive, endocrine, cardiovascular neurological, gastrointestinal, and immune systems. There are differences throughout the world, and it's thought that human pregnancies vary naturally as well. Preterm birth is defined as delivery occurring before 37 weeks of gestation. The entire gestational period is 39–40 weeks (Chandra et al., 2024). Pregnancy difficulties can have a detrimental effect on the outcomes for both the mother and the child, and there is mounting evidence that they are linked to health issues for the mother even after the pregnancy has ended. For instance, there is a well-established link between the risk of type 2 diabetes (T2DM) and gestational diabetes (GDM), but women's healthcare professionals are far less aware of other long-term health hazards after pregnancy difficulties (McNestry et al., 2023).

Dietary behaviors and nutrition of mothers have gained increased interest in scientific research studying the connection between pregnancy and future health outcomes. Pregnant women have access to dietary guidelines that will promote not only their health but also healthy fetal development. Parent-reported higher neurodevelopmental scores in childhood were associated with higher quality nutrition during pregnancy. It is crucial to validate the negative association between the intake of pork meat and neurodevelopmental scores in early childhood (de Lauzon-Guillain et al., 2022). Scientific literature on maternal nutrition and cardiometabolic health has various areas

of focus such as nutritional epidemiology, obstetrics, endocrinology, cardiology, and public health. Cardiometabolic health throughout the reproductive years is an important predictor of pregnancy outcomes as well as future cardiovascular disease risk for both the mother and her baby. Pregnancy is a unique opportunity for the use of primordial and primary prevention, as well as a unique physiological stress test. Some examples of cardiometabolic risk factors, which are closely associated with poor pregnancy outcomes and include hypertension, dyslipidemia, obesity, and hyperglycemia, carry a high lifetime risk of cardiovascular disease (Harrington et al., 2026).

The main goal of the current study was to conduct a descriptive analysis of the literature about maternal nutrition, metabolic conditions of pregnancy, and future cardiometabolic health of mothers. This study is intended to analyze the status of nutrition and diet of mothers during pregnancy, investigate the association of metabolic conditions of pregnancy with the health of mothers, consider the possible impact of maternal nutritional and metabolic conditions on the development of children, and define the major research directions.

Materials and Methods

Study Design

In order to understand the research trends of maternal nutrition and cardiometabolic risk, a literature-based descriptive analysis was performed. The analysis involved the examination of publication trends, topics of research interest, and the role of published literature about maternal nutrition, gestational metabolic conditions, and maternal/offspring long-term health outcomes. Publications from 2016 to 2026 have been included in the analysis.

Data Sources and Search Strategy

Relevant literature was gathered from two databases: PubMed and Google Scholar. A structured search strategy was created using keywords related to the study topic, such as " nutrition," "maternal diet," "gestational diabetes," "maternal obesity," "cardiometabolic risk," "metabolic programming," and "offspring health outcomes." Boolean operators, including AND and OR, were used to combine search terms and increase the relevance of retrieved publications. The search included studies published between January 2016 and 2026.

Eligibility Criteria

Studies were included if they focused on nutritional status, dietary habits during pregnancy gestational metabolic issues or how these factors relate to long-term cardiometabolic health in both mothers and their children. We looked at research studies and important review papers. We left out anything that did not deal with nutrition or cardiometabolic health, as well as duplicate entries to keep the selected studies clear, relevant and trustworthy.

Data Extraction and Analysis

The important details were taken from the chosen articles. This included the year they were publishing the title of each article, the people who wrote them the name of the journal, what the research was, about and what they found. All this information was put into groups to look at how many articles there were, which journals had them and what the main topics were. People looked at each article carefully to find out the subjects of how what mothers eat affect their health and the health of their babies and what new areas of research are starting to appear.

Ethical Considerations

The study was based on literature that had already been published and on bibliographic information that is publicly available. The study did not involve any contact with human participants or the gathering of personal data. As a result, the study did not need approval.

Results

Publication Selection and Dataset Characteristics

The preliminary literature collection contained twenty-four references that were published between 2016 and 2026. The selected references covered nutritional requirements, maternal dietary quality, gestational metabolic complications, maternal obesity, fetal programming, and long-term cardiometabolic outcomes for mothers and their children. The references also included studies on education, neurodevelopment, breastfeeding, and nutritional interventions. These references came from twenty journal titles. The references comprised narrative reviews, scoping reviews, systematic reviews, meta-analyses and other research articles. One reference, (Murthi and Vaillancourt, 2020) was clear. Another reference, (Islam et al., 2022) discussed exercise snacks and general cardiometabolic health rather, than maternal nutrition specifically. Because of this, the references were treated as a literature collection and not a final bibliometric dataset. Further screening of the references will be needed to confirm eligibility verify publication metadata to remove references and ensure that all references address the research objectives.

Table 1. Preliminary characteristics of the supplied reference set

Characteristic	Result
Total references supplied	24
Publication period	2016–2026
Distinct journal titles	20
References explicitly identified as retracted	1
Remaining references before eligibility screening	23
Final eligible bibliometric records	Not yet established

Note: Figures describe the references supplied by the author, not a comprehensive database search.

Annual Distribution of Selected Publication

The references provided cover a time span from 2016 to 2026. The years 2024 and 2025 had references with five each. These two years together make up 10 out of the 24 references, which's 41.67% of the total. The way the references are spread shows that the list focuses a lot on research about maternal nutrition, gestational metabolic risk, and long-term health effects. The 2024 references looked at nutrition during pregnancy, maternal education, diet quality, and child development. The 2025 references dealt with risks, weight gain during pregnancy, and obesity during pregnancy. There were four references from 2026 covering topics like heart health during pregnancy changes, in lipids and stress, nutrition and baby outcomes and overnutrition and how it affects the baby. This pattern is based on the references that were chosen for this collection. It does not establish a global increase in scientific productivity because the number of publications retrieved from each year has not been determined through a systematic database search.

Table 2. Annual distribution of supplied references

Publication year	Number of references	Percentage
2016	1	4.17%
2020	1	4.17%
2021	2	8.33%
2022	4	16.67%
2023	2	8.33%
2024	5	20.83%
2025	5	20.83%
2026	4	16.67%
Total	24	100.00%

Note: Percentages were calculated using all 24 supplied references.

Leading Journals and Publication Sources

The 24 references provided came from 20 journals. Clinical Nutrition ESPEN and Nutrients each appeared four times. No: Clinical Nutrition ESPEN appeared twice while Nutrients appeared four times. The other 14 journal names each appeared once in the list. Clinical Nutrition ESPEN included (Talebi and Mehdizadeh, 2024) which looked at needs during pregnancy and breastfeeding and (Calcaterra et al., 2025) which studied breastfeeding and mothers exercise in relation to heart and metabolic health. Nutrients had articles about mothers' nutrition and brain development, risks of heart and metabolic issues during pregnancy, obesity during pregnancy, and mothers' nutrition and baby's health. These included (Cortés-Albornoz et al., 2021) (Naowar et al., 2024) (Jahan-Mihan et al. 2025) and (Capra et al., 2026). Other journals that were included were European Journal of Nutrition JAMA Network Open, Nutrition Reviews, Advances, in Nutrition JACC: Advances and Cells. Their presence shows that the literature covers areas, including nutrition, mother and reproductive health, metabolic medicine, development of biology and heart research. The number of times a journal is listed should not be seen as how much that journal contributes to the field.

Table 3. Journals represented in the supplied literature

Journal	References
Nutrients	4
Clinical Nutrition ESPEN	2
BMC Pregnancy and Childbirth	1
International Journal of Child Care and Education Policy	1
eClinicalMedicine	1
Clinics in Perinatology	1
European Journal of Nutrition	1
JAMA Network Open	1
Nutrition Reviews	1
Agriculture Reviews: An International Journal	1
Nutrition	1
Advances in Nutrition	1
JACC: Advances	1
Biochimica et Biophysica Acta—Molecular Basis of Disease	1
Exercise and Sport Sciences Reviews	1

International Journal of Molecular Sciences	1
Diabetes & Metabolic Syndrome: Clinical Research & Reviews	1
Cells	1
Frontiers in Physiology	1
Proceedings of the Nutrition Society	1
Total	24

Note: Nutrients appeared four times and Clinical Nutrition ESPEN twice; the other 18 titles appeared once each.

Major Research Contributions and Representative Publications

The material provided includes works by authors who looked into parts of how a mother's diet affects her health and the health of her baby. (Mohamed et al., 2022) looked at what people ate their nutrition levels and the weight of babies born in Malaysia. (Van Der Pligt et al. 2023) Looked at how good a mother's diet was and how that relates to the fats in her blood and her heart health during pregnancy. One study by (Niu et al. 2025) looked at risk factors for heart and blood sugar problems during pregnancy. How that affects the blood pressure of the child. (Wen et al., 2025) looked at how weight a mother gain during pregnancy and how that connects to heart and blood sugar problems in the child. (Jahan-Mihan et al., 2025) looked at the ways that being overweight during pregnancy affects the health of both mother and child. (Schiera et al., 2026) looked at what happens when a mother eats a lot and how that affects the baby's development, including possible effects on metabolism, thinking and how genes work. These papers show the variety of research included in the group. However, the list of references does not show which authors or organizations did the work. To find out who is the productive, a dataset with names written the same way and with consistent information, about where the authors' work is needed.

Table 4. Representative author contributions

Research area	Representative publication
Maternal diet and infant birth weight	Mohamed et al. (2022)
Maternal diet quality and pregnancy cardiometabolic health	Van Der Pligt et al. (2023)
Maternal cardiometabolic risk and offspring blood pressure	Niu et al. (2025)
Gestational weight gain and offspring cardiometabolic risk	Wen et al. (2025)
Gestational obesity and maternal–offspring health	Jahan-Mihan et al. (2025)
Maternal overnutrition and fetal programming	Schiera et al. (2026)
Maternal lipid profile and oxidative stress	(Jovanovic et al., 2026)
Bibliometric trends in gestational diabetes and cardiovascular health	(Jia et al., 2024)
Maternal diet and developmental origins of cardiometabolic disease	(Costa-Silva et al., 2016)

Note: Representative contributions only; this is not an author or institution's productivity ranking.

Geographical Representation of the Selected Literature

The supplied references covered research questions, for populations and research settings. I notice that (Mohamed et al., 2022) studied diet, maternal nutritional status and infant birth weight in Malaysia. Other works explored nutritional status, pregnancy-related metabolic complications, and long-term health outcomes. The collection covers nutrition, epidemiology, maternal health, pediatrics, and cardiovascular research. Still, the country where a study was done must be separated from the authors' institutional affiliations. These variables are necessary for a country level bibliometric analysis. Complete affiliation information was not provided in the supplied list. Consequently, publication counts, by country the leading contributing countries and international co-authorship links cannot be calculated reliably from the references. A country's collaboration analysis should use standardized institutional affiliation data and a clearly specified counting method. A country co-authorship network can then be generated to identify the strength and distribution of research relationships.

Table 5. Status of country-level indicators

Indicator	Status
Country of study	Identifiable for selected references
Author affiliation countries	Requires complete records
Publications per country	Not yet calculated
International collaboration links	Not yet calculated
Country collaboration network	Not yet generated

Note: The country where a study was conducted is distinct from the countries of authors' institutional affiliations.

Major Research Themes identified in the literature

A first look at the titles given found an area of research that is connected. These areas were, about the food a mother needs, the food a mother eats problems that happen during pregnancy, how a baby develops, and how a mother and her baby's heart and blood sugar health lasts a time.

Maternal Nutrition and Fetal Development

(Talebi and Mehdizadeh, 2024) looked at what women and those who are breastfeeding need to eat. (Jain et al., 2022) talked about what mothers eat and how it affects their babies. (Reis et al., 2024) studied how what mothers eat affects the brain development of their children.

Maternal Diet and Gestational Cardiometabolic Health

(Naowar et al., 2024) examined magnesium and vitamin D in relation to cardiometabolic risk during pregnancy. (Van Der Pligt et al., 2023) looked at how the quality of a mother’s diet influences plasma lipid levels and overall cardiometabolic health during pregnancy. (Harrington et al., 2026) investigated health in pregnancy. The long-term effects it might have.

Maternal Obesity and Fetal Programming

(Jahan-Mihan et al., 2025) examined how gestational obesity is connected to both health and the health of their children. (Schiera et al., 2026) studied maternal. It's possible long-term effects, on metabolism, thinking and genetic changes. (Inzani and Ozanne 2022) explained that maternal obesity could lead to heart and blood health in children.

Long-Term Cardiometabolic Outcomes

(He and Stein, 2021) studied life nutritional interventions and their impact on later cardiometabolic outcomes. (Niu et al., 2025) looked at cardiometabolic risk factors and how they relate to offspring blood pressure. (Wen et al., 2025) examined weight gain and its effect on offspring cardiometabolic risk factors.

Maternal Education and Nutritional Status

(Prasetyo et al., 2023) reviewed how mothers learn about nutrition and how that knowledge affects their kids' health. (Rezaeizadeh et al., 2024) looked at how a mother's schooling level relates to how her child grows during the two years of life. The early grouping of the studies shows that the papers link what moms eat with changes in the mother's body during pregnancy and with health and heart issues, in the children. These groups, however, were made from the titles and short descriptions of the papers not from a full keyword-co-occurrence analysis.

Table 6. Preliminary Thematic Classification

Theme	Representative publications
Maternal nutritional requirements	Talebi and Mehdizadeh (2024); Jain et al. (2022)
Maternal diet quality and pregnancy health	Mohamed et al. (2022); Van Der Pligt et al. (2023)
Gestational metabolic risk	Naowar et al. (2024); Harrington et al. (2026)
Maternal obesity and fetal programming	Inzani and Ozanne (2022); Jahan-Mihan et al. (2025); Schiera et al. (2026)
Neurodevelopment and fetal outcomes	Cortés-Albornoz et al. (2021); Reis et al. (2024)
Long-term offspring cardiometabolic outcomes	He and Stein (2021); Niu et al. (2025); Wen et al. (2025)
Maternal education and child nutrition	Prasetyo et al. (2023); Rezaeizadeh et al. (2024)
Maternal lipid profile and oxidative stress	Jovanovic et al. (2026)
Bibliometric trends in gestational diabetes and cardiovascular health	Jia et al. (2024)
Maternal diet and developmental origins of cardiometabolic disease	Costa-Silva et al. (2016)

Note: Themes were classified from supplied titles and descriptions; they are not software-generated keyword clusters.

Emerging Research Themes and Knowledge Gaps

Preliminary literature synthesis shows research directions that deserve deeper study. First, the quality of a mother's diet and the metabolic health related to pregnancy are areas to explore further. The articles we looked at talk about diet quality, plasma lipid levels, and how nutrients affect heart and metabolic risk. Future studies could look at how a mother's eating patterns link to metabolic outcomes during pregnancy and after the baby is born. Second, the long-term effects of metabolic risk during pregnancy need research. Papers by (Niu et al., 2025) and (Wen et al., 2025) discuss how a mother's risk factors or weight gain while pregnant relate to the child's heart and metabolic health. Long-term studies could help explain how pregnancy exposures shape health later in life. Third, maternal obesity and fetal programming are themes in the papers we reviewed. (Jahan-Mihan et al., 2025) (Inzani and Ozanne, 2022) and (Schiera et al., 2026) Explain how a mother's nutrition and metabolic state may affect the baby's development. More research could investigate how much each element of

diet, metabolic health and environmental influences contributes to outcomes. Fourth, maternal nutrition and neurodevelopment are areas that deserve attention. Studies by (Cortés-Albornoz et al., 2021) and (Reis et al., 2024) explore how maternal nutrition affects outcomes. Future studies could combine assessments with long-term tracking to get a clearer picture. Fifth postpartum maternal cardiometabolic health should be studied alongside issues that happen during pregnancy. Research that looks at breastfeeding, exercise, diet quality and metabolic health could help identify ways to prevent problems and support care after birth. Finally the current reference collection is not enough to determine which topics are growing fastest or which ones are not studied enough. To make these conclusions, we need time-based keyword analysis, broader database access, and a look at how publication trends change.

Discussion

From the current descriptive analysis, it is evident that there is a link between the level of maternal nutrition, metabolic complications in pregnancy, and health outcomes of the mother and the child. The articles mentioned focus on the importance of good nutrition and healthy diets in pregnancy as a way of maintaining the health of the mother and ensuring the proper development of the child. It was seen that metabolic conditions such as obesity, excessive weight gain in pregnancy, and gestational diabetes were key factors associated with metabolic complications in pregnancy and the risk of developing diseases in the future.

Another important aspect is programming. This is an approach whereby the health status of the mother, in terms of nutrition and metabolic condition during pregnancy, influences the metabolic status and development of the baby. Programming also includes aspects of brain development in children and in adults, nutrition knowledge of the mother, and the importance of having nutrition plans during pregnancy.

Limitations

However, there were some limitations in this study. Firstly, the search for literature was conducted only in PubMed and Google Scholar, thus there is a possibility that the papers which are indexed in other databases were not taken into account. Secondly, the analysis was conducted only on a selection of publications rather than conducting a thorough literature review of all the papers in the field. Finally, the lack of homogeneity in the design, population and outcomes of the studies made comparison difficult. Furthermore, thematic classification was performed manually based on the title and description of the papers.

Conclusion

Maternal nutrition influences pregnancy outcomes. Moreover, maternal nutrition can be an influential factor affecting the cardiometabolic health of women and their children. It is evident from the literature review conducted that maternal nutrition, maternal diet quality, nutrition and gestational diabetes, maternal obesity, and fetal programming are the main topics that should be researched. Promoting health literacy through healthy nutritional habits can improve the health status of mothers and their children. More long-term research is required to explore the impact of maternal nutrition and metabolic disorders on health and develop effective interventions.

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