

A Mini-Review: Investigating the Interplay of Maternal Diet, Fasting in Ramadan, and Their Collective Impact on Pregnancy and Fetal Outcomes

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ABSTRACT

Background: This study delves into the intricate relationships between maternal dietary choices, fasting practices during pregnancy, and their impacts on birth outcomes and child health. It examines the influence of individual food items, adherence to the Mediterranean diet (MD), and the effects of a vegetarian diet, aiming to provide insights for optimizing maternal and neonatal healthcare.

Aims: The primary aim of this research was to investigate the associations between different dietary factors and various birth outcomes. Additionally, it aimed to assess how adherence to the MD affects both gestational and neonatal outcomes. Furthermore, the study sought to scrutinize the effects of fasting during pregnancy and evaluate the consequences associated with adopting a vegetarian diet. By achieving these aims, the research endeavors to provide insights for refining maternal and neonatal healthcare practices.1.3.

Methodology: This study systematically reviewed 48 articles from PubMed and PubMed Central, focusing on the impact of Ramadan fasting, vegan, vegetarian, and Mediterranean diets on pregnancy and fetal outcomes. Through rigorous screening, 21 articles were selected, adhering to predefined inclusion criteria. Full-text assessments were conducted, extracting data, including study design, sample, methodology, results, and conclusion. Quality assessment ensured a robust review process. This methodology aimed to investigate the specific impact of targeted dietary practices on pregnancy and fetal outcomes.

Results: The findings indicate that specific dietary components play significant roles in influencing various birth outcomes. Protective effects were observed for certain elements such as fibers, potatoes, and plant-based proteins, while risks were associated with the consumption of sugar-sweetened beverages, certain animal proteins, and specific types of fats. Moreover, adherence to the MD was found to have protective effects against conditions like asthma and cardiometabolic risks, as well as certain birth anomalies. However, it showed associations with higher rates of growth restriction and lower birth weights if not adhered to diligently. Fasting during pregnancy exhibited varied outcomes, including lower birth weight, increased likelihood of labor induction, and higher rates of C-sections. Additionally, following a vegetarian diet was positively associated with prolonged breastfeeding but posed challenges such as a higher incidence of hypospadias.

Conclusion: In conclusion, this research sheds light on the complex relationships between maternal dietary patterns, fasting practices, and a range of birth outcomes. The identified protective and risk associations for specific foods, the nuanced impacts of MD adherence, and the diverse outcomes of fasting during pregnancy highlight the importance of tailored nutritional guidance in maternal care. These findings contribute to a more comprehensive understanding of the multifaceted factors influencing maternal and neonatal health and lay the groundwork for developing targeted interventions and healthcare strategies to optimize outcomes during and after pregnancy.

Keywords: Pregnancy; Diet; Gestation; Fetal Health; Fasting

Introduction

Pregnancy is a 39 to 40-week process in which the newborn is given birth to at full-term [1]. It starts from fertilization of the ovum by the sperm until the fetus is born. Such a lengthy process can be affected by a multitude of factors such as the restriction of diet in the context of fasting as well as the different types of macromolecules that are consumed during the time of pregnancy. Predominant food types and dietary restrictions could play a major part in the outcomes of the newborn and the mother during her 9 months of pregnancy. One of the outcomes mainly affected by these changes is the predisposition of the mother to Gestational Diabetes Mellitus (GDM). Fasting has always been a cultural and religious practice done by many societies, it was first dated as old as 1500 B.C. and was used as a cure as well back in the times of Ancient Greece as seen through the teachings of Aristotle and Pythagoras [2]. Fasting in Ramadan has always played a big part in the Islamic community. Refraining from food from the time of dawn until the time of sunset was always a religious obligation that comes from following the teachings of the Prophet Muhammed Peace and Blessings may be upon him [3]. Although pregnant Muslim women aren't obligated to fast during the month of Ramadan, some still find it more convenient to fast in this allocated month as it is seen as more socially acceptable and convenient [4].

Surveys indicate that more than 50% of pregnant women still choose to fast during the month of Ramadan, despite being exempted because of their maternal duties [5]. This builds an emphasis on the importance of knowing the effects of fasting on the woman's and her newborn's health as well as the outcomes of the impact of refraining from food and water. Gestational Diabetes Mellitus (GDM) poses a significant risk during pregnancy, impacting both the mother and newborn. While the Quality of Life for pregnant women with GDM doesn't differ significantly from those with a healthy record, the condition is associated with adverse neonatal outcomes like macrosomia and stillbirth [6,7]. Maternal complications, such as pregnancy-induced hypertension and postpartum hemorrhage, are linked to GDM, along with an increased likelihood of needing a C-section according to a study in Ethiopia [8]. In the United Arab Emirates, where GDM prevalence ranges from 8.4% to 27.1%, the condition has a notable impact on maternal and newborn outcomes [9]. Dietary food changes as well

as fasting have been seen to significantly affect the predisposition of the pregnant mother to GDM. These findings have been thoroughly studied and multiple results have been published about the relationships between dietary habits, fasting, and macromolecule intake on the predisposition of a mother to getting GDM.

Methodology

A comprehensive search was conducted on the PubMed and PubMed Central databases, employing keywords such as "diet during pregnancy" and "fasting during pregnancy." The initial search aimed to identify articles related to the impact of diet and fasting on pregnancy and fetal outcomes without imposing restrictions on publication dates. Inclusion criteria were established to focus exclusively on studies addressing Ramadan fasting, vegan, vegetarian, and Mediterranean diets during pregnancy. Following the initial search, 48 articles were identified, and after subsequent screening, the selection of 21 articles was finalized by excluding those not aligned with the study's agenda. Full-text reviews were performed to confirm the relevance of the articles, and the final selection underwent detailed data extraction, including study design, sample, methodology, results, and conclusion. A total of 4 PubMed Central and 17 PubMed articles were used in the final section of the review.

Impact on Pregnancy

Diet

The bettering of diet and its quality has always been known to improve the quality of life in both the pregnant mother and the fetus as it helps in impacting both the physiology and growth of the newborn [10]. It has been observed that bettering the quality of a diet helped in decreasing the incidence of heart defects in newborns and bettering their quality of life [11]. Most of the studies focused on the changes different diets had on the birth weight of the fetus and if it could decrease the incidence of small-for-gestational-age (Figures 1 & 2). This was found that a well-planned balanced diet and taking proper supplements on the side helped in achieving that [12]. This review helps focus on the two main dietary plans that have been used on pregnant women: The well-established vegan and vegetarian diet as well as the Mediterranean Diet (MD) which has been associated a lot with pregnancy and fetal outcomes.

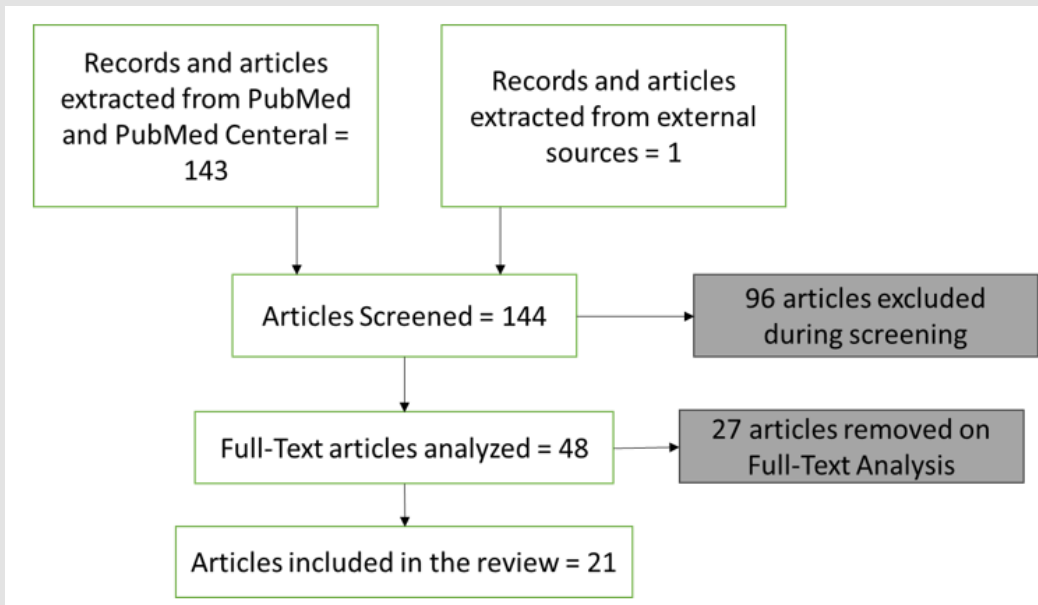


Figure 1.

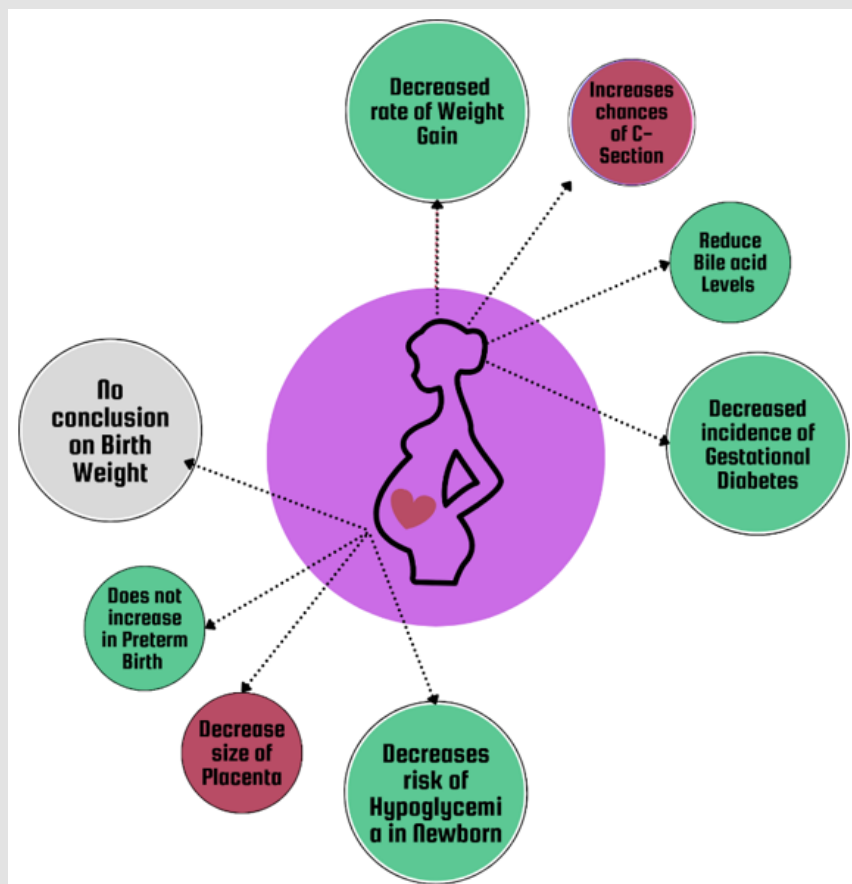


Figure 2.

a) **Mediterranean Diet:** Within the expanding field of research on maternal nutrition, it becomes increasingly clear that dietary choices play a crucial role in prenatal health. Multiple studies highlight that adhering to an MD during pregnancy significantly influences the health and development of infants. A study conducted by Chatzi, L. et al. compared 997 mother-child pairs from Project Viva in the USA with 569 pairs from the Rhea study in Greece, revealing higher adherence to the MD among pregnant women in the Rhea cohort [13]. This increased adherence correlated with better cardiometabolic traits, showing lower systolic and diastolic blood pressure and decreased serum leptin levels in offspring. In a study done in the Netherlands, it was observed that adherence to the MD reduced the risk of spina bifida, likely attributable to the elevated levels of folate and vitamin B12 in this dietary pattern [14]. However, low adherence to the MD has been associated with adverse pregnancy outcomes. A study in Greece found that low adherence to the MD leads to higher intrauterine growth restriction and lower birth weights [15]. Regarding prematurity-related complications, the low MDA group was more likely to develop necrotizing enterocolitis, bronchopulmonary dysplasia, and retinopathy of prematurity. Beyond its positive impact on maternal physical health, adherence to the MD during pregnancy is not only associated with favorable outcomes in terms of offspring's physical well-being but also demonstrates a beneficial influence on their psychological behaviors. Notably, low adherence to the MD has been positively linked to increased child externalizing problems, such as aggression and inattention, as indicated by a study conducted by Jolien Steenweg-de Graaf, et al [16].

b) **Vegetarian and Vegan Diets:** With the rise in popularity of vegetarian and vegan diets, it is important to understand their effects on pregnant women and whether or not they should be avoided. In a study that enrolled 273 women, of whom 60 were vegans, researchers compared many diets in an observational study, and it was found that vegan pregnant women had a higher chance of having low-for-gestational-age babies and a lower birth weight in comparison to omnivores [17]. Another large longitudinal study that was published in 2000 with a population of 7928 boys born to mothers participating in this study found that vegetarian mothers have an increased incidence of giving birth to a baby with hypospadias (2.2%) compared to omnivores (0.6%) [18]. It was found in a prospective cohort study that took place in the United Kingdom to link the vegetarian diet with the thinking ability of children that the gestational age at birth of vegetarian mothers was mildly elevated as opposed to that of omnivores, and no association was found with the IQ of children aged 6-7 years [19].

Fastening

The importance of fasting and its religious background give ground to question the impact of fasting during the month of Ramadan on both neonatal and maternal outcomes. In a study done in Iraq, 301 participants were put into the study and 155 of them fasted

during Ramadan [20]. Safari was able to associate a 0.4 kg weight difference in the pregnant women who fasted compared to those who did not. Another major association was a sharp decrease in gestational diabetes mellitus (GDM) in the fasting group. This finding was challenged by Hisham who found the presence of a higher incidence of GDM in fasting groups in comparison to the control [21]. The method of intermittent fasting was used here rather than through the proper Ramadan fasting done by the mothers in the 2019 study in Iraq which found a protective factor against GDM. In another experimental study done in Karachi where they tested the effects of fasting on pregnant women with GDM on maternal and neonatal outcomes, no associations were witnessed [22]. The association between birth weight and fasting helps us understand the great impact of whether a mother would be advised to go for fasting or refrain from it. A study done in Mainz, Germany on 326 Muslim mothers found that reduced birth weight was associated with fasting [23]. This result was further supported by multiple results of two other studies that have discovered a similar decrease in the birth weight of the newborn [24,25]. Still, with that finding, an association with a high-fat diet during meal times in Ramadan helped recover the weight reduction that was associated with fasting in the beginning.

Another study done in Tehran, Iran found no association between the neonatal birth weight and mothers who fasted across the month of Ramadan [26]. Finally, the results discovered by Savitri et al. in their other study on 1,620,757 residents compared the neonatal outcomes of those who fasted and those who did not and found it to not prove any specific associations at all [27]. In a study done in Sydney, longer exposure during Ramadan was associated with increased levels of bilirubin and decreased incidence of hypoglycemia in newborns [28]. Overall, multiple outcomes were discovered in association with fasting in the month of Ramadan in pregnant women but a proper conclusion on the matter is still to be studied. In a study consisting of 240 pregnant women an amniotic fluid index has shown a significant increase in women who fasted in their second trimester during Ramadan [29]. Also, the same study associated an increase in a pregnant mother's weight with fasting during Ramadan. Another finding seen in Saudi Arabia was a decrease in placental weight in the women who fasted during Ramadan [30]. It has been seen that no proper and finalized association was concluded although multiple different articles have discussed the same associations in different parts of the world. This raises a big gap in the literature that should be answered by conducting more systemic and meta-analytic research on the matter to provide conclusive insights, particularly regarding the perspectives on fasting during Ramadan and its impact on both maternal and neonatal outcomes.

Conclusion

In this ever-changing field of obstetrics that has been there since the dawn of time, humans have always tried to better their ways and

find exclusive evidence on testing and trying out methods to help have their pregnant women and their newborns the best health outcomes as a healthy newborn means a successful continuation of the lineage. The impact of Ramadan fasting on neonatal and maternal outcomes presents conflicting findings, with studies reporting both positive associations, such as reduced gestational diabetes and birth weight, and contradictory results. Methodological variations and regional differences contribute to the complexity of understanding this relationship and more evidence is needed to form a more logical claim on the matter. Meanwhile, diet has been always a been another hot topic in the realm of expected outcomes for the mother and her child. A big pool of evidence is present in the literature that helps reach the conclusion of the benefits of using a MD for both the outcomes of the mother and her newborn.


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