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REVIEW

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Weight management interventions before IVF in overweight and obese women: a scoping review

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Abstract

Background Overweight and obesity are associated with reduced fertility outcomes in assisted reproduction. This scoping review maps available evidence on pre-IVF weight management interventions.

Methods We searched PubMed/MEDLINE (2008–2025) for studies evaluating weight management interventions (dietary, exercise, pharmacological, surgical) before or during IVF in women with BMI ≥ 25 kg/m^2. We included randomized controlled trials, quasi-experimental studies, and cohorts with interventions. Two reviewers independently screened records and extracted data on interventions and outcomes. Supplementary searches included reference screening and citation tracking.

Results From 230 records, 19 studies met inclusion criteria: 17 evaluating IVF-specific outcomes — lifestyle or dietary interventions ($n = 10$), pharmacological therapies ($n = 3$), and bariatric surgery ($n = 4$) — and 2 examining preconception interventions before other ART modalities included exclusively to inform implementation challenges. Weight loss was achieved across intervention categories, though the magnitude varied substantially. Improvements in reproductive outcomes were inconsistent. Some studies reported improved pregnancy rates following lifestyle interventions, while well-designed trials showed no significant differences despite weight reduction. Orlistat showed no reproductive benefit; GLP-1 agonist combination therapy showed preliminary promise in PCOS. Bariatric surgery produced substantial weight loss but inconsistent live birth outcomes. High attrition rates (> 20%), treatment delays, and variable adherence were common challenges.

Conclusions Pre-IVF weight management interventions demonstrate substantial outcome heterogeneity. While weight loss is achievable, reproductive benefits are inconsistent. Evidence does not support rigid BMI cutoffs. Clinical decisions should be individualized. Future research should identify predictive factors and optimize intervention protocols.

Keywords In vitro fertilization, Obesity, Weight loss, Lifestyle intervention, Bariatric surgery, Assisted reproduction, Scoping review

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Introduction

Overweight and obesity are highly prevalent among women of reproductive age, with rates estimated to be up to 44% globally [1]. Excess weight has been associated with reduced fertility in both natural and assisted conceptions [2–4]. Specifically, increased body mass index (BMI) correlates with lower ovulation, conception, clinical pregnancy, and live birth rates [5–7]. Obesity also increases adverse pregnancy outcomes, such as gestational diabetes, hypertensive disorders, preterm birth, and fetal mortality [8–10].

During in vitro fertilization (IVF), higher BMI negatively impacts outcomes at every step, such as oocyte retrieval, fertilization, embryo quality, implantation, and live births [11–13]. The proposed mechanisms include alterations in sex steroid balance, insulin resistance, inflammation, and endometrial receptivity [14, 15]. Therefore, guidelines frequently recommend weight loss interventions prior to fertility treatment for overweight/obese women [16, 17].

Several scientific societies, including the American Society for Reproductive Medicine (ASRM) and the European Society of Human Reproduction and Embryology (ESHRE), have addressed the impact of obesity on fertility and have provided guidance for managing obese patients seeking assisted reproduction [17, 18]. These guidelines acknowledged the detrimental effects of elevated BMI on IVF success rates and pregnancy outcomes, but they do not have recommendations on strict BMI cutoffs for treatment eligibility. Instead, they emphasize the importance of informing patients of obesity-related risks, encouraging weight loss through supportive interventions prior to treatment, and considering an individualized approach based on overall health and specific circumstances. However, some fertility centers have instituted BMI limits, with a survey finding 62.5% of U.S. centers performing more than 1000 cycles per year, having a BMI threshold of 40 kg/m2 for IVF [19]. While anesthesia safety considerations contribute to some thresholds, the lack of consensus on optimal BMI cutoffs for treatment access and the effectiveness of pre-IVF weight loss interventions creates uncertainty for both clinicians and patients seeking fertility treatment.

A variety of structured approaches have aimed at intentional weight reduction before IVF, including low-calorie diets, increased physical activity, medication, and bariatric surgery. These strategies have the potential to improve treatment response and conception success. However, possible downsides such as delays in fertility care and patient burden must also be considered, particularly for women of advanced maternal age.

A recent systematic review and meta-analysis restricted to randomized controlled trials (Jeong et al., 2024) confirmed that pre-IVF weight loss does not significantly improve live birth rates (OR 1.36; 95% CI 0.88–2.10) [20]. However, by limiting inclusion to RCTs, such analyses cannot capture the full landscape of intervention types — including bariatric surgery, pharmacological approaches beyond orlistat, and real-world cohort evidence — precisely the heterogeneous evidence base that a scoping review methodology is designed to map. This review narratively synthesizes the available literature on pre-IVF weight loss interventions, examining their impact on weight reduction outcomes, IVF treatment parameters (oocyte quality, embryo development, gonadotropin requirements), and reproductive outcomes (clinical pregnancy rate, live birth rate, implantation rate). Given the focused nature of our research question, a scoping review methodology was employed, with rapid synthesis principles applied to ensure timeliness.

Methods

Study design and rationale

We conducted a scoping review following the methodological framework proposed by Arksey and O'Malley [21, 22], adapted for rapid synthesis according to World Health Organization guidance [23]. We report our findings according to the PRISMA Extension for Scoping Reviews (PRISMA-ScR) checklist [24].

We selected a scoping review approach for several reasons. First, our objective was to map the landscape of available evidence on weight management interventions before IVF in overweight and obese women, rather than answer a specific effectiveness question suited to systematic review methodology. Second, we anticipated heterogeneous intervention types, study designs, and outcome measures requiring the flexible inclusion criteria characteristic of scoping reviews [25]. Third, this approach enables identification of knowledge gaps and research priorities to inform future systematic reviews and primary studies. The rapid methodology was employed to provide timely evidence synthesis while maintaining transparency and rigor.

Protocol and registration

No formal protocol was prospectively registered, consistent with rapid review methodology prioritizing timeliness. However, we established our search strategy, eligibility criteria, and data extraction methods a priori before initiating the review.

Eligibility criteria

Consistent with scoping review methodology, eligibility criteria were structured according to the Population, Concept, and Context (PCC) framework recommended by JBI guidance [25]. Studies were included if they met the following criteria:

- Population: Adult women (≥ 18 years) with overweight or obesity (body mass index [BMI] ≥ 25 kg/m²) who were planning or undergoing in vitro fertilization (IVF) or intracytoplasmic sperm injection (ICSI) treatment.
- Concept (Intervention): Any weight management intervention implemented before or during the assisted reproductive technology (ART) treatment cycle. Interventions included: (1) dietary modifications or caloric restriction programs; (2) structured exercise or physical activity programs; (3) pharmacological therapies for weight loss; (4) bariatric surgery; or (5) combined or multifaceted lifestyle interventions. We included interventions regardless of whether weight loss was achieved, as our objective was to map all intervention attempts in this population.
- Context: Pre-IVF or peri-IVF clinical setting. Studies with or without a comparison group were eligible, consistent with scoping review methodology, as our aim was to map the available evidence across diverse real-world practice contexts rather than evaluate comparative effectiveness.
- Concept (Outcomes): Studies reporting at least one of the following outcomes: (1) weight change (kilograms or percentage); (2) BMI change; (3) metabolic parameters (e.g., glucose metabolism, insulin resistance, lipid profile); or (4) reproductive outcomes (e.g., number of oocytes retrieved, fertilization rate, embryo quality, clinical pregnancy rate, live birth rate).
- Context (Study design): We included randomized controlled trials (RCTs), quasi-experimental studies, prospective cohort studies with intervention component, retrospective cohort studies with intervention component (e.g., bariatric surgery studies), and case series with ≥ 10 participants. Pure observational studies without any intervention component were excluded.
- Timeframe: We included studies published from 2008 to 2024, unless citation tracking retrieved an article before timeframe. This timeframe was selected to align with the widespread adoption of oocyte and embryo vitrification (2008–2009), which represents a significant methodological advance in contemporary ART practice.

Studies were excluded if they: (1) were review articles, meta-analyses, editorials, letters, or conference abstracts; (2) included only normal-weight women (BMI < 25 kg/m²); (3) examined interventions implemented after IVF treatment rather than before or during treatment; (4) reported outcomes unrelated to weight, metabolic health, or reproductive success; (5) had sample sizes < 10 participants; or (6) were animal or in vitro studies.

Additionally, to comprehensively map implementation challenges and potential harms of preconception weight loss interventions, we included articles examining lifestyle interventions before assisted reproductive technology (ART) treatments other than IVF/ICSI. While these studies employed ovulation induction rather than IVF, they provided evidence on adherence barriers, dropout rates, and safety signals relevant to all preconception weight loss programs in obese infertile women. These studies were analyzed separately and contributed exclusively to our synthesis of implementation challenges rather than reproductive outcomes.

Information sources and search strategy

We searched PubMed/MEDLINE on October 15, 2024. Following reviewer recommendations during the second revision, a complementary update search was conducted on October 25, 2025, extending coverage through that date. The search strategy and terms were identical to those of the primary search. The search strategy combined Medical Subject Headings (MeSH) terms and text words related to three key concepts: (1) assisted reproduction, (2) weight management interventions, and (3) obesity/overweight status.

The complete electronic search strategy was:

> ("Fertilization in Vitro"[Mesh] OR "Reproductive Techniques, Assisted"[Mesh] OR "in vitro fertilization"[tiab] OR IVF[tiab] OR ICSI[tiab] OR "intracytoplasmic sperm injection"[tiab] OR "assisted reproduction"[tiab])
> AND ("Weight Loss"[Mesh] OR "Obesity/therapy"[Mesh] OR "Diet"[Mesh] OR "Diet, Reducing"[Mesh] OR "Exercise"[Mesh] OR "Exercise Therapy"[Mesh] OR "Bariatric Surgery"[Mesh] OR "weight loss"[tiab] OR "weight reduction"[tiab] OR "weight management"[tiab] OR "dietary intervention"[tiab] OR "lifestyle intervention"[tiab] OR "lifestyle modification"[tiab] OR "caloric restriction"[tiab] OR "exercise program"[tiab] OR "physical activity"[tiab])
> AND ("Obesity"[Mesh] OR "Overweight"[Mesh] OR obese[tiab] OR obesity[tiab] OR overweight[tiab] OR "elevated BMI"[tiab] OR "increased BMI"[tiab] OR "body mass index"[tiab])

Filters applied: Publication dates 2009–2024; Humans; Female.

Results: 230 records identified.

We did not apply publication type restrictions (e.g., limiting to "clinical trials") to ensure comprehensive identification of all relevant intervention studies, consistent

with scoping review methodology requiring broad evidence mapping (1,4).

Supplementary search methods

Consistent with scoping review best practices, we supplemented the database search with multiple complementary strategies:

1. Reference list screening: We manually screened reference lists of all included studies and relevant systematic reviews identified during the search process to identify additional potentially relevant studies.
2. Forward citation tracking: We used Google Scholar to identify studies citing seminal papers in the field of obesity and fertility. We screened titles and abstracts of citing papers to identify relevant studies not captured in the database search.
3. Expert consultation: Members of our research team with clinical expertise in reproductive endocrinology and obesity medicine reviewed the list of potentially eligible studies to verify relevance and completeness. No additional studies were identified through this process that had not already been captured by the primary database search or citation tracking.

All studies identified through supplementary methods underwent the same screening and eligibility assessment process as database-identified records, with the exception that citation tracking was not restricted by publication date, allowing identification of relevant studies published before 2008.

Selection of sources of evidence

Two reviewers (AG and CA) independently screened titles and abstracts of all 230 records retrieved from the PubMed search against the eligibility criteria. Studies were classified as: (1) clearly eligible; (2) clearly ineligible; or (3) potentially eligible requiring full-text review. When eligibility was uncertain from title and abstract alone, studies were advanced to full-text review. Disagreements were resolved through discussion.

Following title and abstract screening, both reviewers independently assessed the full text of all potentially eligible articles against the complete eligibility criteria. Reasons for exclusion at the full-text stage were documented for each excluded study. Studies identified through supplementary methods underwent the same dual independent review process.

Data charting process

We developed a standardized data charting form based on the review objectives and guidance for scoping reviews. The form captured the following information: (1) study characteristics (first author, publication year, country, study design, sample size, setting); (2) population characteristics (age, baseline BMI, infertility diagnosis, number of prior IVF cycles); (3) intervention details (type, specific components, duration, intensity, timing relative to IVF cycle, adherence or compliance measures); (4) outcomes reported (weight change, BMI change, metabolic markers, number of oocytes retrieved, fertilization rate, embryo quality parameters, pregnancy outcomes, live birth rate); and (5) key findings relevant to the review questions.

The data charting form was piloted on three studies and refined to ensure clarity and comprehensiveness before full data extraction.

Data items

For each included study, we systematically extracted data on the following items:

- Study identifiers: First author, publication year, country of origin, funding source.
- Study design: Specific study design (e.g., RCT, prospective cohort), presence of control or comparison group, randomization method (if applicable), duration of follow-up.
- Population: Sample size, participant age (mean and standard deviation or range), baseline BMI (mean and standard deviation or range), BMI categories (overweight vs. obese), primary infertility diagnosis, number of previous IVF attempts, inclusion and exclusion criteria.
- Intervention: Type of intervention (dietary, exercise, pharmacological, surgical, or combined), specific intervention components and protocols, duration of intervention (weeks or months), intensity or frequency, timing of intervention relative to IVF cycle initiation, setting (e.g., clinic-based, home-based, supervised), adherence or compliance assessment methods and rates.
- Outcomes: Weight change (kilograms or percentage), BMI change, metabolic outcomes (fasting glucose, insulin levels, homeostatic model assessment for insulin resistance [HOMA-IR], lipid profiles), reproductive outcomes (number of oocytes retrieved, fertilization rate, number and quality of embryos, clinical pregnancy rate, ongoing pregnancy rate, live birth rate, miscarriage rate).

When studies reported outcomes at multiple time points, we extracted data from the time point closest to IVF cycle initiation. When studies reported data as ranges or medians without means, we noted this and, when necessary for descriptive purposes, estimated central tendency. When studies included mixed populations (normal weight and overweight/obese) but reported outcomes

separately for subgroups, we extracted data only for the overweight/obese subgroup.

Critical appraisal of individual sources of evidence

Consistent with scoping review methodology, which focuses on mapping available evidence rather than synthesizing effect estimates or determining intervention effectiveness, we did not conduct formal quality appraisal or risk of bias assessment of included studies (1,4,5). We acknowledge that included studies vary in methodological quality, sample size, and risk of bias. We descriptively noted key design features (e.g., presence of randomization, sample size, use of control group) in our data charting but did not use quality scores to exclude studies or weight findings.

Synthesis of results

Given substantial heterogeneity in intervention types, study designs, populations, and outcome measures, we employed narrative descriptive synthesis. We did not conduct meta-analysis, as quantitative pooling was not appropriate given the clinical and methodological diversity of included studies and the exploratory aims of scoping review methodology.

Results

Study selection and characteristics

The systematic search identified 230 records from PubMed. After title and abstract screening, 62 full-text articles were assessed for eligibility. Following full-text review and supplementary searches through reference screening and citation tracking, 17 studies met all inclusion criteria for IVF-specific outcomes (16 from the primary search strategy and 1 from citation tracking). Two additional studies examined preconception lifestyle interventions before other ART modalities; these were included exclusively to inform our synthesis of implementation challenges and potential harms. Of the 17 IVF-specific studies, interventions included lifestyle or dietary programs ($n = 10$), pharmacological therapies ($n = 3$), and bariatric surgery ($n = 4$) (Fig. 1).

Included studies evaluated three primary intervention types: non-pharmacological approaches (dietary modifications, exercise programs, and combined lifestyle interventions), pharmacological weight-loss therapies, and bariatric surgery. Study designs comprised randomized controlled trials, quasi-experimental studies, and prospective and retrospective cohorts with interventions. Comprehensive characteristics of all included studies, including population details, intervention specifications, and outcomes assessed, are presented in Table 1.

Non-pharmacological weight management strategies

Non-pharmacological interventions encompassed structured dietary prescriptions and combined lifestyle programs implemented before IVF. Very-low-calorie diets (< 800 kcal/day) were evaluated for short-term weight reduction prior to treatment in two pilot studies [28, 29]; Tsagareli et al. [28] reported a mean loss of 5.6 kg over 4–6 weeks, and Sim et al. [29] achieved – 6.6 kg (6.9%), accompanied by significantly higher clinical pregnancy rates (48.1% vs. 13.6%, OR 5.88, $p = 0.007$) and live birth rates (44.4% vs. 13.6%, $p = 0.02$) compared with controls [28, 29]. More commonly, studies employed low-calorie or hypocaloric dietary regimens, some incorporating low-glycemic index prescriptions or partial meal replacements, in randomized and prospective interventions designed to modify metabolic status before IVF cycles [30–32]. One retrospective cohort examined a 60-day structured program combining dietary modifications with supervised physical activity before IVF/ICSI [33], while a randomized trial assessed an intensive lifestyle program integrating caloric restriction, behavioral components, and guided physical activity in obese infertile women preparing for IVF [34].

Weight loss was achieved across these interventions, although the magnitude varied substantially between studies. In contrast, reproductive outcomes demonstrated considerable inconsistency. Some studies reported improvements in clinical pregnancy rates following diet-based or combined behavioral interventions [30, 31], suggesting potential influence on early reproductive endpoints. However, several trials involving structured lifestyle modification showed no significant differences in implantation, clinical pregnancy, or live birth rates despite achieving modest weight reduction [32, 34]. Similarly, analysis of a nested cohort from a lifestyle trial found that pre-IVF weight loss did not improve embryo utilization or cumulative live birth [35]. Overall, lifestyle-based interventions produced weight loss but did not yield uniform improvements in IVF outcomes. Notably, the largest randomized trial in this category (Einarsson et al. [34], $n = 317$) achieved a mean weight reduction of 9.44 kg yet found no difference in live birth rates (29.6% vs. 27.5%, $p = 0.77$), and a pilot RCT (Moran et al. [32], $n = 46$) found no significant difference in pregnancies (12/18 vs. 8/20, $p = 0.119$) or live births (7/18 vs. 5/20, $p = 0.483$) despite significant weight loss.

Pharmacological weight management strategies

Three studies evaluated pharmacological interventions for weight loss before IVF. Two assessed orlistat and one examined liraglutide combined with metformin. In a large multicenter randomized controlled trial ($n = 877$), orlistat administered for 4 to 12 weeks before IVF-ET resulted in slightly greater weight loss compared

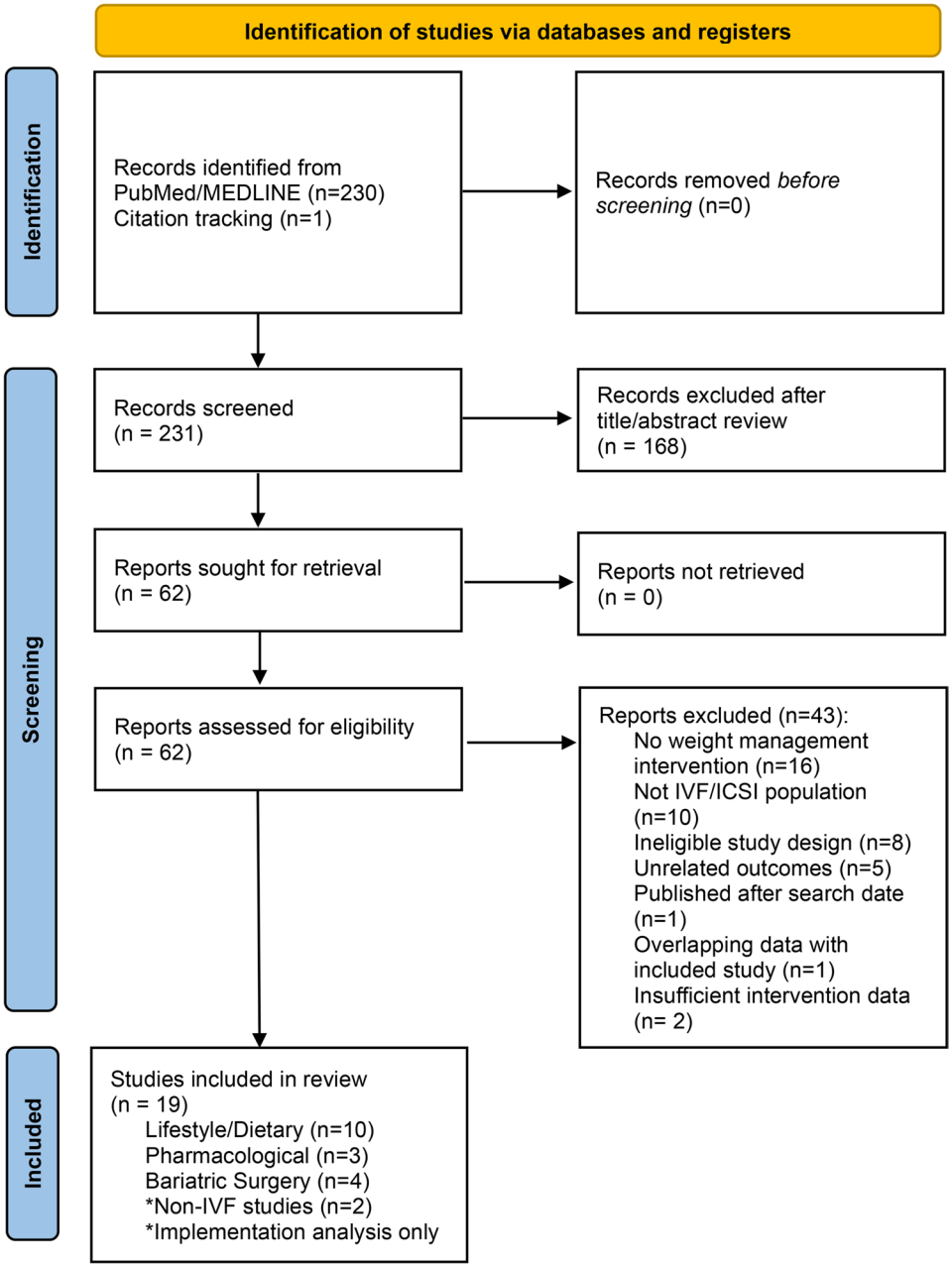

Fig. 1 PRISMA flow diagram of study selection

with placebo (– 2.49 kg vs. – 1.22 kg, $p = 0.005$) but produced no significant differences in live birth rate (25.5% vs. 25.6%, RR 1.00, 95%CI 0.80–1.25, $p = 0.984$), conception, clinical pregnancy, or ongoing pregnancy rates [36]. Embryologic parameters and ovarian stimulation characteristics were also comparable between groups. A smaller retrospective cohort ($n = 58$) reported higher clinical pregnancy rates among women who received orlistat (59.46% vs. 39.47%, $p = 0.004$), though live birth rates did not differ significantly (54.05% vs. 36.84%, $p > 0.05$) [37]; differences in embryo transfer practices may have contributed to these findings.

The combination of liraglutide plus metformin was evaluated in a pilot randomized study among obese women with polycystic ovary syndrome (PCOS). This regime resulted in higher implantation and clinical pregnancy rates compared with metformin alone, despite similar degrees of weight loss between groups [38]. While these findings suggest potential reproductive benefit of GLP-1–based therapy beyond weight loss alone, the sample size was limited and the population was PCOS-specific, reducing generalizability. Across pharmacologic interventions, the available evidence indicates minimal reproductive benefit of orlistat, with preliminary but

Table 1 Scoping Review Articles Synthesis

Author	Country	Year	Subjects (*n*)	Type / Methods	Focus of Study	Weight Loss Intervention	Key Findings (Weight Loss / LBR / CPR)
Tsagareli	Australia	2006	10 (no control group)	Prospective pilot study	Effect of very-low–calorie diet on IVF outcomes	VLCD < 800 kcal/day, Optifast-based regimen 4 to 6 weeks prior to IVF (up to oocyte retrieve)	Weight loss: mean 5.6 kg (6.3%). IVF outcomes not definitively assessed ($n = 6$ completers). No LBR reported. Feasibility pilot only.
Becker	Brazil	2015	26 (14 intervention group)	Randomized controlled trial	Short-term hypocaloric, low glycemic index diet prior to fertility treatment	Hypocaloric low glycemic index / low glycemic load diet	Weight loss: −4.51 kg (LGI) vs. + 0.72 kg (control), $p < 0.001$. Oocytes retrieved: 7.75 vs. 4.18 ($p = 0.039$). CPR: 21.4% vs. 0%. LBR: 21.4% (3/14) vs. 0%.
Moran	Australia	2011	46 (21 intervention group)	Pilot randomized controlled trial	Short-term weight loss preceding IVF	Energy-restricted diet including meal replacements + lifestyle advice	Weight loss: mean − 3.8 kg (intervention) vs. − 0.5 kg (control), $p < 0.001$. Pregnancies: 12/18 vs. 8/20 (NS, $p = 0.119$). LBR: 7/18 (38.9%) vs. 5/20 (25.0%), $p = 0.483$ (NS). Waist circumference reduction associated with increased pregnancy odds (OR 1.286, $p = 0.042$) on logistic regression.
Espinós	Spain	2017	41 (21 intervention group)	Randomized controlled pilot study	Effect of pre-IVF weight loss on live birth	Hypocaloric individualized diet + lifestyle program before IVF	Weight loss: mean − 5.39 kg (6.97%). LBR/cycle: 52.4% vs. 30.0% (NS); cumulative LBR: 61.9% vs. 30.0% ($p = 0.045$). CPR/cycle: 57.1% vs. 35.0% (NS).
Yang	China	2022	2381 (495 intervention group	Retrospective cohort	Effect of 60-day structured intervention on IVF/ICSI outcomes	Low-carb diet + diet structure adjustment + supervised activity	BMI: 30.9→27.7 kg/m^2 ($p < 0.001$). No significant differences in perinatal complications. Birth weight higher in intervention (3519.6 vs. 3406.8 g, $p < 0.001$). ≥10% weight loss associated with fewest adverse perinatal outcomes.
Einarsson	Sweden / Denmark / Iceland	2017	317 (160 intervention group)	Multicenter randomized controlled trial	Low calorie liquid diet on IVF outcomes	Low Calorie Liquid Diet of 880 kcal/day 12 weeks and 2–5 weeks of weight stabilization	Weight loss: mean − 9.44 kg. LBR: 29.6% vs. 27.5% ($p = 0.77$, NS). CPR: 34.9% vs. 30.7% (NS). More spontaneous pregnancies in intervention group (10.5% vs. 2.6%, $p = 0.009$).
Sim	Australia	2014	49 (27 intervention group)	Randomized control trial	Very-low-energy Diet followed by multidisciplinary intervention	Very-low-energy diet for the initial 6 weeks followed by a hypocaloric diet, combined with a weekly group multidisciplinary program	Weight loss: mean − 6.6 kg (6.9%). CPR: 48.1% vs. 13.6% (OR 5.88, 95%CI 1.40–24.64, $p = 0.007$). LBR: 44.4% (12/27) vs. 13.6% (3/22), $p = 0.02$. Improved fertilization rate (73% vs. 49%, $p = 0.04$).
Wang	Netherlands	2021	137 (58 intervention group)	Nested cohort study in RCT (LIFEStyle Study by Mutsaerts et al.)	Effect of lifestyle interventions in fertility outcomes	6-month lifestyle intervention	Nested cohort from LIFEStyle RCT [26]. Pre-IVF lifestyle intervention did not improve embryo utilization rate or cumulative LBR in IVF subgroup.

Table 1 (continued)

Author	Country	Year	Subjects (*n*)	Type / Methods	Focus of Study	Weight Loss Intervention	Key Findings (Weight Loss / LBR / CPR)
Wu	China	2022	424 (352 divided according to weight loss)	Retrospective cohort	Metabolic, reproductive & granulosa-cell gene expression outcomes	6-month weight loss pre-treatment (intervention details not given)	Weight loss groups (PCOS): >10 kg: LBR 54.83% vs. no-loss 29.5% ($p < 0.05$); CPR 61.29% vs. 40.95% ($p < 0.05$). >10 kg loss normalizes granulosa cell gene expression (FSHR, Smad7, GPX3).
Shen	China	2023	197 (98 intervention group)	Retrospective cohort	Impact of pre-IVF weight reduction on IVF cycle parameters	Weight management program (3–6 months)	≥ 10% loss: CPR 64.3% vs. 39.7% ($p = 0.002$), LBR 57.1% vs. 34.8% ($p = 0.004$). ≥5% loss: CPR/LBR differences NS. Reduced gonadotropin dose in both threshold groups.
Wang	China	2021	877 (439 intervention group)	Multicenter double-blind RCT	Effect of orlistat before IVF-ET on live birth	Orlistat vs. placebo (4–12 weeks pre-IVF)	Weight loss: −2.49 kg (orlistat) vs. − 1.22 kg (placebo), adjusted diff − 1.18 kg ($p = 0.005$). LBR: 25.5% (112/439) vs. 25.6% (112/438), RR 1.00 (95%CI 0.80–1.25), $p = 0.984$ (NS). CPR: 31.7% vs. 30.4% (NS). Singleton birth weight higher with orlistat (3487 vs. 3285 g, $p = 0.039$). GI adverse events more frequent with orlistat (17.3% vs. 11.4%, $p = 0.013$).
Tong	China	2022	58 (29 intervention group)	Retrospective matched cohort	Effect of orlistat on IVF/ICSI outcomes	Orlistat 120 mg TID before IVF/ICSI	Orlistat vs. matched controls: CPR 59.46% vs. 39.47% ($p = 0.004$); LBR 54.05% vs. 36.84% (NS, $p > 0.05$). Different embryo transfer strategies between groups (double cleavage vs. single blastocyst, $p = 0.006$) noted as potential confounder. No significant differences in stimulation parameters or oocyte yield.
Salamun	Slovenia	2018	28 (14 MET group, 14 MET+Lira)	Randomized controlled pilot study	Effect of liraglutide + metformin vs. metformin alone (PCOS)	Liraglutide 1.2 mg + metformin	Weight loss: −6.99 kg (MET) vs. − 7.51 kg (COMBI), NS between groups. PR per ET: 85.7% (COMBI) vs. 28.6% (MET), $p = 0.03$. Reproductive benefit independent of weight loss magnitude.
Milone	Italy	2017	40	Prospective pre–post cohort	Effect of restrictive bariatric surgery on ART outcomes	Restrictive bariatric surgery (sleeve)	BMI: 40.7→35.0 post-surgery. LBR: 35% (14/40) post- vs. 0% pre-surgery ($p < 0.001$). CPR: 37.5% (15/40) vs. 0% ($p < 0.001$). Improved oocyte yield and embryo quality. Best outcomes if BMI < 34.5 post-surgery.
Christofolini	Brazil	2014	180 (29 bariatric patients)	Retrospective cohort	Effect of bariatric surgery on oocyte number/quality	Prior bariatric surgery	Median weight loss 46 kg. Fewer oocytes retrieved (5 vs. 6–6.5, $p = 0.013$) and MII oocytes (3 vs. 4–5, $p = 0.0006$) vs. controls. No significant difference in CPR (RR 1.82, 95%CI 0.82–4.07, NS).

Table 1 (continued)

Author	Country	Year	Subjects (*n*)	Type / Methods	Focus of Study	Weight Loss Intervention	Key Findings (Weight Loss / LBR / CPR)
Nilsson-Condori	Sweden	2022	897 (153 bariatric patients)	National registry case–control	IVF outcomes after bariatric surgery	Prior bariatric surgery	Post-bariatric BMI 28.4 at IVF. CLBR: 29.4% vs. 33.1% (aOR 1.04, 95%CI 0.73–1.51, NS). Fewer oocytes (7.6 vs. 8.9, $p = 0.005$). Lower birth weight (3190 vs. 3478 g, $p = 0.037$).
Grzegorczyk-Martin	France	2020	332 (83 bariatric patients)	Multi-center retro-spective cohort	IVF outcomes after bariatric surgery	Prior bariatric surgery	Weight loss: mean 41.8 kg pre-surgery. CLBR: 22.9% (bariatric) vs. 25.9% (BMI-matched) vs. 12.0% (obese, $p = 0.042$). LBR/transfer: 20% vs. 18% vs. 9.3% ($p = 0.017$). BMI independently associated with LBR (OR 0.92/unit, $p = 0.002$). Lower birth weight in bariatric group (2753 vs. 3170 g, $p = 0.044$).
Mutsaerts	Netherlands	2016	577 (290 inter-vention group)	Random-ized con-trolled trial	Lifestyle interven-tion vs. prompt fertility treatment	Lifestyle program (diet, activity, behav-ioral coaching)	Weight loss: mean 4.4 kg (6-month program). Healthy singleton birth at term: 27.1% vs. 35.2% (RR 0.77, $p < 0.05$) — LOWER in lifestyle group. LBR: 43.9% vs. 53.9% (RR 0.82, $p < 0.05$). Non-IVF; mixed OI/IUI/IVF population.
Legro	USA	2022	379 (191 standard lifestyle, 188 intensive group)	Random-ized con-trolled trial	Effect of precon-ception lifestyle intervention on live birth	Structured lifestyle program (meal replacement, orlistat and physical activity) vs. physical activity alone.	Weight loss: −6.6% (inten-sive). Metabolic syndrome: 52.8%→32.2% (intensive), $p = 0.003$. Healthy LBR: 12.2% vs. 15.2% (NS). No reproduc-tive benefit despite marked metabolic improvement. OI/IUI only; not IVF-specific.

Studies by Legro et al. (2022) [27] and Mutsaerts et al. [26] examined preconception interventions before ovulation induction/IUI rather than IVF. These were included to inform implementation challenges and potential harms analysis.

Articles synthesis. *IVF* In vitro fertilization, *VLDC* Very low-calorie diet, *BMI* Body mass index, *ICSI* Intracytoplasmic Sperm Injection, *RCT* Randomized control trial, *PCOS* polycystic ovary syndrome, *ART* Artificial Reproductive Technology, *MET* metformin, *Lira* liraglutide

encouraging signals from combination GLP-1 agonist therapy requiring confirmation in larger and more diverse populations.

Surgical weight management strategies

Five studies examined IVF outcomes in women with a history of bariatric surgery. Early case series demonstrated feasibility of IVF following procedures such as Roux-en-Y gastric bypass or gastric banding, with several patients achieving term pregnancies after substantial postoperative weight loss [39]. A prospective pre-post cohort study ($n = 40$) reported improvements in ovarian response, mature oocyte yield, and embryo quality following restrictive bariatric surgery, accompanied by significantly higher clinical pregnancy (37.5% vs. 0%, $p < 0.001$) and live birth rates (35% vs. 0%, $p < 0.001$) compared with pre-surgery outcomes in the same patients [40].

Larger observational analyses presented a more complex picture. A national registry-based case-control study ($n = 897$) found that cumulative live birth rates were comparable between women with prior bariatric surgery and matched controls (29.4% vs. 33.1%, aOR 1.04, 95%CI 0.73–1.51), despite consistently lower follicle numbers and fewer retrieved oocytes (7.6 vs. 8.9, $p = 0.005$) in the surgical group [41]. Other cohort studies similarly reported reduced ovarian response among women with previous bariatric surgery (fewer oocytes retrieved: 5 vs. 6–6.5, $p = 0.013$; fewer MII oocytes: 3 vs. 4–5, $p = 0.0006$) yet observed no significant disadvantage in live birth rates [42]. A multicenter retrospective cohort revealed heterogeneous outcomes influenced by patient characteristics and clinical practice patterns [27]. Collectively, bariatric surgery produces substantial and durable weight loss and may favorably influence metabolic parameters and some IVF parameters such as embryo quality, though its impact on final reproductive outcomes remains

inconsistent, likely reflecting the competing effects of improved metabolic health against reduced ovarian reserve.

Summary of outcomes and implementation challenges

Across all intervention categories, weight-loss interventions produced reductions in body weight, with magnitude varying between studies and metabolic improvements documented in several but not all cases. Live birth rate — the most clinically meaningful reproductive endpoint — was the primary outcome in the majority of included studies, and showed the most inconsistent findings across all intervention types. Improvements in other reproductive endpoints were similarly variable and inconsistent. Lifestyle interventions reliably facilitated weight loss but frequently did not improve implantation, clinical pregnancy, or live birth rates. Pharmacological treatments demonstrated mixed effects, with orlistat showing no reproductive advantage in the largest trial and GLP-1-based combination therapy yielding promising but preliminary results in a PCOS population. Surgical interventions produced significant metabolic changes but inconsistent reproductive outcomes, with some studies suggesting benefits in embryo quality offset by reductions in ovarian response.

Several implementation challenges were identified across studies. High attrition rates were commonly reported in lifestyle intervention programs [43], potentially limiting the effectiveness of these approaches. Treatment delays associated with prolonged weight-loss attempts were noted as particularly concerning for women of advanced reproductive age, in whom time to treatment is a critical factor. Gastrointestinal adverse events were frequently reported with orlistat, affecting treatment adherence. Some analyses noted non-significant patterns suggesting increased early pregnancy loss in intensive lifestyle interventions, although these findings were inconsistent and their clinical significance remains uncertain.

Overall, the evidence demonstrates considerable variability in both implementation and effectiveness of weight-loss interventions before IVF, with limited and heterogeneous support for improvements in live birth as the ultimate reproductive outcome.

Potential harms and difficulties

Despite the observed benefits in some studies, challenges exist with pre-IVF weight loss interventions. Lifestyle-based approaches had high dropout rates, with studies reporting attrition exceeding 20% of participants [26, 43]. Delaying fertility care for weight loss interventions may be less beneficial for women of advanced maternal age, particularly those over 38 years old, unless substantial weight loss can be achieved in a short period [34]. Very low-calorie diets yielded a high patient burden, and their impact was deemed unsatisfactory in some studies [26, 34, 43]. Lastly, some analyses found non-significant trends of first trimester pregnancy loss in intensive therapy groups [43].

Discussion

This scoping review synthesized evidence from 19 primary intervention studies examining pre-IVF weight management interventions in women with overweight or obesity. We identified diverse approaches including dietary interventions, exercise programs, pharmacological treatments, and bariatric surgery. The findings demonstrate substantial heterogeneity in outcomes across interventions, populations, and study designs. Some studies reported improvements in clinical pregnancy rates [30, 31], while others achieved significant weight loss without corresponding improvements in reproductive outcomes [32, 34, 35], highlighting the complexity of this relationship and suggesting that weight loss alone may not be sufficient to improve fertility outcomes in all populations.

The biological pathways through which obesity impairs IVF outcomes are well characterized. Insulin resistance disrupts granulosa cell metabolic support of the oocyte through impaired PI3K/Akt/mTOR signaling while augmenting androgen production in theca cells [15]. Chronic low-grade inflammation, mediated by elevated TNF-α and IL-6, displaces the endometrial window of implantation and impairs decidualization through inhibition of insulin receptor substrate signaling [15]. Dyslipidemia generates a lipotoxic follicular microenvironment in which elevated free fatty acids induce endoplasmic reticulum stress and mitochondrial membrane potential collapse in cumulus-oocyte complexes [15]. Adipokine dysregulation — hyperleptinemia inducing central leptin resistance and hypoadiponectinemia derepressing ovarian androgen synthesis — further disrupts hypothalamic-pituitary-gonadal axis function [15]. Critically, these changes occur during a folliculogenesis process spanning approximately six to twelve months, meaning oocytes retrieved after a twelve-to-sixteen-week preconception intervention were already developing in an obesogenic microenvironment throughout most of their maturation. Preclinical evidence demonstrates that obesity-induced mitochondrial dysfunction, meiotic spindle abnormalities, and epigenetic reprogramming in oocytes persist after full systemic metabolic normalization, providing a mechanistic basis for the absence of reproductive benefit observed in the largest RCTs despite achieving significant weight loss [15]. This timeline mismatch between short-term metabolic improvement and the protracted biology of folliculogenesis likely explains much of the outcome heterogeneity observed across included studies.

Pharmacological interventions remain limited in the available evidence, with metformin plus liraglutide showing promise in a small pilot study (pregnancy rates 85.7% vs. 28.6%) despite comparable weight loss between groups [38]. This dissociation between weight loss and reproductive outcomes raises the possibility of direct pleiotropic effects of GLP-1 receptor agonists on endometrial receptivity, independent of their metabolic actions, though this hypothesis requires further investigation. Bariatric surgery yielded substantial weight reductions and improvements in oocyte quality and embryo parameters [39, 40], though concerns about timing, nutritional deficiencies, and complications warrant careful patient selection.

Despite observed benefits in some studies, significant implementation challenges persist. High dropout rates in lifestyle programs [43], and very low-calorie diets imposed high patient burden. The heterogeneity of outcomes despite successful weight reduction suggests the relationship between weight loss and fertility is more complex than previously understood, potentially reflecting differences in underlying infertility etiology, metabolic phenotypes, intervention adherence, and unmeasured confounders.

Critical questions remain unanswered regarding optimal intervention duration, the degree of weight loss necessary (absolute vs. percentage vs. BMI reduction), which modalities are most effective, and how interventions should be tailored by individual patient characteristics including age, BMI category, and metabolic comorbidities. While our review was not designed to evaluate BMI cutoffs, the evidence does not support rigid thresholds. The heterogeneity of outcomes and inconsistent relationship between weight loss and fertility success argue for individualized assessment rather than blanket restrictions, though 62.5% of high-volume U.S. centers maintain BMI thresholds [19], creating tension between optimizing outcomes and ensuring equitable access. Most studies focused on anthropometric outcomes without detailed mechanistic investigations, and few followed patients beyond initial pregnancy, leaving questions about offspring health and long-term benefits unanswered.

This scoping review has important limitations. We searched a single primary database supplemented by targeted searches, which may have missed relevant studies on other platforms such as Embase, Cochrane CENTRAL, Scopus, or Web of Science, though substantial overlap exists in reproductive medicine literature indexed across these databases. We did not conduct formal risk of bias assessment, instead characterizing evidence quality descriptively by study design. Screening and data extraction were conducted with verification rather than full dual review, carrying greater risk of errors. The included studies exhibited substantial heterogeneity in populations, interventions, and outcomes, precluding meta-analysis. Most studies were small with limited power, and publication bias likely affects the evidence base. Studies were conducted predominantly in European and North American populations at specialized centers, limiting generalizability. We did not systematically evaluate cost-effectiveness, patient preferences, or implementation barriers.

Based on current evidence, clinicians should individualize recommendations based on patient characteristics including age, BMI, comorbidities, and time constraints rather than applying rigid cutoffs. Some studies suggest potential benefit of combined dietary and exercise approaches over isolated interventions [32, 33], though direct comparative evidence is insufficient to establish superiority. Pharmacological adjuncts may offer additional benefit in selected populations, particularly those with PCOS [38]. Setting realistic expectations is important: retrospective evidence suggests reproductive benefits tend to occur in women achieving weight reductions of 10% or more [Shen 2023], though this threshold has not been validated in randomized trials or meta-analyses, and fertility improvement is not guaranteed even with successful weight reduction. The ethical dimension of weight-loss prerequisites deserves explicit consideration. For women of advanced reproductive age — particularly those over 35 to 38 years — the opportunity cost of a three-to-six-month weight-loss program must be weighed against age-related decline in ovarian reserve and cumulative live birth probability. Available evidence does not demonstrate that weight-loss-induced treatment delay is offset by improved outcomes in this subgroup, raising concerns about equitable access and potential inadvertent harm through delayed fertility care [43]. It is also important to recognize that BMI thresholds applied by fertility centers frequently reflect procedural safety considerations — including anesthetic risk and technical difficulty of oocyte retrieval — rather than evidence that preconception weight loss improves reproductive outcomes per se. These distinct rationales are often conflated in clinical practice and policy, and should be communicated transparently to patients.

Future research priorities include large pragmatic trials comparing different approaches with adequate power for pregnancy and live birth outcomes, mechanistic studies linking interventions to specific metabolic and reproductive pathways, predictive biomarker research enabling personalized recommendations, optimal timing studies balancing weight loss benefits against treatment delays, cost-effectiveness analyses, implementation research addressing adherence barriers, and longer-term follow-up examining maternal complications and offspring health. The development of personalized approaches

balancing reproductive goals with overall health remains crucial for improving outcomes in this population.

Conclusion

Available evidence on pre-IVF weight loss interventions, synthesized from 19 studies, shows heterogeneous results across different populations and intervention types. While some studies suggest reproductive benefits with structured interventions, recent well-designed randomized trials demonstrate that weight reduction does not consistently improve pregnancy or live birth rates. High dropout rates and treatment delays remain significant implementation concerns. The current evidence does not support rigid BMI cutoffs for treatment eligibility. Clinical decision-making should be individualized, considering patient age, comorbidities, intervention feasibility, and time constraints. Future research should focus on identifying predictive factors for treatment response and optimizing intervention protocols to improve adherence while minimizing delays in fertility care.

Abbreviations

ART	Assisted reproductive technology
ASRM	American society for reproductive medicine
BMI	Body mass index
CLBR	Cumulative live birth rate
ESHRE	European society of human reproduction and embryology
ET	Embryo transfer
GLP-1	Glucagon-like peptide-1.
ICSI	Intracytoplasmic sperm injection
IVF	In vitro fertilization
LGI	Low glycemic index
MET	Metformin
MII	Metaphase II
OHSS	Ovarian hyperstimulation syndrome
PCOS	Polycystic ovary syndrome
PR	Pregnancy rate
RR	Relative risk
VLCD	Very low-calorie diet

Supplementary Information

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Supplementary Material 1.

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AI use declaration

During the preparation of this work, the authors used Claude AI to improve the readability and language editing of this manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Authors' contributions

CA and AG designed the study and conducted the literature search, screening, and data extraction. CA and AG performed the data synthesis and analysis. AG drafted the manuscript. AC, MM, and CJ contributed to the interpretation of findings and critically reviewed the manuscript. All authors read and approved the final manuscript.

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Data availability

All data analyzed during this study are included in this published article and its reference list. The search strategy and inclusion criteria are described in the Methods section. No original datasets were generated as this is a review of published literature.

Declarations

Ethics approval and consent to participate

Not applicable. This is a scoping review of published literature and did not involve human participants, human data, or human tissue.

Consent for publication

Not applicable. This manuscript does not contain data from any individual person.

Competing interests

The authors declare no competing interests.

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References

1. World Health Organization Obesity and overweight. Fact Sheet. 2022 [cited 2024 Mar 25]. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight. Accessed 25 Mar 2024.
2. Gesink Law DC, Maclehose RF, Longnecker MP (2007) Obesity and time to pregnancy. 22:414–420 [cited 2024 Mar 25];. Hum Reprod https://doi.org/10.1093/HUMREP/DEL400.
3. Ramlau-Hansen CH, Thulstrup AM, Nohr EA, Bonde JP, Sørensen TIA, Olsen J (2007) Subfecundity in overweight and obese couples. 22:1634–1637 [cited 2024 Mar 25];. Hum Reprod https://doi.org/10.1093/HUMREP/DEM035.
4. Van Der Steeg JW, Steures P, Eijkemans MJC, Habbema JDF, Hompes PGA, Burggraaff JM et al (2008) Obesity affects spontaneous pregnancy chances in subfertile, ovulatory women. Hum Reprod 23:324–328 [cited 2024 Mar 25];. https://doi.org/10.1093/HUMREP/DEM371.
5. Bellver J, Melo MAB, Bosch E, Serra V, Remohí J, Pellicer A (2007) Obesity and poor reproductive outcome: the potential role of the endometrium. 88:446–451 [cited 2024 Mar 25];. Fertil Steril https://doi.org/10.1016/J.FERTNSTERT.2006.11.162.
6. Metwally M, Cutting R, Tipton A, Skull J, Ledger WL, Li TC (2007) Effect of increased body mass index on oocyte and embryo quality in IVF patients. Reprod Biomed Online [Internet]. 15:532–538 [cited 2024 Mar 25];. https://doi.org/10.1016/S1472-6483(10)60385-9. Reprod Biomed Online
7. Shah DK, Missmer SA, Berry KF, Racowsky C, Ginsburg ES (2011) Effect of obesity on oocyte and embryo quality in women undergoing in vitro fertilization. Obstetrics and gynecology. 118:63–70 [cited 2024 Mar 25]; Obstet Gynecol https://doi.org/10.1097/AOG.0B013E31821FD360.
8. Gaillard R (2015) Maternal obesity during pregnancy and cardiovascular development and disease in the offspring. Eur J Epidemiol. 30:1141–1152 [cited 2024 Mar 25];. https://doi.org/10.1007/S10654-015-0085-7.
9. Leddy MA, Power ML, Schulkin J (2008) The Impact of Maternal Obesity on Maternal and Fetal Health. 1:170 [cited 2024 Mar 25]; Rev Obstet Gynecol. https://doi.org/10.51362/neonatology.today/202121621012. MedReviews.
10. Poston L Maternal obesity, gestational weight gain and diet as determinants of offspring long term health. Best Pract Res Clin Endocrinol Metab. Best Pract Res Clin Endocrinol Metab; 2012 [cited 2024 Mar 25];26:627–39. https://doi.org/10.1016/J.BEEM.2012.03.010.
11. Rittenberg V, Seshadri S, Sunkara SK, Sobaleva S, Oteng-Ntim E, El-Toukhy T (2011) Effect of body mass index on IVF treatment outcome: an updated systematic review and meta-analysis. Reprod Biomed Online. 23:421–439 [cited 2024 Mar 25];. https://doi.org/10.1016/J.RBMO.2011.06.018.
12. Provost MP, Acharya KS, Acharya CR, Yeh JS, Steward RG, Eaton JL et al (2016) Pregnancy outcomes decline with increasing recipient body mass index: an analysis of 22,317 fresh donor/recipient cycles from the 2008–2010 Society for Assisted Reproductive Technology Clinic Outcome Reporting System

registry. 105:364–368 [cited 2024 Mar 25];. Fertil Steril https://doi.org/10.1016/J.FERTNSTERT.2015.10.015.
13. Luke B, Brown MB, Missmer SA, Bukulmez O, Leach R, Stern JE (2011) The effect of increasing obesity on the response to and outcome of assisted reproductive technology: a national study. Fertil Steril 96:820–825 [cited 2024 Mar 25];. https://doi.org/10.1016/J.FERTNSTERT.2011.07.1100
14. Jungheim ES, Schon SB, Schulte MB, Deugarte DA, Fowler SA, Tuuli MG (2013) IVF outcomes in obese donor oocyte recipients: a systematic review and meta-analysis. Hum Reprod [Internet] Hum Reprod 28:2720–2727 [cited 2024 Mar 25];. https://doi.org/10.1093/HUMREP/DET292
15. Broughton DE, Moley KH Obesity and female infertility: potential mediators of obesity's impact. Fertil Steril; 2017 [cited 2024 Mar 25];107:840–847. https://doi.org/10.1016/J.FERTNSTERT.2017.01.017.
16. Balen AH, Morley LC, Misso M, Franks S, Legro RS, Wijeyaratne CN et al (2016) The management of anovulatory infertility in women with polycystic ovary syndrome: an analysis of the evidence to support the development of global WHO guidance. 22:687–708 [cited 2024 Mar 25]. Hum Reprod Update https://doi.org/10.1093/HUMUPD/DMW025.
17. Penzias A, Azziz R, Bendikson K, Falcone T, Hansen K, Hill M et al (2021) Obesity and reproduction: a committee opinion. 116:1266–1285 [cited 2024 Mar 25];. Fertil Steril https://doi.org/10.1016/J.FERTNSTERT.2021.08.018.
18. Gameiro S, Boivin J, Dancet E, De Klerk C, Emery M, Lewis-Jones C et al (2015) ESHRE guideline: routine psychosocial care in infertility and medically assisted reproduction-a guide for fertility staff. Hum Reprod 30:2476–2485 [cited 2024 Mar 25];. https://doi.org/10.1093/HUMREP/DEV177.
19. Kaye L, Sueldo C, Engmann L, Nulsen J, Benadiva C (2016) Survey assessing obesity policies for assisted reproductive technology in the United States. 105:703–706e2 [cited 2024 Mar 26]. Fertil Steril https://doi.org/10.1016/J.FERTNSTERT.2015.11.035.
20. Jeong HG, Cho S, Ryu KJ, Kim T, Park H (2024) Effect of weight loss before in vitro fertilization in women with obesity or overweight and infertility: a systematic review and meta-analysis. Sci Rep 14(1):6153. https://doi.org/10.1038/s41598-024-56818-4
21. Arksey H, O'Malley L (2005) Scoping studies: towards a methodological framework, vol 8. Taylor and Francis Group Ltd, pp 19–32. Int J Soc Res Methodol. [cited 2025 Nov 26]; https://doi.org/10.1080/1364557032000119616.
22. Levac D, Colquhoun H, O'Brien KK Scoping studies: advancing the methodology. Implement Sci. 2010 [cited 2025 Nov 26];5:69. https://doi.org/10.1186/1748-5908-5-69.
23. Tricco AC, Langlois EV, Straus SE Rapid reviews to strengthen health policy and systems: a practical guide
24. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D et al (2018) PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. 169:467–473 [cited 2025 Nov 27];. https://doi.org/10.7326/M18-0850. Ann Intern Med [Internet]Ann Intern Med
25. Peters MDJ, Godfrey C, McInerney P, Munn Z, Tricco AC, Khalil H (2020) Chapter 11: Scoping reviews. JBI Manual for Evidence Synthesis. JBI; [cited 2025 Nov 27]; https://doi.org/10.46658/JBIMES-20-12.
26. Mutsaerts MAQ, van Oers AM, Groen H, Burggraaff JM, Kuchenbecker WKH, Perquin DAM, et al. Randomized trial of a lifestyle program in obese infertile women. N Engl J Med. 2016;374(20):1942–53. Available from: https://doi.org/10.1056/NEJMoa1505297.
27. Grzegorczyk-Martin V, Fréour T, de Bantel Finet A, Bonnet E, Merzouk M, Roset J et al (2020) IVF outcomes in patients with a history of bariatric surgery: a multicenter retrospective cohort study. Hum Reprod. 35:2755–2762 [cited 2024 Jun 10];. https://doi.org/10.1093/HUMREP/DEAA208.
28. Tsagareli V, Noakes M, Norman RJ (2006) Effect of a very-low-calorie diet on in vitro fertilization outcomes. 86:227–229 [cited 2024 Mar 26];. Fertil Steril https://doi.org/10.1016/J.FERTNSTERT.2005.12.041.
29. Sim KA, Dezarnaulds GM, Denyer GS, Skilton MR, Caterson ID (2014) Weight loss improves reproductive outcomes in obese women undergoing fertility treatment: a randomized controlled trial. Clin Obes 4:61–68 [cited 2024 Jun 10];. https://doi.org/10.1111/COB.12048.
30. Becker GF, Passos EP, Moulin CC (2015) Short-term effects of a hypocaloric diet with low glycemic index and low glycemic load on body adiposity, metabolic variables, ghrelin, leptin, and pregnancy rate in overweight and obese infertile women: a randomized controlled trial. Am J Clin Nutr 102:1365–1372 [cited 2024 Mar 26];. https://doi.org/10.3945/AJCN.115.117200.
31. Espinós JJ, Polo A, Sánchez-Hernández J, Bordas R, Pares P, Martínez O et al (2017) Weight decrease improves live birth rates in obese women undergoing IVF: a pilot study. 35:417–424 [cited 2024 Mar 26];. Reprod Biomed Online https://doi.org/10.1016/J.RBMO.2017.06.019.
32. Moran L, Tsagareli V, Norman R, Noakes M (2011) Diet and IVF pilot study: short-term weight loss improves pregnancy rates in overweight/obese women undertaking IVF. Aust N Z J Obstet Gynaecol. Aust. 51:455–459 [cited 2025 Oct 18];. https://doi.org/10.1111/J.1479-828X.2011.01343.X.
33. Yang C, Yang S, Zheng W, Zu R, Ran S, Wu H et al (2022) Effect of a 60-day weight reduction intervention prior to IVF/ICSI on perinatal outcomes in overweight or obese infertile women. [cited 2024 Mar 26];13 Front Endocrinol (Lausanne) https://doi.org/10.3389/FENDO.2022.1062790.
34. Einarsson S, Bergh C, Friberg B, Pinborg A, Klajnbard A, Karlström PO et al (2017) Weight reduction intervention for obese infertile women prior to IVF: a randomized controlled trial. Hum Reprod. 32:1621–1630 [cited 2024 Mar 26];. https://doi.org/10.1093/HUMREP/DEX235.
35. Wang Z, Groen H, Van Zomeren KC, Cantineau AEP, Van Oers A, Van Montfoort APA et al (2021) Lifestyle intervention prior to IVF does not improve embryo utilization rate and cumulative live birth rate in women with obesity: a nested cohort study. Hum Reprod Open. Oxford Academic; [cited 2025 Oct 18];2021:1–11. https://doi.org/10.1093/HROPEN/HOAB032.
36. Wang Z, Zhao J, Ma X, Sun Y, Hao G, Yang A et al (2021) Effect of Orlistat on Live Birth Rate in Overweight or Obese Women Undergoing IVF-ET: A Randomized Clinical Trial. J Clin Endocrinol Metab. 106:E3533–E3545 [cited 2025 Nov 27];. https://doi.org/10.1210/CLINEM/DGAB340.
37. Tong J, Xiang L, Niu Y, Zhang T (2022) Effect of orlistat intervention on in vitro fertilization/intracytoplasmic sperm injection outcome in overweight/obese infertile women. Gynecol Endocrinol. 38:253–257 [cited 2025 Nov 27];. https://doi.org/10.1080/09513590.2022.2028769.
38. Salamun V, Jensterle M, Janez A, Bokal EV (2018) Liraglutide increases IVF pregnancy rates in obese PCOS women with poor response to first-line reproductive treatments: a pilot randomized study. Eur J Endocrinol. 179:1–11 [cited 2024 Mar 26];. https://doi.org/10.1530/EJE-18-0175.
39. Doblado MA, Lewkowksi BM, Odem RR, Jungheim ES (2010) In vitro fertilization after bariatric surgery. 94:2812–2814 [cited 2025 Oct 18];. Fertil Steril. https://doi.org/10.1016/J.FERTNSTERT.2010.06.052.
40. Milone M, Sosa Fernandez LM, Sosa Fernandez LV, Manigrasso M, Elmore U, De Palma GD et al (2017) Does Bariatric Surgery Improve Assisted Reproductive Technology Outcomes in Obese Infertile Women? Obes Surg [Internet]. Obes Surg; [cited 2025 Oct 18];27:2106–2112. https://doi.org/10.1007/S11695-017-2614-9
41. Nilsson-Condori E, Mattsson K, Thurin-Kjellberg A, Hedenbro JL, Friberg B (2022) Outcomes of in-vitro fertilization after bariatric surgery: a national register-based case–control study, vol 37. Oxford Academic, pp 2474–2481. Human Reproduction. [cited 2024 Jun 10]; https://doi.org/10.1093/HUMREP/DEAC164.
42. Christofolini J, Bianco B, Santos G, Adami F, Christofolini D, Barbosa CP Bariatric surgery influences the number and quality of oocytes in patients submitted to assisted reproduction techniques. Obesity (Silver Spring). Obesity (Silver Spring); 2014 [cited 2024 Jun 10];22:939–42. https://doi.org/10.1002/OBY.20590.
43. Legro RS, Hansen KR, Diamond MP, Steiner AZ, Coutifaris C, Cedars MI et al (2022) Effects of preconception lifestyle intervention in infertile women with obesity: The FIT-PLESE randomized controlled trial. PLoS Med Public Libr Sci 19:e1003883 [cited 2024 Mar 27];. https://doi.org/10.1371/JOURNAL.PMED.1003883.

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