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Maternal obesity management: a narrative literature review of health policies

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Abstract

Maternal obesity rates are increasing significantly, posing substantial risks to both mothers and their children. This study aims to introduce health policies addressing maternal obesity, identify preventive interventions, and highlight scientific gaps necessitating further research.

We identified documents through electronic searches in PubMed, CINAHL Plus, EMBASE, and grey literature sources (ministry of health websites, national gynecology and obstetrics associations) from January 2013 to August 2023, updated in June 2024. The inclusion criteria focused on English-language documents discussing interventions or health policies that promote weight loss through lifestyle changes during pregnancy.

A total of 22 documents (10 studies and 12 guidelines) were included. 12 studies (N=1244) identified via databases; included two Clinical Practice Guidelines (CPGs) from Canada and Singapore. Other 10 CPGs sourced from governmental websites and national associations: England (1), Australia (1), New Zealand (1), combined Australia and New Zealand (1), Canada (3), USA (1), Ireland (1), Germany (1). 10 guidelines focused on obesity in pregnancy, two on weight management during pregnancy. Covered interventions across pre-pregnancy, pregnancy, and postpartum periods (9 guidelines); pre-pregnancy and pregnancy (2); exclusively postpartum (1). Seven guidelines offered evidence-based recommendations on maintaining healthy weight in mothers, largely based on expert opinions.

Maternal obesity poses significant risks to both mothers and children, underscoring the need for effective health policies and systems. However, few countries have integrated adequate responses into their healthcare policies and guidelines for professionals. Limited evidence exists on optimal practices to improve reproductive health outcomes in obese women. Hence, the crucial need to developing comprehensive guidelines and proactive strategies to manage maternal obesity. These measures can improve outcomes and reduce healthcare costs. Increased focus on research and policymaking is essential to protect the health of mothers and their children.

Keywords Maternal obesity management, Prevention, Health Policy, Narrative literature review

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Background

The global rise in obesity has prompted the World Health Organization (WHO) to classify it as a major health threat, particularly affecting young people, including women of reproductive age [1]. This has significant implications for both Maternal and Child Health (MCH) in the periods leading up to pregnancy, during pregnancy, and after childbirth [2], introducing challenges in obstetrics [3]. Maternal obesity is also associated with Childhood Obesity (CHO) and long-term Non-Communicable Diseases (NCDs) [4, 5], exacerbating their impact. Thus, addressing this issue is crucial for achieving the Sustainable Development Goals (SDGs), especially in the Low And Middle-Income Countries (LMICs) [6].

Life transitions, such as moving out, employment changes, and relationship shifts, can impede healthy behaviors and result in over 50% of women starting pregnancy with obesity [7]. In 2014, approximately 40 million pregnant women around the world were overweight or obese. While Low- and Middle-Income Countries (LMICs) have high rates of overweight, Upper-Middle-Income Countries (UMICs) experience a higher prevalence of obesity during pregnancy [8]. Excessive Gestational Weight Gain (EGWG) is also a significant problem among pregnant women [7], with about 20% of them maintaining a post-birth weight exceeding 4.5 kg [4]. In general, nearly half of women experience pre-pregnancy obesity, excessive weight gain during pregnancy, and postpartum weight retention [9], which all contribute to maternal obesity [10].

Obesity during the early stages of pregnancy is linked to negative outcomes for both the mother and child on a global scale. Research has identified several risks, such as gestational diabetes, high blood pressure, and pre-eclampsia, which contribute to the worldwide burden of diabetes and heart diseases [10]. Additionally, evidence within the Developmental Origins of Health and Disease paradigm (DOHaD) suggests that maternal obesity increases the risk of NCDs for both the mother and child [11]. This risk is further increased by the potential for childhood obesity to double [12, 13], subsequently increasing the likelihood of NCDs in the future [11]. By 2030, the annual obesity-related medical costs are projected at $66 billion in the United States (US) [14], with every increase in adult Body Mass Index (BMI) resulting in an additional $6 billion in healthcare expenses [15]. Furthermore, healthcare costs for obese pregnancies will rise due to the need for additional specialized exams [3]. Taking into account factors such as age, parity, ethnicity, and comorbidities, costs were found to be 23% higher for overweight individuals and 37% higher for obese women, compared to those with normal weight [16].

Evidence supports the effectiveness of intervention programs in preventing maternal obesity by improving behavior, modifying the environment, adopting healthier eating habits, and increasing physical activity. These interventions are essential in breaking the cycle of intergenerational obesity and reducing the growing global burden of non-communicable diseases [11]. Research suggests that lifestyle interventions, combining self-monitoring, diet, and exercise, can significantly reduce postpartum weight in women [12]. Additionally, breastfeeding helps prevent maternal overweight by prolonging its duration, potentially preventing around 975,000 cases of childhood obesity [13, 14]. In fact, focusing on maintaining weight after childbirth shows promise in reducing obesity-related diseases [15].

In this regard, various countries, particularly high-income nations, have issued guidelines to address maternal obesity, emphasizing its immediate health consequences for women of reproductive age [11, 16, 17]. However, certain countries, e.g., India, with limited focus on maternal obesity in health policies, may miss opportunities to effectively address this significant public health issue [18].

This study aims to introduce health policies addressing maternal obesity, identify preventive practices, and highlight scientific gaps necessitating further research. We anticipate that our findings will contribute to enhancing preventive measures and improving women's health during pregnancy.

Materials and methods

We identified relevant documents through electronic searches conducted from January 2013 to August 2023, with updates in June 2024. The search encompassed databases including PubMed, CINAHL Plus, and EMBASE, as well as an exploration of grey literature, i.e., the ministry of health websites and national gynecology and obstetrics associations. The search incorporated text words and MESH terms related to maternal obesity and health policies (Table 1). Inclusion criteria specified a focus on English-language documents addressing interventions or health policies aimed at promoting weight loss through lifestyle changes before, during, and after pregnancy. We also included official health documents in the form of guidelines or policies, if they provided guidance to health professionals on managing maternal obesity through lifestyle changes and were the most recent version available. In total, we included 22 documents, comprising 10 studies and 12 guidelines (Fig. 1).

Results

We selected a total of 22 studies and policy documents for review. Among the 12 studies ($N=1244$) found through databases, two were related to Clinical Practice Guidelines (CPGs) from England [19] and Singapore [20]. The remaining 10 CPGs were found through

Table 1 Electronic data-base search strategy

Databases	Search Strategy
PubMed	((overweight[tiab] OR overnutrition[tiab] OR obesity[tiab] OR "weight gain"[tiab] OR "maternal obesity"[tiab] OR "weight retention"[tiab]) AND (pregnancy[tiab] OR Gestation*[tiab] OR "pregnant woman"[tiab] OR "pregnant women"[tiab] OR maternal[tiab] OR "pre-pregnancy"[tiab] OR Post-partum[tiab]) AND ("Road Map"[tiab] OR "Policymaking"[tiab] OR "Policy"[tiab] OR "policy-making"[tiab] OR "lesson learned"[tiab] OR guideline*[tiab] strateg*[tiab] OR recommendation*[tiab]) AND ((ffrft[Filter]) AND (humans[Filter]) AND (female[Filter]) AND (2013:2025[pdat]) AND (english[Filter]))) NOT (("Gestational Diabetes"[Title/Abstract]) OR ("Gestational Diabetes Mellitus"[Title/Abstract]) AND ((ffrft[Filter]) AND (humans[Filter]) AND (female[Filter]) AND (2013:2025[pdat]) AND (english[Filter])))
CINAHL Plus	https://search.ebscohost.com/login.aspx? direct=true&db=rzh&bquery=(TI+(((TI+(overweight+OR+obesity+OR+obese+OR+(unhealthy+AND+weight)+OR+(high+AND+bmi)))+OR+(TI+%26quot%3bovernutrition%26quot%3b)+OR+(TI+(weight+AND+gain+AND+during+AND+pregnancy))+OR+(TI+((maternal+AND+obesity)+OR+(obesity+AND+%26quot%3bin%26quot%3b+AND+pregnancy)+OR+(maternal+AND+raised+AND+body+AND+mass+AND+index)))+OR+(TI+(weight+AND+retention)))+AND+((TI+(road+AND+map))+OR+(TI+policymaking)+OR+(TI+(policy+OR+policies))+OR+(TI+(lesson+AND+learned))+OR+(TI+(guideline+OR+guidelines+OR+recommendation))+OR+(TI+(strategy+OR+strategies+OR+methods+OR+techniques)))))+NOT+(TI+(childhood+AND+obesity))&cli0=FT&clv0=Y&cli1=DT1&clv1=201601-202412&type=1&searchMode=And&site=ehost-live
EMBASE	#1: (((overweight: ab, ti OR overnutrition: ab, ti OR obesity: ab, ti OR 'weight gain':ab, ti OR 'maternal obesity':ab, ti OR 'weight retention':ab, ti) AND pregnancy: ab, ti OR gestation*:ab, ti OR 'pregnant woman':ab, ti OR 'pregnant women':ab, ti OR maternal: ab, ti OR 'pre-pregnancy':ab, ti OR 'post partum':ab, ti) AND 'road map':ab, ti OR 'policymaking':ab, ti OR 'policy':ab, ti OR 'policy-making':ab, ti OR 'lesson learned':ab, ti OR guideline*:ab, ti OR strateg*:ab, ti OR recommendation*:ab, ti) AND (2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py OR 2023:py OR 2024:py OR 2025:py) AND ('evidence based practice'/de OR 'human'/de OR 'practice guideline'/de OR 'systematic review'/de) AND [female]/lim AND [adult]/lim AND ('article'/it OR 'article in press'/it OR 'preprint'/it OR 'review'/it) AND ([systematic review]/lim OR [meta analysis]/lim) AND [2013–2025]/py #1 AND ([embase]/lim OR ([medline]/lim NOT ([embase classic]/lim AND [medline]/lim))) AND 'obesity'/dm AND 'human'/de AND [female]/lim AND [adult]/lim AND 'article'/it

governmental websites and national associations were from England [1, 17], Australia [1, 21], New Zealand [1, 22], Australia and New Zealand guideline [1, 23], Canada [3, 24–26], the United States [1, 27], Ireland [1, 28], and Germany [1, 29]. Ten guidelines specifically addressed obesity in pregnancy, while two focused on weight management or maintaining a healthy weight during pregnancy. These guidelines covered interventions in various periods, including pre-pregnancy, pregnancy, and postpartum (9 guidelines), pre-pregnancy and pregnancy (2 guidelines), and exclusively postpartum (1 guideline). Out of these, seven provided evidence-based recommendations regarding maintaining a healthy weight in mothers, primarily based on strong experts' opinions. Tables 2 and 3, and 4 outline the key features of the included studies and policy documents.

Below, we summarize some recommendations for the management of maternal obesity, as outlined by the included studies.

Weight management before, during and after pregnancy

The UK NICE guidelines for weight management before, during, and after pregnancy focus on healthcare providers supporting women in adopting healthy weight behaviors, diet, and exercise during the pre-pregnancy, pregnancy, and postpartum periods. For effective weight-loss programs, the document recommends addressing barriers to weight loss, tailoring approaches to individual needs and preferences, being sensitive to weight-related concerns, promoting a balanced and healthy diet, encouraging regular physical activity, setting realistic goals of 0.5–1 kg (1–2 lb) per week, and actively identifying and addressing obstacles to successful change. Furthermore, it stands out among other guidelines by promoting postpartum weight loss as a strategy to prevent maternal obesity [17].

Management of obesity in pregnancy

The Royal Australian and New Zealand College of Obstetricians and Gynecologists (RANZCOG) provides guideline for managing obesity during pregnancy. The intended audience is healthcare professionals working in maternity care and their patients. Key recommendations include assessing height and weight before conceiving, promoting good nutrition and physical fitness, offering psychological support, and discussing appropriate weight gain during pregnancy based on early pregnancy BMI. Healthcare providers are encouraged to address the impact of obesity on fertility and pregnancy outcomes in a sensitive and non-judgmental manner. They should also monitor weight during and after pregnancy, providing ongoing nutrition and exercise guidance to women with obesity to support weight reduction [23].

Obesity in pregnancy

The American College of Obstetricians and Gynecologists (ACOG) Practice Bulletin seeks to offer a comprehensive approach to the management of obesity in reproductive-aged women who are planning for pregnancy. Dealing with obesity requires long-term strategies, including population-based public health and economic initiatives, as well as individual nutritional, behavioral, or surgical interventions. Obstetricians have a crucial role in providing care for pregnant women who

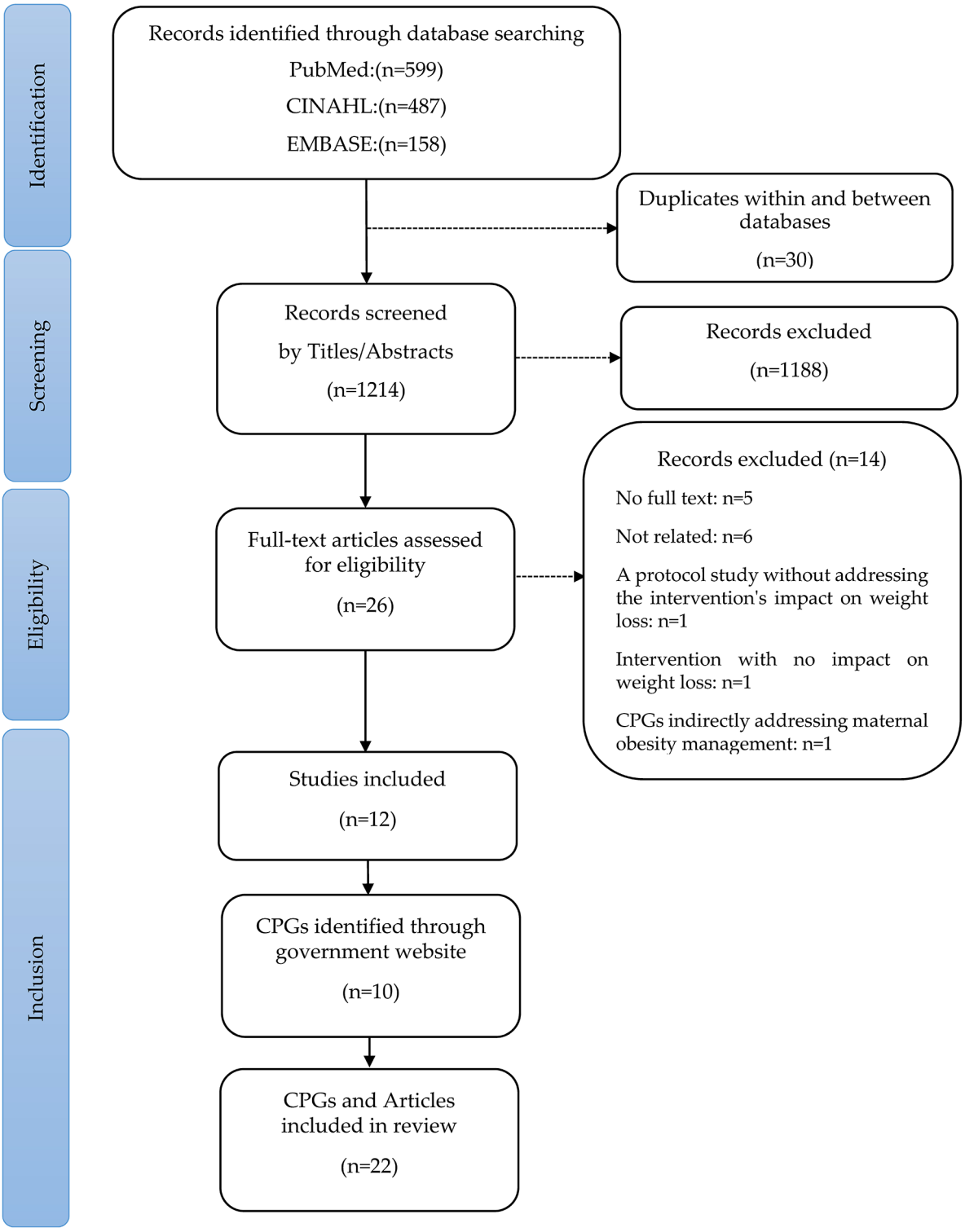

Fig. 1 PRISMA 2009 flow diagram

Table 2 Characteristics of included studies

Author & Year	Aim(s)	I. Study design II. Data collection methods III. Data Analysis	Key findings
Dipietro L, Evenson KR, Bloodgood B, et al. 2019 [30]	to summarize the evidence from the 2018 Physical Activity Guidelines Advisory Committee Scientific Report, including new evidence from an updated search of the effects of physical activity on maternal health during pregnancy and postpartum	I. systematic review and meta-analysis II. Literature review	1. Moderate-intensity physical activity during pregnancy is associated with reduced risk of excessive gestational weight gain. 2. This study emphasizes the public health importance of regular moderate-intensity physical activity before, during, and after pregnancy, and calls for further research in this area.
Withanage NN, Botfield JR, Srinivasan S, et al. 2022 [31]	To evaluate the effectiveness of primary care-based PCC delivered to reproductive-aged females and/or males to improve health knowledge, reduce preconception risk factors, and improve pregnancy outcomes	I. systematic review II. searched for randomized controlled trials (RCTs)	1. Primary care-based preconception care (PCC) interventions, including brief/intensive education, and dietary modification, effectively improve health knowledge and reduce preconception risk factors; obesity, among females, but more research is needed to confirm their impact on pregnancy outcomes. 2. Preconception care (PCC) education, whether brief or intensive, should be a standard practice for reproductive-aged individuals in primary care.
Most J, Amant MS, Hsia DS, et al. 2019 [32]	to characterize determinants of gestational weight gain in women with obesity	I. prospective, observational study II. to measure energy intake, energy expenditure, and body composition in 72 pregnant women with obesity III. energy intake, calculated using the energy intake-balance method, energy expenditure measured by doubly labeled water and calorimetry, and body composition assessed by a 3-compartment model.	1. Women with obesity should gain fat-free mass during pregnancy without increasing fat mass. 2. They should not increase energy intake during pregnancy. 3. Energy imbalance is the main factor in gestational weight gain for women with obesity. 4. A 10% energy deficit is needed to maintain weight during pregnancy. 5. Energy needs should be estimated individually or patients should be advised not to increase energy intake. 6. Lifestyle interventions for weight maintenance in obese pregnant women require a 9% energy deficit.
Goldstein, R.F., Boyle, J.A., Lo, C. et al. 2021 [34]	to describe women's experiences and perspectives in attending a Healthy Pregnancy Service designed to optimise healthy lifestyle and support recommended gestational weight gain for women with obesity	I. explanatory sequential mixed methods study II. quantitative questionnaires and qualitative interviews	1. The lifestyle intervention, embedded in routine antenatal care and led by dedicated health professionals, increased women's confidence and empowered them to make positive changes.
O'Brien EC, Segurado R, Geraghty AA, et l. 2019 [35]	to determine the differential effects of lifestyle interventions (diet based, physical activity based or mixed approach) on GWG, stratified by educational attainment	I. Individual participant data (IPD) meta-analysis of randomized controlled trials (RCTs)	1. Diet-based interventions are effective in reducing these risks for lower-educated women. 2. Mixed interventions also help lower-educated women reduce excessive weight gain. 3. Diet-based interventions can mitigate excessive weight gain in higher-educated women. 4. Healthcare professionals should prioritize dietary and mixed interventions for managing gestational weight gain in lower-educated women, as these approaches effectively address both excessive and inadequate weight gain in this group.

Table 2 (continued)

Author & Year	Aim(s)	I. Study design II. Data collection methods III. Data Analysis	Key findings
Harrison CL, Bahri Khomami M, Enticott J, et al. 2023 [36]	To evaluate intervention components using the Template for Intervention Description and Replication (TIDieR) framework to inform implementation of antenatal lifestyle interventions in routine antenatal care	I. systematic review and meta-analysis	1. Antenatal lifestyle interventions by allied health professionals improved gestational weight gain (GWG). 2. Individual dietary interventions with moderate intensity showed the most significant decrease in GWG. 3. Early and extended physical activity and mixed behavioral interventions were more effective in reducing GWG.
Hart TL, Petersen KS, Kris-Etherton PM. 2022 [37]	To discusses the nutritional recommendations for healthy weight loss before and after pregnancy for women with overweight and obesity	I. Review article	1. Women with overweight or obesity should follow a weight loss diet of 1,200-1,500 kcal/day, aiming for a deficit of 500–750 kcal/day to lose 0.5–1 kg per week. 2. During lactation, women with overweight or obesity can aim for a 500 kcal/day deficit for 6 weeks postpartum, aiming to lose 0.5 kg per week over 4 months, while consuming at least 1,800 calories/day.
Allman-Farinelli M. 2023 [38]	Strengthen the evidence base for weight gain prevention strategies	I. Review article	1. Strategies to prevent weight gain and obesity should target various life stages: pregnancy, early childhood, school-age children, adolescents, and adults. 2. Interventions should integrate dietary adjustments, physical activity promotion, and policy measures targeting the food environment, like regulating food marketing and pricing.
Boyle JA, Dodd J, Gordon A, et al. 2022 [39]	To explore opportunities to change increasing weight gain trajectories for women during their reproductive lives, focusing on optimising health before pregnancy	I. Narrative description of changing policies and approaches for improving preconception health	1. Public awareness about preconception health is lacking, with many women who plan pregnancies not seeking preconception health advice. 2. Strategies are needed to increase public awareness and provide healthcare professionals with proper training and resources on preconception health. 3. Incorporate the socio-ecological environment in preconception health policies, guidelines, and interventions.
Teefey CP, Durnwald CP. 2017 [40]	To discusses the problem of maternal obesity, excessive gestational weight gain, and preexisting diabetes, which are more prevalent in certain racial and ethnic minorities, and suggests strategies to address these disparities through healthy lifestyle interventions and the support of obstetrical providers	I. Review article	1. The paper describes two interventions for gestational weight gain and postpartum weight retention in racial/ethnic minority women: ■ A technology-based behavioral intervention for low socioeconomic status African American women, including diet and activity goals, weekly weigh-ins, text message reminders, Facebook support, and weekly health coach calls. ■ A group-based intervention for overweight and obese African American women, involving antenatal group sessions, a postpartum home visit, and phone calls focused on weight monitoring, diet, nutrition support, physical activity, and postpartum weight reduction.

are obese, while other healthcare professionals, such as nutritionists, can offer specialized knowledge based on the obstetrician's level of comfort with obstetric care [27].

Management of pre-pregnancy, pregnancy, and postpartum obesity

The FIGO Committee's guideline aims to offer practical guidance for obstetricians and gynecologists. It focuses on the management of pre-pregnancy, pregnancy, and postpartum obesity by consolidating clinical practice recommendations from international sources. The Pregnancy Obesity and Nutrition Initiative (PONI) emphasizes a life course approach, connecting preconception, pregnancy, and postpartum services to prevent excessive weight gain before and during pregnancy. Dietary advice before getting pregnant places importance on weight loss or halting further gain by consuming nutrient-dense foods customized to individual characteristics. Pregnant women with obesity are advised to restrict gestational weight gain to 5–9 kg to enhance outcomes. Postpartum, weight loss is encouraged through a healthy diet, breastfeeding if possible, and moderate physical activity. Long-term monitoring is crucial due to the increased risk of NCDs for both mothers and their children [11].

Obesity and pregnancy

The guideline set by the Association of Improvements in Maternity Services (AIMS) in Ireland aim to improve the management of obese women before, during, and after pregnancy. This guideline is intended for healthcare professionals, including those in training, who work in obstetric and gynecological services funded by the Health Service Executive (HSE). One important aspect emphasized in the guideline is the advice for obese women to lose weight prior to becoming pregnant. Primary care is vital in providing pre-pregnancy care for these women and is involved in various models of antenatal care. The guideline also highlights the importance of monitoring

Table 3 Characteristics of included CPGs

Country (World Bank Economic Indicator)	Document Title (Year of Publication)	Issuing Entities of the Document	Organization Level of Body	Period(s)
U.K (High-Income Economic)	Weight management before, during and after pregnancy (2010)(17)	National Institute for Healthcare and Excellence (NICE)	Governmental	• Pre-pregnancy • Pregnancy • Post-partum
U.K (High-Income Economic)	Care of Women with Obesity in Pregnancy. Green-top Guideline No. 72 (2018)(19)	Royal College of Obstetricians and Gynecologists (RCOG)	Professional or Scientific	• Pre-pregnancy • Pregnancy • Post-partum
Australia (High-Income Economic)	Obesity and pregnancy (including post bariatric surgery) (2021)(21)	Queensland Clinical Guidelines Steering Committee	Governmental	• Pre-pregnancy • Pregnancy • Post-partum
Australia & New Zealand (High-Income Economic)	Management of Obesity in Pregnancy (2021)(23)	Women's Health Committee (RANZCOG)	Professional or Scientific	• Pre-pregnancy • Pregnancy • Post-partum
New Zealand (High-Income Economic)	Guidance for Healthy Weight Gain in Pregnancy (2014)(22)	Ministry of Health Wellington, New Zealand	Governmental	• Pre-pregnancy • Pregnancy • Post-partum
Canada (High-Income Economic)	Obesity in Pregnancy No. 239 (2018)(24)	Board of the Society of Obstetricians and Gynecologists of Canada (SOGC)	Professional or Scientific	• Pre-pregnancy • Pregnancy
Canada (High-Income Economic)	Guideline No. 391-Pregnancy and Maternal Obesity Part 1: Pre-conception and Prenatal Care (2019)(25)	Board of the Society of Obstetricians and Gynecologists of Canada (SOGC)	Professional or Scientific	• Pre-pregnancy • Pregnancy
Canada (High-Income Economic)	Guideline No. 392-Pregnancy and Maternal Obesity Part 2: Team Planning for Delivery and Postpartum Care (2019)(26)	Society of Obstetricians and Gynecologists of Canada (SOGC)	Professional or Scientific	• Post-partum
Germany (High-Income Economic)	Obesity and Pregnancy (S3-Level) (2019) (29)	German Society of Gynecology and Obstetrics (GSGO)	Professional or Scientific	• Pre-pregnancy • Pregnancy • Post-partum
USA (High-Income Economic)	Obesity in Pregnancy PRACTICE BULLETIN NO.230 (2021)(27)	American College of Obstetricians and Gynecologists (ACOG)	Professional or Scientific	• Pre-pregnancy • Pregnancy • Post-partum
Ireland (High-Income Economic)	Obesity and pregnancy IOG clinical practice guideline No.21(2013)(28)	Royal College of Physicians of Ireland and Clinical Strategy and Programs Directorate	Professional or Scientific	• Pre-pregnancy • Pregnancy • Post-partum
Singapore (High-Income Economic)	Obesity (2016) (20)	Health Promotion Board	Governmental	• Pre-pregnancy • Pregnancy • Post-partum

women's weight during their initial antenatal visit in a primary care setting. It is recommended to educate women about healthy eating and to encourage regular physical exercise during and after pregnancy, unless there are medical or obstetric reasons not to do so [28].

Obesity and pregnancy (including post bariatric surgery)

This guideline provides recommendations for pregnant women who have a high BMI or a history of bariatric surgery. It stresses the significance of maintaining a healthy lifestyle during reproductive years and receiving specialized care for individuals with an elevated BMI. Additionally, it brings attention to the harmful effects of weight stigma on mental well-being and suggests various strategies to combat this, including respecting language preferences, improving non-judgmental communication, providing training, and fostering an understanding of the clinical impact of obesity. Professionals can improve communication by reflecting on their attitudes towards obesity [21].

Obesity and pregnancy

This guideline, which is produced at the highest quality level (S3 level), aims to standardize care for pregnant women who are overweight or obese throughout all stages of pregnancy. It offers evidence-based recommendations for prevention and care in both outpatient and inpatient settings. Studies have shown that adopting a healthier lifestyle before getting pregnant, which includes exercising more and eating a proper diet, can

Table 4 Maternal obesity: recommendations for management identified in the documents surveyed

period	Care pathway	U.K	Australia	Australia & New Zealand	New Zealand	Canada	USA	Germany	Ireland	Singapore
Pre-pregnancy	A.1 record pre-pregnancy BMI	(17,19*)	(21)	(23*)	(22)	(24*)	(27*)	(29)	(28)	(20*)
	A.2 pre-pregnancy weight optimization	(17,19*)	(21)	(23*)	(22)	(24*,25*)	(27*)	***X***	(28)	(20*)
	A.3 clarification of the risks of maternal obesity	(17,19*)	***X***	(23*)	(22)	(24*,25*)	(27*)	(29)	(28)	(20*)
	A.4 counselling on lifestyle (diet/physical activity/ behavioral)	(17,19*)	***X***	(23*)	(22)	(25*)	(27*)	(29)	(28)	***X***
Pregnancy	B.1 Record BMI at first antenatal appointment	(17)	(21)	(23*)	(22)	***X***	(27*)	(29)	***X***	(20*)
	B.2 monitor gestational weight	(17)	(21)	(23*)	(22)	(25*)	***X***	(29)	***X***	(20*)
	B.3 clarification of the risks of gestational weight	(17)	***X***	(23*)	***X***	(25*)	***X***	(29)	***X***	(20*)
	B.4 counselling on lifestyle (diet/physical activity/ behavioral)	(17,19*)	(21)	(23*)	(22)	(24*,25*)	(27*)	(29)	(28)	(20*)
	B.5 counselling on how to limit GWG	***X***	(21)	(23*)	(22)	(25*)	(27*)	(29)	(28)	***X***
Post-partum	C.1 clarification of the risks of postpartum obesity	***X***	(21)	(23*)	(22)	(26*)	***X***	***X***	***X***	(20*)
	C.2 post-partum weight management	(17,19*)	(21)	(23*)	(22)	(26*)	***X***	***X***	(28)	(20*)

have positive effects on pregnancy, delivery, and the postpartum period. Numerous research studies, including ones specifically focused on overweight or obese pregnant women, support the recommendations made by the Institute of Medicine (IOM). A meta-analysis of 36 randomized controlled trials (RCTs) has shown that dietary changes, increased exercise, or a combination of both can result in an average weight loss of approximately 0.7 kg for these women. [29].

Discussion

This narrative literature review aimed to identify strategies, health policies, or Clinical Practice Guidelines (CPGs) for preventive recommendations encompassing maternal obesity or weight management across pre-pregnancy, pregnancy, and postpartum. We also highlighted areas where gaps exist to inform stakeholders to enhance preventive measures to improve the health of women of reproductive age.

We found a consensus that maternal obesity rates are rising dramatically, which poses serious risks to both mothers and their offspring [33, 41]. Multiple studies found that obese women face higher risks of complications, i.e., gestational diabetes, high blood pressure, breastfeeding cessation, longer hospital stays, and higher rates of caesarean sections or instrumental deliveries [42]. Their babies also face higher risks of being admitted to the neonatal intensive care unit or suffering birth injuries [41, 43].

Preconception lifestyle health in tackling maternal and childhood obesity is a key priority for the World Health Organization (WHO). A life course approach can improve outcomes for both mothers and children [37]. Enhancing health across the life course requires a comprehensive and integrated approach, involving education, work, community environments, and health professionals to engage young women before pregnancy and optimize their health [39]. The lack of specific guidelines for managing weight before and after pregnancy may lead to missed opportunities for intervening and supporting women throughout their reproductive journey [44]. Lifestyle interventions such as maintaining a healthy diet, engaging in regular physical activity, and receiving behavioral counseling, especially before pregnancy, effectively prevent maternal obesity [45–47], and are essential components of obstetric care aimed at modifying maternal weight to prevent obesity [21, 28, 29].

Challenges to effective lifestyle interventions during pregnancy include time constraints, diverse preferences, socioeconomic status (SES), competing demands, and healthcare professionals' self-efficacy. Overcoming these barriers requires creating supportive environments for healthy changes aligned with public health strategies [48, 49]. Educating and supporting obese women empowers informed decision-making about their health during and

after pregnancy [6]. Moreover, robust economic evidence is crucial for evaluating policy interventions targeting environmental changes to prevent maternal obesity [50].

In the context of high-Income countries (HIC) such as England and Australia, there is a strong emphasis on the management of maternal obesity [51], which has led to the development of evidence-based guidelines to address this concern [33]. However, preventive recommendations concerning diet, physical activity, and behavior vary across guidelines, and most preventive recommendations for maintaining a healthy lifestyle in women are strongly based on experts' opinion [11, 52]. For instance, the preventive recommendations outlined in the 2020 International Federation of Gynecology and Obstetrics (FIGO) committee guidelines for pre-pregnancy, pregnancy, and post-partum obesity are generally considered weak due to insufficient evidence. Therefore, further research is needed to enhance our understanding of their effectiveness, particularly in low- and middle-income countries (LMICs). One notable exception is the strong endorsement of moderate-intensity exercise during pregnancy [11]. International consensus on guidelines of maternal weight management, particularly focusing on pre-pregnancy and post-partum periods, can lead to consistencies in care and potentially suboptimal outcomes for pregnant women with obesity [50].

There are significant research gaps in optimizing women's health before and during pregnancy, particularly regarding lifestyle interventions for weight management [52]. Ecological Systems Theory (EST) Model demonstrates that maternal obesity is the result of a complex interplay between women and their surrounding environments. By developing a better understanding of how these systems interact, we can design more effective interventions and policies to support women in achieving and maintaining a healthy weight before, during and after pregnancy [9]. The WHO advocates a multifaceted approach, incorporating policy, mass media, community, and primary health care strategies to tackle the obesity epidemic [45].

At the individual level, women's behavior play a significant role in weight gain during and after pregnancy [9]. However, it is essential to recognize that women are not isolated entities and their partner and family members can either bolster or hinder their endeavors to maintain a healthy diet and stay physically active [53].

At the community level, characteristics such as access to healthy food, opportunities for physical activity, and social norms about body size shape a woman's weight [54, 55]. For instance, a community with many fast food restaurants and no sidewalks or parks will make it more difficult for a woman to maintain a healthy weight than one with farmer's markets, bike lanes, and recreational facilities [55]. Therefore, community-level policies and environments, such as promoting breastfeeding, increasing access to affordable healthy food, enjoying paid maternity leave, and providing nutrition information, may help curb obesity rates [53, 56–58].

Healthcare practitioners play a crucial role in promoting healthy nutrition and weight before pregnancy [45]. Current guidelines emphasize early, women-centered care focusing on gradual lifestyle changes through improved diet and exercise [25, 59]. However, research predominantly targets modifying behaviors of pregnant women, overlooking barriers faced by healthcare professionals, such as limited knowledge, challenges in addressing weight sensitively, resource constraints, and insufficient evidence on effective interventions [24]. These barriers hinder effective management of maternal obesity, underscoring the need for targeted interventions and support systems. Integrating nutrition services into Antenatal Care (ANC) can enhance support for obese pregnant women and promote healthy behaviors during pregnancy [33, 60]. Nonetheless, robust evidence is needed to identify effective strategies for enabling behavioral changes among healthcare professionals to better support obese pregnant women [61].

FIGO guideline specifically offer intervention and tool aimed at facilitating the prevention of obesity [11, 51]. For instance, the Pregnancy Obesity and Nutrition Initiative (PONI) established by the FIGO's Pregnancy and NCDs (PNCD) Committee assists healthcare professionals in creating collaborative actions to prevent and alleviate obesity's impact [62]. Additionally, tools such as the FIGO's Nutrition Checklist can aid obstetricians in enhancing their knowledge and time management when providing care to women [11].

Limitations of Review

First, the limited database search may have weakened the findings by potentially omitting relevant studies that could provide a more comprehensive understanding of the topic. Additionally, the lack of a full-text review means that important details and nuanced information may have been missed, which could impact the depth and accuracy of the analysis. These constraints highlight the need for a more extensive and thorough approach in future research to ensure a more robust and detailed exploration of the subject. Second, although a narrative review has limitations compared to a systematic review, this study provides valuable initial data and insights. It serves as a foundational step in identifying research gaps and guiding future systematic reviews and policy development. This review highlights important aspects of maternal obesity, preventative strategies, and management during pregnancy and postpartum. While a systematic review might offer stronger conclusions, this study identifies areas needing further investigation and

policy improvements, laying the groundwork for future research. Implementing suggested improvements will enhance the manuscript's contribution to the field.

Conclusion

Maternal obesity poses major risks on mother and their child that require a coordinated policy and healthcare response [33]. Only a few nations have addressed these health risks adequately in their policies and guidelines for healthcare professionals [11, 52, 63]. Moreover, there is limited evidence on best practices to improve reproductive health outcomes in obese women, and national guidelines lack specific details and supporting evidence for implementing management changes that would improve outcomes [64]. Current care recommendations are mostly based on good clinical practice than strong evidence, with variations in nutrition, physical activity, and behavior modification strategies across different pregnancy stages [51, 52, 65]. The absence of standardized international guidelines may lead to diverse practices in managing maternal obesity globally [50]. Many studies lack the statistical power to address clinical outcomes effectively, hindering their application in practice [66]. Challenges such as ensuring access to nutritious food further obstruct evidence-based care for pregnant women with obesity. Developing comprehensive, high-quality guidelines and proactive implementation strategies is essential. Identifying and engaging stakeholders is also crucial for success. These measures can help healthcare professionals and women achieve better outcomes, reduce disparities, and lower health and economic costs. Research gaps in maternal weight management underscore the need for evidence to inform policies and interventions for improved maternal and child health outcomes [9, 33, 52, 63].

Abbreviations

ACOG	American College of Obstetricians and Gynecologists
AIMS	Association of Improvements in the Maternity Services
BMI	Body Mass Index
DOHaD	Developmental Origins of Health and Disease paradigm
EGWG	Excessive Gestational Weight Gain
EST	Ecological Systems Theory
FIGO	International Federation of Gynecology and Obstetrics
FOGSI	Federation of Obstetric and Gynecological Societies of India
GSGO	German Society of Gynecology and Obstetrics
HSE	Health Service Executive
IOM	Institute of Medicine
LMICs	Lower-Middle-Income Countries
MCH	Maternal and Child Health
NCD	Non-Communicable Diseases
NICE	National Institute for Healthcare and Excellence
PNCD	Pregnancy and Non-Communicable Diseases
PONI	Pregnancy Obesity and Nutrition Initiative
RCT	Randomized Controlled Trial
RANZCOG	Royal Australian and New Zealand College of Obstetricians and Gynecologists
RCOG	Royal College of Obstetricians and Gynecologists
SDG	Sustainable Development Goals
SOGC	Society of Obstetricians and Gynecologists of Canada
UMICs	Upper-Middle-Income Countries
WHO	World Health Organization

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Author contributions

A.T. and E.K. conceived the study, its methodology and obtained funding. E.K. collected and analyzed data, and drafted the manuscript. M.T. and S.N. were the advisors and gave comments on the draft. A.T. supervised the study, helped in the interpretation of findings, and provided feedback for the intellectual development of the manuscript. He is guarantor.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

This study received ethical clearance from the Ethics Committee of Tehran University of Medical Sciences (no. IR.TUMS.SPH.REC.1401.253).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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