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Guidelines for the management of pregnant women with obesity: A systematic review

Alexandre Simon[1] | Misty Pratt[2] | Brian Hutton[2,3] | Becky Skidmore[2] | Romina Fakhraei[1,3] | Natalie Rybak[1] | Daniel J. Corsi[1,3] | Mark Walker[1,3,4] | Maria P. Velez[5,6] | Graeme N. Smith[5] | Laura M. Gaudet[1,3,4]

[1]OMNI Research Group, Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada

[2]Knowledge Synthesis Group, Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada

[3]Public Health and Preventive Medicine, University of Ottawa School of Epidemiology, Ottawa, Ontario, Canada

[4]Department of Obstetrics, Gynecology& Newborn Care, University of Ottawa, Ottawa, Ontario, Canada

[5]Department of Obstetrics and Gynecology, Queen's University, Kingston, Ontario, Canada

[6]Department of Public Health Sciences, Queen's University, Kingston, Ontario, Canada

Correspondence
Dr Laura Gaudet, 501 Smyth Road, CPCR, L1223, Box 241, Ottawa, Ontario, K1H 8 L6, Canada.
Email: lagaudet@toh.ca

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Summary

Multiple clinical practice guidelines (CPGs) have been established for pregnant women with obesity. The quality and consistency of recommendations remain unknown. The objective of this study is to conduct a systematic review to synthesize and appraise evidence from CPGs, available worldwide, for pregnant women affected by obesity. An experienced information specialist performed a rigorous search of the literature, searching MEDLINE, Embase, grey literature, and guideline registries to locate CPGs that reported on pregnancy care relating to obesity. CPGs related to antenatal care of pregnant women with obesity (pre-pregnancy body mass index [BMI] ≥ 30 kg/m^2) in low-risk (eg, care provider = family physician or midwife) or high-risk settings (eg, obstetrician or maternal fetal medicine) were included. CPGs were appraised for quality with independent data collection by two raters. Information was categorized into five domains: preconception care. care during pregnancy, diet and exercise during pregnancy, care immediately before, during, and after delivery, and postpartum care. The literature search yielded 2614 unique citations. Following screening of abstracts and full texts, 32 CPGs were included, with quality ranging between 0 and 100 on the AGREE II tool. The strongest evidence related to nutritional advice, exercise, and pregnancy risk counselling. Guidance was limited for timing of screening tests, antenatal visits and delivery, ideal postpartum care, and management of adverse pregnancy outcomes. Most guidelines in this population are not evidence based. Research is needed to bridge knowledge gaps pertaining to fetal antenatal surveillance, management of adverse outcomes and postpartum care, and enhance consistency across CPGs.

KEYWORDS

clinical practice guidelines, evidence-based practice, obesity, pregnancy

1 | INTRODUCTION

Obesity is a major public health concern around the world. Approximately 13% of the world's adult population were affected by obesity in 2016, with similar rates in pregnancy.[1] Over the past few decades, the worldwide rise in excessive weight gain during pregnancy has accompanied concurrent increases in rates of pregnancy complications. Between 1996 and 2010, there was a doubling in the rate of both gestational diabetes (from 2.7% to 5.6%) and pregestational diabetes (from 0.7% to 1.5%).[2] Rates of preeclampsia and gestational hypertension increased 25% and 184%, respectively, in the United States between 1987 and 2004.[3] The fetuses of mothers affected by obesity are at risk of both overgrowth and growth restriction, stillbirth and birth injury.[4] Furthermore, obesity in pregnancy can pose risks for long-term adverse health outcomes for not only the mother, but also their offspring.[4] These risks include cardiovascular disease, diabetes, hypertension, future obesity among the offspring, and premature death.

Given the well-documented association between pregnant women with obesity and adverse outcomes both during pregnancy and longer term,[5-8] there is a need for consistent clinical care that follows best evidence-based practice. A number of studies have shown that guidelines can improve health care processes and patient outcomes, but are often of low quality because they contain conflicting recommendations, insufficient consideration of relevant patient characteristics, low quality evidence underlying the recommendations, lack of transparency, and inadequate management of potential conflicts of interest.[9] Access to high quality clinical practice guidelines (CPGs) facilitates informed discussions with patient and decision making that follows best evidence-based practice.

Production of CPGs occurs at national and international levels by medical associations or government bodies. Databases of evidence-based CPGs are developed and maintained by many countries including the United States (National Guideline Clearinghouse). In 2002, the Guidelines International Network (G-I-N) was established to facilitate the international collaboration in guideline development, adaption, and implementation.[10] Currently, G-I-N includes representation from approximately 46 countries around the world.[10] Although national and international guidelines for the management of obesity during pregnancy have already been established, the quality and consistency of these CPGs is currently unknown.

The objective of this review was to identify and synthesize currently available CPGs for pregnant women with obesity. Findings from this review will serve to evaluate the quality of existing CPGs and determine the need for rigorous updating.

2 | METHODS

A systematic review protocol was prepared following the PRISMA-P checklist[11] and then posted to the University of Ottawa Health Sciences Library's online repository (https://ruor.uottawa.ca/handle/10393/35998). The review was registered in the PROSPERO database (CRD42017060503).

2.1 | Electronic literature search and process of study selection

The search strategies were developed and tested through an iterative process by an experienced medical information specialist (BS) in consultation with the review team. The strategies were peer reviewed by another senior information specialist prior to execution using the PRESS Checklist.[12] Using the OVID platform, we searched Ovid MEDLINE, including Epub Ahead of Print and In-Process & Other Non-Indexed Citations, and Embase. We also undertook a grey literature search of guideline registries listed in *Grey Matters: a practical tool for search health-related grey literature* (https://www.cadth.ca/resources/finding-evidence/grey-matters), as well as national and international specialty societies in the field of obstetrics and gynaecology (eg, Society of Obstetricians and Gynaecologists of Canada [SOGC] and American College of Obstetricians and Gynecologists [ACOG]). A table outlining our grey literature search strategy, including the list of selected specialty societies, can be found in the Supporting Information for this review. All searches were originally performed on 19 December 2016 and updated on 22 March 2019. Strategies utilized a combination of controlled vocabulary (eg, "Pregnancy," "Prenatal Care," and "Obesity") and keywords (eg, "pregnant," "antenatal," and "obese").

Search filters for the retrieval of CPGs, outlined by the Canadian Agency for Drugs and Technologies in Health (CADTH), were applied. These filters are extensively tested and routinely used by CADTH. We applied CADTH's guideline/care pathway filter, which helped to retrieve relevant CPGs within our selected databases. The CADTH-derived filters were adjusted to include the vocabulary and syntax appropriate to each database. In addition, the CADTH filters were slightly amended to include additional terms (eg, "continuity of care" and "patient care") deemed relevant to our project. We excluded documents that were animal-only, as well as opinion pieces from our results. Our database search strategy, which omitted restrictions based on geographic location, combined with the grey literature search of guideline registries both nationally (eg, SOGC) and internationally (eg, National Guideline Clearinghouse), allowed coverage of CPGs available globally. Specific details regarding the strategies appear in Appendix S1.

Duplicates from bibliographic and grey literature searches for the review were identified and removed. Remaining articles were uploaded into an online systematic review software package, Distiller SR (Evidence Partners, Inc, Ottawa, Canada) for level 1 (titles and abstracts) and level 2 (full-text) screening. Before initiating each level, a pilot screening test was completed by each reviewer to confirm understanding. Two reviewers (M.P. and A.S.) then systematically and independently screened the titles and abstracts of the references at level 1, using the "liberal accelerated" method established by Khangura et al.[13] Within this method, only one reviewer is required to retain the abstract for full text screening; however, exclusion from full text screening requires two reviewers to assign the abstract as irrelevant. The same reviewers screened all full-text articles at level 2, and discrepancies were settled by discussion or involvement of a third

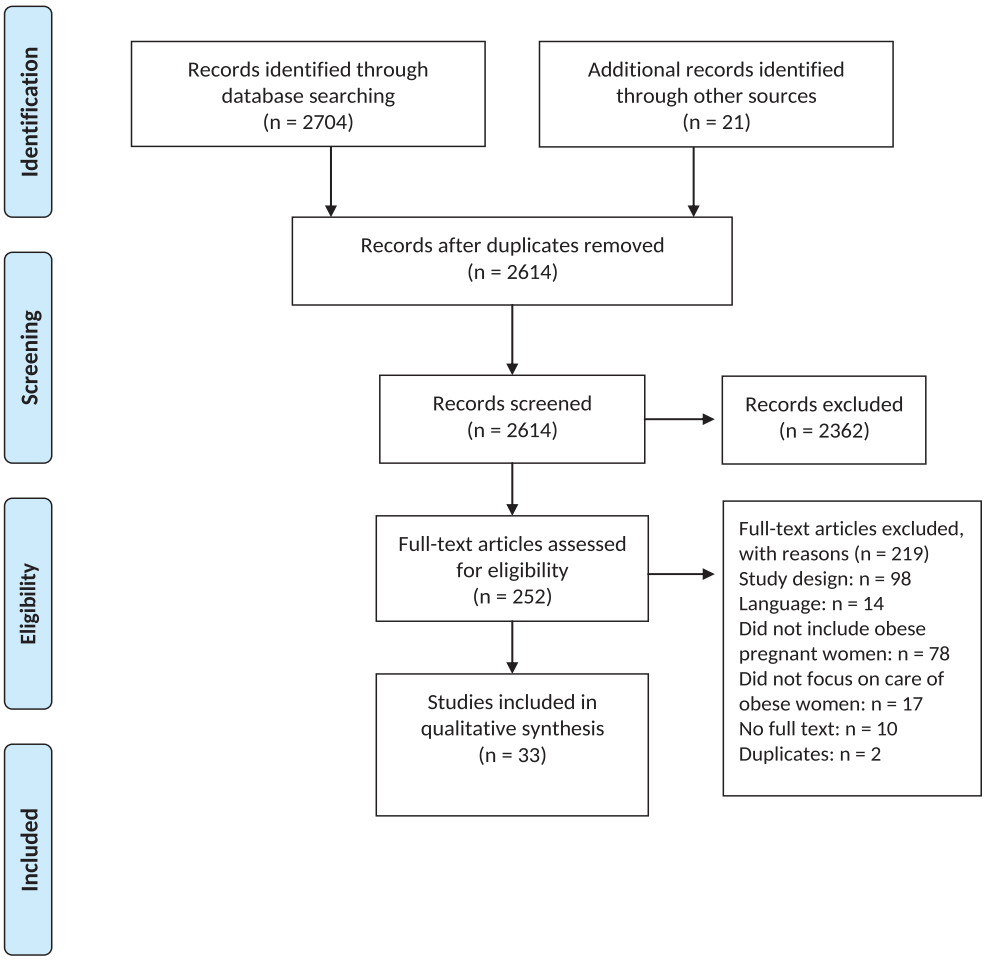

FIGURE 1 Systematic review flow chart

party (L.G.) if necessary. The process of study selection was summarized using a PRISMA flow diagram (Figure 1).[14]

2.2 | Study selection criteria

We sought CPGs that addressed the population of pregnant women meeting criteria for obesity (pre-pregnancy body mass index [BMI] ≥ 30 kg/m^2), receiving antenatal care in either low-risk (eg, care provider = family physician or midwife) or high-risk settings (eg, obstetrician or maternal fetal medicine). Guidelines referring to pregnant women with obesity but not clearly defining obesity as a BMI of ≥30 kg/m^2 were also included. Guidelines that included pregnant women affected by obesity with medical complications (such as pre-existing diabetes or hypertension) were not excluded. No selection criteria related to interventions or outcomes were used. There were no date restrictions on the searches, but reports with full texts published in languages other than English or French were excluded. If two guidelines were identified from one source, the most recently updated guideline was selected. Studies not reporting CPGs were excluded.

2.3 | Data extraction and quality assessment

Two reviewers (A.S. and M.P.) performed single extraction, with verification of 50% of data extractions (extracted by both A.S. and M.P. and cross-checked to ensure data quality). The following data were collected from the included studies: authorship list, date of publication, journal of publication, country/language of publication, guideline objective, methodology used, type of care (family physician, midwife, obstetrician, or maternal fetal medicine), setting of care (high- or low-risk), general recommendations, and grading of the evidence.

The Appraisal of Guidelines for Research & Evaluation II tool (AGREE II) was used to assess the methodological quality of each CPG. The AGREE II scale is composed of 23 items in six domains: scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. Each item was scored from 1 (strongly disagree) to 7 (strongly agree).[15] Domain scores were calculated by summing up all the scores of the individual items in a domain and by scaling the total as a percentage of the maximum possible score for that domain. A detailed summary

of these assessments was compiled and included in the summary of findings. While no firm criteria currently are in place, we considered scores of 1, 2, or 3 to correspond to a score of "not recommended," scores of 4 and 5 were considered to represent "recommended with modifications," and scores of 6 and 7 were considered to correspond to "recommended." As the AGREE-II Consortium has not set minimum domain scores or patterns of scores across domains to differentiate between high-quality or poor-quality guidelines,[15] an overall quality score of 1 to 3 was considered low quality, and therefore, the CPG was not recommended. An overall quality score of 4 or 5 was considered good quality, and the CPG was recommended with modifications. Lastly, a score of 6 or 7 was considered high quality, and the CPG was recommended.

Two raters independently completed the AGREE II appraisals. Disagreements were identified in cases where a difference of more than 2 points within an item occurred. Consensus was reached through general discussion within the pair and involvement of a third party when necessary.

3 | RESULTS

A flow diagram capturing the process of study selection is presented in Figure 1. Ultimately, 252 articles underwent full text review, and 33 publications related to 32 CPGs were selected for inclusion.

Most CPGs considered obesity to be a BMI of >30 kg/m^2 or ≥30 kg/m^2. Two guidelines did not define obesity[16,17]; four others did not define obesity, but referred to populations with BMIs over 25 kg/m^2,[18] over 30 kg/m^2,[19] or ≥35 kg/m^2.[20,21]

3.1 | Characteristics of available guidelines

Table 1 provides an overview of the primary features of the 32 included CPGs.[18,22-24] A total of 11 CPGs (34%) stated that their recommendations were based upon a systematic or literature review of the evidence, four CPGs (13%) described using consensus opinions, six CPGs (19%) used a combination of a systematic/literature review with consensus opinions, and the remaining 11 CPGs (34%) did not report any methods.

Overall, 15 of the 32 included CPGs (47%) stated that the target patient population for recommendations was pregnant women affected by obesity. The remaining 17 included CPGs contained subsections relevant to pregnant women with obesity, but targeted the following related populations: anovulatory polycystic ovary syndrome (PCOS) (one CPG [3%]), pregnant women in general (six CPGs [19%]), women with obesity of reproductive age (whether pregnant or not, one CPG [3%]), all people with obesity (one CPG [3%]), individuals with hypertension (one CPG [3%]), pregnant women with gestational, type 1 or type 2 diabetes (one CPG[3%]), pregnant women with a history of bariatric surgery (two CPGs [6%]), and women at any stage of reproduction (pre-pregnancy, pregnancy, or postpartum, four CPGs [13%]).

The included CPGs applied formal grading systems to assign strength of their recommendations in 12 of the 32 available CPGs (38%).There were a variety of grading systems identified in the included CPGs, including the GRADE system (three CPGs [9%]),[25-27] the Canadian Task Force on Preventive Health Care grading system (one CPG [3%]),[25] the US Preventative Services Task Force grading system (two CPGs [8%]),[28,29] and the Royal College of Obstetricians and Gynecologists grading system (one CPG [3%]).[30] One CPG (3%)[23] stated that a grading system was used but did not provide details.

3.2 | Quality assessment findings (AGREE II evaluations)

After assessment of CPG quality using the AGREE II tool, only four out of the 32 available (13%) CPGs[26,30-32] were determined to be strongly recommended based on the AGREE II criteria. The majority of items scored above the predefined threshold of 50%; 10 (31.3%) CPGs[20-22,28-30,33-37] were determined to be recommended with modifications, as some domains were scored >50%, and 18 (56.3%) CPGs[14-19,23,25,31,32,38-44] were determined to be not recommended due to all items being scored <50%. Domain scores of the AGREE II quality assessments are illustrated in Table 2.

3.3 | Overview of recommendations made by included guidelines

The following sections summarize recommendations from the included set of 32 CPGs. Table 3 presents a comprehensive visual representation of the recommendations available for the care of pregnant women with obesity.

3.4 | Recommendations for preconception care of pregnant women with obesity

It was generally suggested that women of childbearing age with obesity should receive information from health care providers about both the risks of being affected by obesity and the benefits of weight loss before pregnancy, specifically improving pregnancy outcomes for both mother and baby by reducing the risks of miscarriage, pre-eclampsia, and gestational diabetes mellitus (GDM). Women should be reminded that weight loss also reduces long-term health risks, including hypertension, sleep apnoea, pulmonary disease, and cardiac disease,[23,25,29,32,38,39,45] especially in women with diabetes.[41] Four CPGs also noted that women with a BMI ≥30 wishing to become pregnant should be advised to take 5 mg of folic acid supplementation daily, starting at least 1 month before conception and continuing during the first trimester of pregnancy.[30,38,39,45] One CPG indicated

TABLE 1 Overview of clinical practice guidelines included in this review (n = 32)

Author	Year	Country of Origin	Funding	Methods Used	Update to Previous Guideline?	Grading of Evidence Performed?
Balen et al[41]	2016	United Kingdom	Academic or government	Systematic review and consensus		
Lee et al; Singapore Health Promotion Board[25]	2016	Singapore	Not reported	Not reported		✓
Sentilhes et al; French College of Gynecologists and Obstetricians[16]	2016	France	Not reported	Systematic review		
The Royal Australian and New Zealand College of Obstetricians and Gynecologists[39]	2016	Australia and New Zealand	Not reported	Not reported		
Cuschieri et al[31]	2015	Malta	Academic or government	Not reported		
Queensland Health Australia[28]	2015	Australia	Academic or government	Systematic review and consensus	✓	
Royal College of Obstetricians and Gynecologists[14]	2015	United Kingdom	Not reported	Not reported		
The American College of Obstetricians and Gynecologists (no.156)[23]	2015	United States	Not reported	Literature review	✓	✓
The American College of Obstetricians and Gynecologists (no.650)[15]	2015	United States	Not reported	Not reported	✓	
Ministry of Health New Zealand[29]	2014	New Zealand	Not reported	Not reported	✓	
National Institute for Care and Excellence (NICE)[26]	2014	United Kingdom	Not reported	Systematic review	✓	
Nizard et al[17]	2014	France	Not reported	Systematic review		
The American College of Obstetricians and Gynecologists (no. 600)[32]	2014	United States	Not reported	Not reported		
Blumer et al (The Endocrine Society, USA)[20]	2013	Various	Academic or government	Consensus		✓
Mancia et al; European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC)[19]	2013	Europe	Not reported	Consensus		
The American College of Obstetricians and Gynecologists (no. 548)[38]	2013	United States	Not reported	Not reported		
University of Michigan Health System[30]	2013	United States	Not reported	Literature search and consensus	✓	
Poston et al; International Pediatric Research Foundation (ISIL)[42]	2011	UK and Europe	Industry funding	Consensus		
Royal College of Obstetricians and Gynecologists[40]	2011	United Kingdom	Not reported	Systematic review		

(Continues)

TABLE 1 (Continued)

Author	Year	Country of Origin	Funding	Methods Used	Update to Previous Guideline?	Grading of Evidence Performed?
Fitzsimmons and Modder; (Centre for Maternal and Child Enquiries, UK)[24]	2010	United Kingdom	Academic or government	Systematic review and consensus		✓
National Institute for Care and Excellence[27]	2010	United Kingdom	Not reported	Systematic review		
Davies et al; Society of Obstetricians and Gynaecologists of Canada[21]	2010	Canada	Not reported	Systematic review		✓
The American College of Obstetricians and Gynecologists (no. 105)[22]	2009	United States	Not reported	Literature search		✓
Simmons D et al; National GDM Technical Working Party, New Zealand[18]	2008	New Zealand	Not reported	Consensus		
Denison et al; RCOG[33]	2018	United Kingdom	Not reported	Systematic review	✓	✓
Mottola et al; SOGC[34]	2018	Canada	Academic or government	Systematic review		✓
Homer et al; NHMRC[35]	2018	Australia	Academic or government	Systematic review and consensus		✓
Busetto et al; EASO[36]	2018	Europe	Not reported	Not reported		✓
Mahutte et al; CFAS[49]	2018	Canada	Not reported	Literature review		✓
The American College of Obstetricians and Gynecologists (no. 763)[43]	2019	United States	Not reported	Not reported	✓	
The American College of Obstetricians and Gynecologists (no. 591)[44]	2016	United States	Not reported	Not reported	✓	
The Royal Australian and New Zealand College of Obstetricians and Gynecologists[37]	2017	Australia and New Zealand	Not reported	Literature review and consensus	✓	✓

TABLE 2 Summary of AGREE II evaluations

Author (No., Institution, or Country)	Year	Aspects of AGREE-II Evaluation							
		Scope and Purpose	Stakeholder Involvement	Rigor of Development	Clarity and Presentation	Applicability	Editorial Independence	Overall Quality	Overall Recommendation
NICE (UK)[26]	2014	100	89	96	100	75	58	83	Recommended
NICE (UK)[27]	2010	100	89	96	94	83	75	83	Recommended
Fitzsimons &Modder (Centre for Maternal and Child Enquires, UK)[24]	2010	64	64	73	75	23	100	75	Recommended
Society of Obstetricians and Gynaecologists of Canada (no. 239)[21]	2010	89	33	48	94	79	0	67	Recommended with modifications
Blumer et al (The Endocrine Society, USA)[20]	2013	100	33	35	89	50	75	67	Recommended with modifications
The American College of Obstetricians and Gynecologists (No. 105)[22]	2005	100	39	33	89	33	0	67	Recommended with modifications
Queensland Health (Australia)[28]	2015	100	0	54	56	71	67	50	Recommended with modifications
Ministry of Health (New Zealand)[29]	2014	78	67	21	89	63	0	50	Recommended with modifications
University of Michigan Health System[30]	2013	72	44	58	83	46	50	50	Recommended with modifications
The American College of Obstetricians and Gynecologists (No. 156, replaces 549)[23]	2015	83	47	27	64	21	0	42	Not recommended
Balen et al (UK)[41]	2016	39	39	33	33	33	67	33	Not recommended
Sentilhes et al; French College of Gynecologists and Obstetricians[16]	2016	17	39	35	72	54	50	33	Not recommended
Poston et al [International Pediatric Research Foundation (ISIL)][42]	2011	33	17	17	56	17	0	33	Not recommended
Cuschieri, S et al (Malta)[31]	2015	61	33	21	83	38	17	33	Not recommended
Simmons, D et al (National GDM Technical Working Party, New Zealand)[18]	2008	72	22	19	78	50	50	33	Not recommended

(Continues)

TABLE 2 (Continued)

Author (No., Institution, or Country)	Year	Aspects of AGREE-II Evaluation							
		Scope and Purpose	Stakeholder Involvement	Rigor of Development	Clarity and Presentation	Applicability	Editorial Independence	Overall Quality	Overall Recommendation
Mancia et al; European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC)[19]	2013	50	44	38	33	33	50	33	Not recommended
The American College of Obstetricians and Gynecologists (No. 650)[15]	2015	39	11	14	61	15	0	25	Not recommended
The American College of Obstetricians and Gynecologists (No. 600)[32]	2014	72	33	9	64	35	0	17	Not recommended
Nizard et al (France)[17]	2014	28	39	15	6	0	0	17	Not recommended
The American College of Obstetricians and Gynecologists (No. 548)[38]	2013	39	31	5	36	6	0	17	Not recommended
Lee et al (Singapore Health Promotion Board)[25]	2016	100	39	4	83	21	0	17	Not recommended
The Royal Australian and New Zealand College of Obstetricians and Gynecologists (no. 49)[39]	2016	28	19	14	56	21	0	17	Not recommended
Royal College of Obstetricians and Gynecologists (UK)[40]	2011	67	6	19	61	8	0	17	Not recommended
Royal College of Obstetricians and Gynecologists (UK)[14]	2015	28	6	2	56	4	0	0	Not recommended
Denison et al; RCOG[33]	2018	72	75	70	78	35	38	58	Recommended with modifications
Mottola et al; SOGC[34]	2018	89	94	67	86	56	83	58	Recommended with modifications
Homer et al; NHMRC[35]	2018	97	100	91	100	96	100	100	Recommended

(Continues)

TABLE 2 (Continued)

Author (No., Institution, or Country)	Year	Aspects of AGREE-II Evaluation							
		Scope and Purpose	Stakeholder Involvement	Rigor of Development	Clarity and Presentation	Applicability	Editorial Independence	Overall Quality	Overall Recommendation
Busetto et al; EASO[36]	2018	42	33	22	86	10	42	42	Recommended with modifications
Mahutte et al; CFAS[49]	2018	67	50	27	72	17	25	33	Not recommended
The American College of Obstetricians and Gynecologists (no. 763)[43]	2019	81	33	15	69	46	33	25	Not recommended
The American College of Obstetricians and Gynecologists (no. 591)[44]	2016	25	19	4	56	23	0	17	Not recommended
The Royal Australian and New Zealand College of Obstetricians and Gynecologists[37]	2017	64	53	17	58	29	79	42	Recommended with modifications

Note. This table presents results from the AGREE II quality assessment, comprising 23 items in six domains (scope and purpose, stakeholder involvement, rigor and development, clarity of presentation, applicability, and editorial independence). Each item was scored from 1 (strongly disagree) to 7 (strongly agree). Domain scores were calculated by summing up all the scores of the individual items in a domain and by scaling the total as a percentage of the maximum possible score for that domain.

TABLE 3 Overview of recommendations within the clinical practice guidelines

Recommendations	Number of CPGs by Stage of Pregnancy					
	Prepregnancy	First Trimester	Second Trimester	Third Trimester	Intrapartum	Postpartum
Nutritional advice	5	15				6
Physical activity advice (30 min for at least 5 d/wk)	5	11				6
Pregnancy risk counselling (including obesity with PCOS)	9	7				
Folic acid supplementation (5 mg)	6					
Early pregnancy screening for GDM		7				
BMI calculated from pre-pregnancy height and weight and documented (first prenatal visit)		6				
Anaesthesia consultation (if BMI > 35)		9				
VTE evaluation and thromboprophylaxis		4				4
Early booking visit to plan care		2				
Appropriate BP cuff size		3				
GWG counselling		8				
Preeclampsia surveillance			3			
Vitamin D supplementation (if deficient or post bariatric surgery)	1	3				1
Limitations of ultrasound in identifying structural anomalies counselling			2			
Evaluation of fetal growth			5			
Adequate staffing, equipment and clear policies and guidelines available		4				
Obesity alone is not an indication of induction of labour					3	
Dietitian referral (including post bariatric surgery)	2	5				3
Documentation of BMI in health records, possible complications and intended place of birth		4				
Bariatric surgery is not indication of caesarean section					2	
Venous access on admission to labour					2	
Breastfeeding support and or lactation consultant referral						8
Psychosocial support	3					
Stabilizing weight before conception or inter-pregnancy weight loss (including post bariatric surgery)	13					

Note. This table presents a comprehensive summary of all the recommendations available for the care of pregnant women with obesity. The numbers above each line represents the total number of clinical practice guidelines (CPGs) that included information regarding each recommendation, by the stage of pregnancy in which it was recommended. A total of 32 CPGs were included.

Abbreviations: BMI, body mass index; CPGs, clinical practice guidelines; GDM, gestational diabetes mellitus; PCOS, polycystic ovary syndrome.

that prior to attempting to conceive, women of childbearing age should stop taking medication for weight loss.[23]

One CPG recommended that bariatric surgery could be considered to improve fertility outcomes in women with PCOS who are anovulatory, have a BMI ≥ 35 kg/m^2, and who remain infertile despite undertaking an intensive structured lifestyle management programme involving reducing dietary energy intake, exercise, and behavioural interventions preferably for a minimum of 6 months.[22] This recommendation contradicted that of another CPG that suggested bariatric surgery should not be considered as a treatment for infertility.[28] One CPG recommended that if a woman has had bariatric surgery pre-pregnancy, ongoing follow-up by a dietician should be ensured.[45]

3.5 | Diet and exercise during pregnancy

Thirteen of the included guidelines recommended that pregnant women with obesity be informed of the importance of controlling their weight during pregnancy.[16,18,22,23,25,30,31,38-41,45,46] One CPG suggested the use of newer techniques (eg, text messages, reminder letters, personal, or group coaching) to reinforce dietary measures to control weight gain during pregnancy.[18] Use of the patient's BMI at first prenatal visit to provide diet and exercise counselling guided by IOM recommendations was supported.[23,25,29,30,45,46] Beginning with low-intensity exercise[29] and working towards 150 minutes per week[23] or 30 minutes per day of moderate intensity exercise[30,31] were mentioned in some CPGs, while others did not make specific recommendations for the amount of exercise, but outlined the need for it to be "regular exercise"[40] or to align with national guidelines.[45]

One CPG recommended that weight loss during pregnancy should be based on medical considerations (such as co-existing diabetes or hypertension),[47] while two others indicated there is no evidence to recommend weight loss during pregnancy.[31,48]

3.6 | Recommendations for care of women with obesity during pregnancy

Early pregnancy screening for pre-existing type 2 diabetes mellitus was commonly recommended[17,20,23,40,42,45] and varied according to relevant national protocols—two CPGs recommended fasting plasma glucose measurement,[40,42] while one recommended a 50-g glucose challenge test at 12 weeks.[42]

It was generally recommended that a daily dose of 5 mg of folic acid be continued until the end of the first trimester of pregnancy. Vitamin D supplementation during pregnancy was recommended by some CPGs for women who are confirmed to be vitamin D deficient.[30,38,45] One also noted that women with a BMI ≥ 35.0 kg/m^2 may be advised to take at least 75 mg of aspirin (but not more than 180 mg) daily from 12 weeks until the birth of the baby to reduce the risk of preeclampsia, provided their risk of gastrointestinal haemorrhage was considered to be low.[21]

Recommendations for ultrasound assessment in the CPGs included nuchal scan between 11 weeks, 4 days, and 13 weeks, 6 days gestation for women with BMI greater than 40 kg/m^2, assessment of early anatomy between 14 and 16 weeks gestation (to reduce the problem of impaired acoustic windows), routine morphology scan at 20 to 22 weeks gestation, and where clinical assessment is limited by obesity, growth scan at 28 to 32 weeks gestation to aid in the detection of late-onset fetal growth restriction.[38] Another CPG recommended fetal growth scans at 26 and 32 weeks for women affected by obesity with BMI greater than 40 kg/m^2.[40]

One CPG[29] indicated there was no evidence showing a clear improvement in pregnancy outcomes with the implementation of antenatal surveillance of fetal well-being and concluded that a recommendation could not be made for or against routine use in pregnant women with obesity. The exact definition of "antenatal surveillance" was not provided.

Options/approaches for antenatal thromboprophylaxis[23,25,30] conflicted, with two CPGs[23,30] not providing any details. One CPG recommended thromboprophylaxis before Caesarean section (C-section), another suggested considering thromboprophylaxis in women with "extreme obesity" who are hospitalized prior to delivery, and another recommended consideration of thromboprophylaxis for patients with obesity, on bed rest or having surgery during the antenatal period.

Antenatal patient referral to an anaesthesiologist was recommended by four guidelines,[23,25,29,45] one of which specifically made mention of this for women with BMI greater than 40 kg/m^2.[38] During that consultation, it was advised that the limitations and risks of anaesthesia during delivery be discussed.

In women with a history of bariatric surgery, the importance of good communication between the obstetrician and the bariatric surgery team was noted, as was the need for referral to a dietician and nutritional supplements over and above the usual requirements in a normal pregnancy.[23,28,38,45] One CPG noted that alternative testing for gestational diabetes be considered for those patients with a history of malabsorptive surgery, consisting of 1 week of home glucose monitoring of fasting and 2-hour postprandial blood sugars, completed between 24 and 28 weeks of gestation[28] . This CPG also noted that bariatric surgery should not be considered an indication for Caesarean delivery.[28]

The importance of fetal growth monitoring during pregnancy was noted,[22,38] as was the value of maintaining a high index of suspicion for complications of bariatric surgery, which may present as common pregnancy complaints.[38]

3.7 | Delivery and postpartum care

In the included CPGs, there was little guidance provided for care around timing of delivery. Only one CPG provided specific recommendations,[30] stating that in the absence of other obstetric or medical indications, obesity alone is not an indication for induction of labour and a normal birth should be encouraged.

Early establishment of venous access during labour was recommended in women with a BMI above 40.[30,45] The allowance of a longer first stage of labour prior to performing a C-section for labour arrest should be considered.[29] All women with a BMI ≥30 should have active management of the third stage of labour due to an increased risk of postpartum haemorrhage.

The majority of recommendations for delivery care related to C-section procedures. It was noted that obesity alone is not an indication for elective C-section[30,38]; however, based upon the fact that the operative and anaesthetic risks of emergency C-section are higher for women with obesity, one CPG noted that informed discussion should be held with women regarding the mode of delivery.[45] This CPG noted that as a C-section delivery approaches, operating room staff should be alerted regarding any woman whose weight exceeds 120 kg in order to ensure that adequate staffing and equipment are available.[45] Suturing of the subcutaneous tissue space to reduce the risk of wound infection and wound separation in women with more than 2 cm of subcutaneous fat was recommended.[30] It was recommended that mechanical thromboprophylaxis using pneumatic compression devices be applied before C-section, if possible, as well as after C-section delivery and that weight-based dosing of pharmacologic options for thromboprophylaxis be considered, as such a strategy may be more effective than BMI-stratified dosage strategies in class III women with obesity after C-section.[29]

One CPG recommended that behavioural interventions including diet and exercise be recommended, geared towards reduction of weight postpartum.[29,39] One guideline recommended the offering of additional support for breastfeeding,[30] while another reinforced involvement of a lactation consultant to increase supervision during breastfeeding and to provide early postpartum support.[23] Another CPG also suggested providing advice that weight loss incurred during breastfeeding through eating a healthy diet and performing regular exercise does not impact the quantity or quality of milk production.[31]

4 | DISCUSSION

4.1 | Main findings

The use of CPGs is common in clinical practice, and national clinical organizations commonly produce CPGs and encourage their members to adhere to them. Specifically, guidelines aimed in managing the clinical risks of obesity among pregnant women have become an international focus. The current study presents a rigorous systematic review that explores the quality of existing CPGs that are available for pregnancy in women with obesity.

When assessing with the AGREE II instrument, only four CPGs[26,30-32] were recommended without any modifications. The main difference between these four CPGs and the remaining CPGs was the quality of reporting, specifically in terms of the level of transparency with respect to the methodology applied to develop the guideline. Most of the CPGs scored low in the "rigour of development" domain, which relates to the process used to gather and synthesize the evidence and the methods to formulate and update recommendations.[33] This domain is considered the most important for evaluation of guideline development and may have an impact on recommendations for clinical practice.[34] Confidence is low in the overall quality of currently available CPGs relating to pregnancy care of women with obesity.

Despite tools such as AGREE II, concerns about quality and reporting of CPGs continue to exist. The consistent use of guideline development standards will improve the quality of CPGs. Such standards should be incorporated into the routine development and updating of CPGs,[35] similar to the use of the CONSORT statement for design and reporting of randomized controlled trials. There is also a role for conducting pilot tests to ensure guideline feasibility prior to publication.[34]

As other studies[36,49] have found, few of the existing CPGs explicitly identified the use of other systematic reviews to inform development of their guideline. Given the high rate of systematic review production and updates, guideline developers working in all clinical specialties should take greater steps to incorporate these works into their syntheses and interpretations of the evidence when developing clinical recommendations.

Recommendations presented in available CPGs were generally consistent and well presented. However, several forms of heterogeneity were identified, including the degree of methodologic rigor, the specific objectives, and target populations considered by the reviews. Key clinical messages from this collection of guidelines were consistent across sources. There was limited guidance for significant key elements of care, including the timing of screening tests (including fetal anatomy and wellbeing), antenatal visits and delivery, ideal care during the postpartum period and the management of adverse pregnancy outcomes.

The CPGs in our review failed to provide recommendations for risk stratification at the first prenatal visit that would direct women to low risk (family medicine or midwifery) versus higher risk (obstetrics or maternal fetal medicine) care models. One guideline recommended that all women with a BMI ≥35 kg/m^2 "give birth in a consultant-led obstetric unit with appropriate neonatal services."[30] Not all pregnant women with obesity have the same odds of developing adverse pregnancy outcomes. The identification of well-defined risk factors will aid in the development of triage tools and help clinicians implement preventative strategies and monitor higher-risk women for the development of adverse pregnancy outcomes.

Aspects of the CPGs for which there is a strong basis of evidence and a high degree of agreement should be adhered to when providing care to pregnancies complicated by obesity. The substantial gaps in knowledge and clinical direction identified in the CPGs in this study represent logical opportunities for future consensus and research. CPGs in all areas of medicine can be optimized by providing, clear, pragmatic, evidence-based recommendations that improve patient outcomes, as well as experience.

4.2 | Strengths and limitations

To our knowledge, this is the first review to identify, synthesize, and assess the CPGs available on the care of pregnant woman with obesity. Other strengths include the systematic and comprehensive literature search of guidelines by an experienced medical information specialist and the review of eligible studies by a team of reviewers.

Original study sources were neither retrieved nor evaluated in this study. It was beyond the scope of the current project to interrogate individual care elements within the CPGs, but the limited utility of vague recommendations within CPGs is highlighted. An additional drawback was the language limitation, as only English and French materials were included. As such, we may have missed beneficial information present in guidelines of other languages. Finally, we were limited to the information present in the CPGs, which often omitted details such as optimal method and timing of antenatal surveillance.

5 | CONCLUSION

This study presents a systematic review of CPGs for pregnant women with obesity. The ideal management of this population remains a priority to improve both their own health and that of their future generations. Over the past decade, a number of CPGs have been developed with variation in methodologic rigor, specific objectives, and target populations. This study highlights some strong and consistent recommendations on healthy diet, exercise, and dietician referral and revealed some weaknesses regarding important aspects of care. More effort and research are needed to bridge knowledge gaps and enhance consistency in development and reporting of CPGs. The importance of CPGs targeting obesity and weight management during pregnancy is internationally apparent; however, ongoing investigations are required to ensure information detailed in these guidelines are sufficient and consistent.

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CONFLICT OF INTEREST

No conflict of interest was declared.

CONTRIBUTION TO AUTHORSHIP

L.G. conceived the idea of the study. B.S. designed the literature searches. M.P. and A.S. reviewed all abstracts and full-text articles. B.H. and A.S. wrote the first draft of the manuscript; R.F., N.R., D.C., L.G., M.W., M.P.V., G.N.S., D.C., and M.W. assisted in the editing and reviewing of the content of the manuscript. All the authors critically revised the review and gave their approval.

ETHICS APPROVAL

This review did not require ethics approval.

ORCID

Romina Fakhraei https://orcid.org/0000-0002-4406-3199

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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