EFFECTS OF MATERNAL OBESITY ON QUALITY OF LIFE, FETAL DEVELOPMENT AND BIRTH OUTCOMES: A SYSTEMATIC REVIEW

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Abstract

Objectives: To compile the developmental and birth outcomes in obese women

Methods: A thorough search of pertinent databases was done in order to find studies that satisfied the requirements for inclusion. A thorough search of PubMed, Web of Science, SCOPUS, and Science Direct was conducted to find pertinent literature.

Results: Ten studies, including a total of 763,265 obese women were included in our data. Nine studies considered a BMI ≥30 kg/m2 as obesity, while only one study used 25 kg/m2 as a cut-off point for obesity. Four studies reported that maternal obesity was a significant and modifiable risk factor for stillbirth incidence. Maternal obesity has also been associated with an increased risk of macrosomia, lower APGAR scores at one minute, lower APGAR scores at five minutes, increased rates of newborn critical care unit admissions, and birth defects.

Conclusion: The development of birth outcomes appears to be significantly influenced by maternal fat. To infer which maternal exposure has a greater effect on the development of childhood obesity is currently impossible due to a lack of evidence. Effective public and personal health programs that maximize gestational weight gain and minimize prepregnancy weight are desperately needed.

Keywords: Maternal obesity; Prepregnancy obesity; Birth outcomes; Systematic review.

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Introduction

With 13% of adults worldwide believed to be obese, obesity is a global public health concern that has tripled in frequency since 1975. Likewise, there has been a significant increase in the prevalence of overweight and obesity among children and teenagers; 50 million girls and 74 million boys between the ages of 5 and 19 are thought to be obese globally [1].

Complex exposures with behavioral, psychological, and biological roots interact to cause obesity [2, 3]. Two aspects contribute to the pathophysiology of obesity: the first is a continuous positive energy balance that arises when energy intake surpasses energy expenditure; the second is a major obstacle to treating obesity and involves raising the body weight's "set point" [4]. Due to increased calorie intake, diet has a significant impact on the development of obesity. However, there are other environmental factors that also increase the risk of obesity, such as sedentary lifestyles, exposure to the environment, and developmental factors like genetic and epigenetic factors [4].

While there is insufficient evidence on the combined impacts of these exposures at various points in time [5, 6], there have been several studies looking into the relationship between maternal obesity and childhood obesity. Most of these studies have focused on the impact of maternal overweight and/or obesity at individual time points, such as pre-pregnancy [7], during pregnancy [8], post-natal [9], and during childhood [10].

The primary aim of this systematic review was to synthesize existing literature, identify knowledge gaps, and provide insights for future research and clinical practice. The findings of the literature were compiled to throw light on the developmental and birth outcomes in obese women.

Methods

For the purposes of this systematic review, we complied with the guidelines provided in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [11]. A database search was conducted electronically to locate English-language research using PubMed, Web of Science, SCOPUS, and Science Direct. Relevant keywords were included in the search strategy for these situations; "Maternal obesity," "Prepregnancy obesity," "Fetal outcomes," and "Birth outcomes." To evaluate the quality of the included research, the writers independently examined the search results, selected relevant papers, gathered information, and applied the appropriate evaluation techniques.

Eligibility Criteria:

Inclusion Criteria:

1. Studies reported the birth outcomes among obese women.
2. Studies conducted between 2022-2024.
3. Studies published in the English language.
4. Randomized controlled trials, cohort studies, case-control studies, and cross-sectional studies.

Exclusion Criteria

1. Studies not published in English.
2. Review articles, case reports, letters to the editors, commentaries, and case series.
3. Studies with insufficient data or unclear methodology.
4. Studies with overlapping data or duplicate publications.

Data Extraction

To ensure accuracy, Rayyan (QCRI) was utilized to check the search results [12]. The relevance of the titles and abstracts that the search turned up was assessed using the inclusion and exclusion criteria. The study team gave careful consideration to the papers that met the inclusion conditions. Disagreements were resolved by consensus. Using a predetermined data extraction form, key study data, such as titles, authors, publication year, study location, gender distribution, age, obesity cut-off point, BMI, and birth outcomes were documented. To evaluate the possibility of bias, an impartial assessment instrument was created.

Data Synthesis Strategy

In order to provide a qualitative evaluation, summaries of the research findings and elements were prepared using data from relevant studies. Once the data collection for the systematic review was completed, the optimal approach to utilizing the included studies' data was determined.

Risk of Bias Assessment

The quality of the study was evaluated using the critical assessment criteria for studies reporting prevalence data, as outlined by the Joanna Briggs Institute (JBI) [13]. There were nine questions on this tool. A good response received a score of one, while a negative, unclear, or irrelevant response received a score of zero. The scores below 4, between 5 and 7, and above 8 will be classified as low quality, moderate quality, and high quality, accordingly. Researchers separately assessed the studies' quality, and disagreements were resolved through dialogue.

Results

Systematic search outcomes

After 596 duplicates were removed, a total of 1222 study papers were found through a systematic search. After 626 studies had their titles and abstracts evaluated, 511 papers were discarded. Merely 6 articles were not located out of the 115 reports that were required to be retrieved. 109 articles passed the screening process for full-text evaluation; 75 were rejected due to incorrect study results, 22 due to incorrect population type, and 2 articles were editor's letters. Ten research publications in this systematic review satisfied the requirements for eligibility. An overview of the procedure used to choose the research is illustrated in (Figure 1).

Sociodemographic features of the comprised studies

The research publications' sociodemographic information is displayed in (Table 1). Ten studies, including a total of 763,265 obese women were included in our data. Five studies were retrospective cohorts [17, 19, 20, 21, 23], three were prospective cohorts [15, 18, 22], and two were cross-sectional studies [14, 16]. Four studies were conducted in the USA [16, 17, 20, 21], two in Saudi Arabia [10, 22], one in Japan [15], one in Austria [18], one was multicentered [19], and one in Australia [23].

Clinical outcomes (Table 2)

Nine studies considered a BMI ≥30 kg/m2 as obesity, while only one study used 25 kg/m2 as a cut-off point for obesity [16]. Four studies reported that maternal obesity was a significant and modifiable risk factor for stillbirth incidence [15, 16, 17, 19, 23]. Maternal obesity has also been associated with an increased risk of macrosomia [14, 21, 22], lower APGAR scores at one minute [14, 20], lower APGAR scores at five minutes [19, 20], increased rates of newborn critical care unit admissions [14, 20], and birth defects [23].

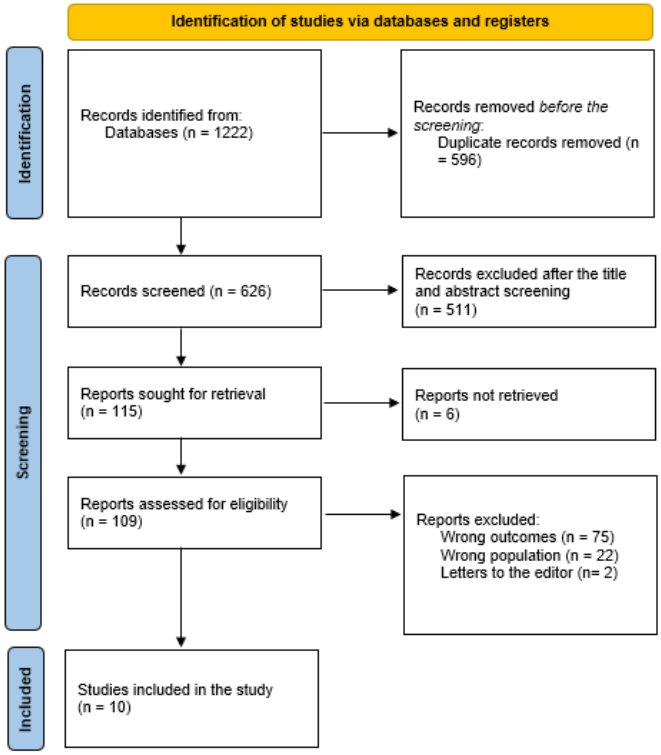

Figure 1. Study decision is summed up in a PRISMA diagram.

Discussion

This comprehensive review demonstrated that maternal obesity was a significant and modifiable risk factor for stillbirth incidence in four reports [15, 16, 17, 19, 23], this was consistent with the findings of a review conducted by Lassi & Bhutta [24]. The underlying mechanism of the reported correlation between stillbirth and obesity is currently unknown and is probably complex. Gestational diabetes mellitus and gestational hypertensive disorders are risk factors for stillbirth that are more common in obese women. Increased apneic hypoxic episodes among obese women may play a significant impact, according to some researchers [25].

Changes in maternal metabolism [26] and the pro-inflammatory state linked to obesity have been proposed as potential contributory factors [27]. Elevations of the mother's body mass index during the first trimester of pregnancy are positively correlated with the levels of C-peptide, a byproduct of insulin synthesis, and the amount of glucose in the cord blood after birth [28]. Fetal hyperglycemia and hyperinsulinemia are significant risk factors for fetal hypoxia, according to research conducted in both humans and animals [29]. Additionally, obese women had higher rates of chorioamnionitis and cord problems [30, 31], which could be harmful to the developing fetus. There is, however, a dearth of information regarding the possible reasons behind obese women's higher risk of stillbirth.

We also found that maternal obesity has also been associated with an increased risk of macrosomia [14, 21, 22], lower APGAR scores at one minute [14, 20], lower APGAR scores at five minutes [19, 20], increased rates of newborn critical care unit admissions [14, 20], and birth defects [23]. Gaudet et al. reported that fetal overgrowth is linked to maternal obesity. If the baby is huge for gestational age (≥90th percentile), there is an increased chance of having an overly large birth [32]. A complex physiological process, fetal growth is controlled by a combination of fetal and maternal factors, such as environment and genes. It is probable that maternal obesity causes macrosomia through mechanisms such as elevated insulin resistance, which raises fetal glucose and insulin levels (even in non-diabetic women) [33].

Evidence supporting the efficacy of therapies aimed at achieving ideal pre-pregnancy weight is desperately needed. This review demonstrates that encouraging daily, persistent improvements in diet and exercise with the backing of a support network leads to increased physical activity and weight loss.

A multimodal strategy is needed to avoid children obesity, and more prospective research is required to identify the maternal exposure that may be a higher predictor of childhood obesity. The results of this systematic review are consistent with earlier reviews and observational research, as was previously said, and they demonstrate a strong correlation between each exposure and the emergence of juvenile obesity. The review's overall findings indicate a high correlation between maternal weight status and exposure. We have not yet shown whether mother obesity throughout childhood is a stronger predictor of childhood obesity, despite the fact that prior research has demonstrated that maternal obesity before pregnancy is a stronger predictor of childhood obesity [34, 35], relative to other exposures. Public health policies should focus on obesity prevention and intervention during the pre-conception stage and for future pregnancies in order to affect a change in the intergenerational obesity that is observed worldwide [34, 36]. They should also customize public health messages for all women of childbearing age, emphasizing the value of maintaining a healthy body weight and diet throughout life.

Strengths and limitations

An expert librarian provided support in developing the thorough search

Table 1. The sociodemographic attributes of the participating populations.

Study	Study design	City	Participants	Mean age
AlAnnaz et al., 2024 [14]	Cross-sectional	Saudi Arabia	341	30.5 ± 5.24
Shinohara et al., 2023 [15]	Prospective cohort	Japan	2390	31.2 ± 5.0
Dongarwar et al., 2024 [16]	Cross-sectional	USA	5,632,75	NM
Ramji et al., 2024 [17]	Retrospective cohort	USA	1,28,325	31 ± 5.8
Monod et al., 2024 [18]	Prospective cohort	Austria	103	32.1 ± 6.1
Akselsson et al., 2023 [19]	Retrospective cohort	Multi-centered	6545	NM
Addicott et al., 2024 [20]	Retrospective cohort	USA	472	27
Aguree et al., 2023 [21]	Retrospective cohort	USA	29901	NM
Fayed et al., 2022 [22]	Prospective cohort	Saudi Arabia	2447	29.7 ± 5.9
Neal et al., 2022 [23]	Retrospective cohort	Australia	2466	32.3 ± 5.1

Table 2. Clinical features and results of the included research.

Study ID	Obesity cut-off (kg/m2)	BMI (kg/m2)	Main outcomes	JBI
AlAnnaz et al., 2024 [14]	≥30	35.7 ± 3.7	Maternal obesity has also been associated with adverse fetal outcomes, such as increased risk of macrosomia, lower APGAR scores at one minute, and increased rates of newborn critical care unit admissions.	High
Shinohara et al., 2023 [15]	≥30	NM	In the Japanese population, a higher maternal BMI was linked to a higher incidence of stillbirth.	Moderate
Dongarwar et al., 2024 [16]	≥25	NM	Public health initiatives raising awareness of the detrimental effects of obesity on pregnancy and birth outcomes are necessary because obesity is an avoidable risk factor for stillbirth.	High
Ramji et al., 2024 [17]	≥30	NM	There is a higher chance of stillbirth when maternal obesity is present, both by itself and in combination with other risk factors.	Moderate
Monod et al., 2024 [18]	≥30	35 ± 5.1	Fetal overgrowth was more common in mothers who were overweight or obese but did not have gestational diabetes.	Moderate
Akselsson et al., 2023 [19]	≥30	NM	Compared to women of normal weight, obese or severely obese women were at a higher risk for nearly every pregnancy outcome, including Apgar score < 7 at 5 min, stillbirth, transfer to neonatal care, and instrumental delivery.	Moderate
Addicott et al., 2024 [20]	≥30	NM	Trend analysis showed that poorer 1- and 5-minute Apgar scores, admission to the neonatal critical care unit, and progressively preterm birth were all substantially correlated with greater preconception BMI.	Moderate
Aguree et al., 2023 [21]	≥30	NM	Regardless of the presence of maternal diabetes, the risk of both macrosomia and LGA rises with maternal prepregnancy BMI. Women who have diabetes and are morbidly obese (BMI of ≥40 kg/m2) are especially at high risk of giving birth to infants with macrosomia and LGA.	Moderate
Fayed et al., 2022 [22]	≥30	NM	Infants born to fat mothers were less likely to have low birth weight and more likely to have macrosomia.	Moderate
Neal et al., 2022 [23]	≥30	NM	Obesity and higher class of women were associated with greater rates of stillbirth and birth abnormalities.	Moderate

*NM=Not-mentioned

plan. This review was carried out in compliance with the PRISMA Statement's guidelines. The utilization of studies using observational cohort designs, which the National Health and Medical Research Council classified as level 2 and 3 evidence [37], is another strength of our analysis. Furthermore, because cohort studies can show a causal relationship between exposures and outcomes, they may yield the most compelling scientific evidence. Cohort studies also have the ability to look at several exposures at once [38].

The different outcome and effect measures employed in the ten studies made it difficult to evaluate the findings, which was another weakness of this systematic review. With respect to the exposures, the majority of the research employed international cut-offs for overweight and obesity, however, this systematic review also included studies looking at maternal obesity and did not establish a standard for BMI thresholds. Although BMI is a commonly used measure of obesity, it has inherent limitations when applied to an individual level. Specifically, it may exaggerate adiposity and fail to discriminate between muscle and fat mass. Another restriction that limits comparison between research is the diversity in the various body composition metrics reported for the cohorts of children involved in the chosen studies.

Conclusion

The development of birth outcomes appears to be significantly influenced by maternal fat. To infer which maternal exposure has a greater effect on the development of childhood obesity is currently impossible due to a lack of evidence. Effective public and personal health programs that maximize gestational weight gain and minimize prepregnancy weight are desperately needed.

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