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The Impact of Obesity on Hormonal IUD versus Copper IUD Failure: A Comprehensive Systematic Review

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ABSTRACT

Introduction: *Obesity is a growing global health concern that significantly affects female reproductive health and may alter contraceptive efficacy. Given the increasing prevalence of obesity worldwide, it is essential to understand how elevated body mass index (BMI) impacts the performance of hormonal and copper intrauterine devices (IUDs). This systematic review evaluates current evidence on the influence of obesity on IUD failure, aiming to clarify inconsistencies and guide clinical recommendations for contraceptive counseling in this population.*

Methods: *A systematic review was conducted using PubMed, Embase, and Cochrane Central Register of Controlled Trials (CENTRAL) from April to July 2025. Studies published between 2010 and 2025 in English and classified as meta-analyses or systematic reviews were included. Two independent reviewers screened titles, abstracts, and full texts according to predefined inclusion and exclusion criteria, extracted relevant data, and assessed risk of bias. Discrepancies were resolved through discussion.*

Results: *Of 13,713 studies identified, eight met the inclusion criteria. Most studies concluded that IUD efficacy is generally unaffected by BMI, with both levonorgestrel-releasing (LNG-IUS) and copper IUDs maintaining high contraceptive effectiveness across weight categories. Some evidence indicated higher expulsion rates in individuals with class III obesity (BMI ≥40 kg/m²), but no significant increase in pregnancy or overall failure rates. Copper IUDs consistently demonstrated stable performance in both routine and emergency contraception, while LNG-IUS efficacy appeared locally preserved despite lower systemic levonorgestrel levels in obese users.*

Conclusions: *Current evidence suggests that obesity does not significantly compromise the contraceptive efficacy of hormonal or copper IUDs, though higher expulsion rates in morbid obesity may warrant attention. However, existing studies are limited by small sample sizes, lack of BMI-stratified outcomes, and heterogeneity in defining IUD failure. Further high-quality, obesity-focused research is needed to strengthen evidence-based contraceptive guidance and ensure equitable reproductive care for individuals with obesity.*

Introduction

Obesity (body mass index ≥30 kg/m^2) is a growing global health crisis, with prevalence rising from 1990 to 2022: among children and adolescents (5–19 years) obesity rates quadrupled (2% to 8%), and among adults it more than doubled (7% to 16%) [1]. Obesity increases risks for cardiovascular disease, high blood pressure, type II diabetes, joint stress, sleep apnea, and other comorbidities [2]. In women, it also disrupts reproductive health by causing menstrual irregularities, hormone imbalances, impaired ovarian function, worsened polycystic ovarian syndrome (PCOS), and higher obstetric risks [3].

There has been conflicting research on the impact BMI has on the effectiveness of contraception. Individuals with a greater BMI have an increased production of estradiol and progesterone, suggesting greater ovarian activity, potentially decreasing the efficacy of combined oral contraceptive pills [4]. However, in other studies, the efficacy of the pill, patch, or vaginal ring in overweight and obese women resulted in similar levels of pregnancy protection compared to that of a normal-weight woman [5].

Long-acting reversible contraceptives include levonorgestrel-releasing intrauterine devices (LNG-IUDs) and the copper T380A intrauterine device. An LNG-IUD is a small T-shaped device inserted into the uterus with a polydimethylsiloxane sleeve that releases levonorgestrel [6]. Levonorgestrel binds to progesterone and androgen receptors, delaying gonadotropin-releasing hormone release, reducing the luteinizing hormone surge before ovulation, inhibiting follicular rupture, and thickening cervical mucus to block sperm movement. These mechanisms are most effective when initiated during the pre-ovulation stage [7].

Four major LNG-IUD brands (Mirena, Kyleena, Liletta, and Skyla) differ in their levonorgestrel doses and duration of effectiveness [6]. The copper IUD is also a T-shaped device, but with polyethylene wrapped in copper wire along the stem and arms. Once inserted into the uterus, the copper ions it releases create a toxic environment that impairs sperm migration and viability [8]. LNG-IUDs have brand-specific FDA-approved durations of use, ranging from 3 years to more than 8 years, and is associated with a cumulative failure rate as low as 0.31 per 100 women-years within the first 5 years. In comparison, copper IUDs provide contraceptive efficacy for 10 to 12 years, with a reported cumulative 12-year failure rate of approximately 2.1% to 2.8% [6].

Both devices are highly effective and reversible, though complications are uncommon but can occur. Expulsion is the most frequent, affecting 2–10% of users within the first year. Perforation is rare, occurring in 1.4 per 1,000 insertions of hormonal IUDs and 1.1 per 1,000 for copper IUDs [6,9]. Current literature on the role BMI plays in IUD use is inconclusive. Individuals with a normal BMI (11%) or obese BMI (11%) had greater complications compared to those with an overweight BMI (4%) [10].

As public health implications for both contraception and obesity rates rise, it is crucial to assess the relationship between IUDs and obesity. People with obesity often face healthcare disparities and decreased access to contraceptive counseling [11]. In a population that is already at a higher risk for pregnancy complications, such as gestational diabetes and cesarean deliveries, it is essential to have accurate data on the intersection between IUD use and obesity. This review aims to synthesize and identify gaps in current literature on obesity and IUD failure to optimize reproductive care for all individuals.

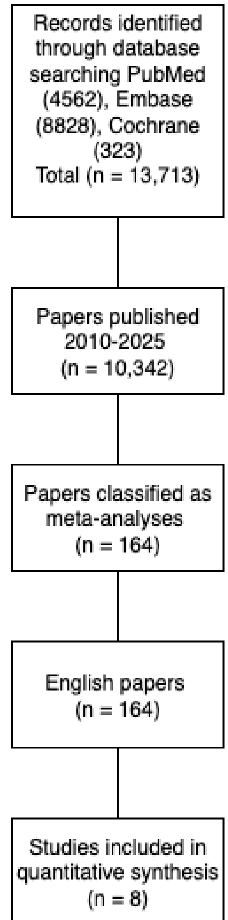

Figure 1: Flowchart of the literature selection of meta-analyses studying the impact of obesity on hormonal and copper IUD failure.

Methods

This study is a systematic literature review that was performed with searches in the databases PubMed, Embase, and the Cochrane Central Register of Controlled Trials (CENTRAL) from April 2025 to July 2025 (Supplemental Table). The keywords and Medical Subject Headings (MeSH) utilized to filter the studies include "Paragard AND obesity," "Copper AND obesity," "LNG-IUS AND obesity," "LNG-IUD AND obesity," "Copper OR LNG-IUS AND obesity," "Copper AND LNG-IUS AND obesity," "Copper OR LNG-IUD AND obesity," "Copper AND LNG-IUD AND obesity," "Paragard OR LNG-IUS AND obesity," "Paragard AND LNG-IUS AND obesity," "Paragard OR LNG-IUD AND obesity," and "Paragard AND LNG-IUD AND obesity."

Inclusion and Exclusion Criteria

The following inclusion criteria were adopted for this systematic literature review: (1) studies published between 2010-2025; (2) studies published in English; and (3) studies classified as meta-analyses. Exclusion criteria included: studies published before 2010, non-English studies, case reports, reviews, conference abstracts, comments, letters, and duplicate studies. A total of 13,713 studies were originally identified using the search terms.

Table 1: Number of search results per search term with inclusion and exclusion requirements.

Search term	Total studies	Studies Published Within 2010-2025	Studies Classified as Meta-Analyses	Studies in English
Paragard AND Obesity Cochrane	2	2	0	0
Paragard AND Obesity Embase	102	62	2	2
Paragard AND Obesity Pubmed	738	430	4	4
Copper AND Obesity Cochrane	26	25	0	0
Copper AND Obesity Embase	2886	1646	33	33
Copper AND Obesity Pubmed	735	550	4	4
LNG-IUS AND Obesity Cochrane	6	6	0	0
LNG-IUS AND Obesity Embase	1	1	0	0
LNG-IUS AND Obesity Pubmed	31	30	3	3
LNG-IUD AND Obesity Cochrane	6	6	0	0
LNG-IUD AND Obesity Embase	1	1	0	0
LNG-IUD AND Obesity Pubmed	18	18	0	0
Copper AND LNG-IUS AND Obesity Cochrane	2	2	0	0
Copper AND LNG-IUS AND Obesity Embase	39	38	1	1
Copper AND LNG-IUS AND Obesity Pubmed	2	2	0	0
Copper AND LNG-IUD AND Obesity Cochrane	2	2	2	2
Copper AND LNG-IUD AND Obesity Embase	37	36	1	1
Copper AND LNG-IUD AND Obesity Pubmed	5	5	0	0
Paragard AND LNG-IUS AND Obesity Cochrane	0	0	0	0
Paragard AND LNG-IUS AND Obesity Embase	35	35	1	1
Paragard AND LNG-IUS AND Obesity Pubmed	2	2	0	0
Paragard AND LNG-IUD AND Obesity Cochrane	0	0	0	0
Paragard AND LNG-IUD AND Obesity Embase	33	32	1	1
Paragard AND LNG-IUD AND Obesity Pubmed	5	5	0	0
Copper OR LNG-IUS AND Obesity Cochrane	136	120	0	0
Copper OR LNG-IUS AND Obesity Embase	2611	2271	26	26
Copper OR LNG-IUS AND Obesity Pubmed	764	578	7	7
Copper OR LNG-IUD AND Obesity Cochrane	125	109	0	0
Copper OR LNG-IUD AND Obesity Embase	2576	2237	40	40
Copper OR LNG-IUD AND Obesity Pubmed	749	564	4	4
Paragard OR LNG-IUS AND Obesity Cochrane	31	29	0	0
Paragard OR LNG-IUS AND Obesity Embase	246	231	12	12
Paragard OR LNG-IUS AND Obesity Pubmed	764	578	7	7
Paragard OR LNG-IUD AND Obesity Cochrane	15	14	0	0
Paragard OR LNG-IUD AND Obesity Embase	261	247	12	12
Paragard OR LNG-IUD AND Obesity Pubmed	749	564	4	4

After the implementation of exclusion criteria, eight studies were analyzed.

Data Extraction

Two researchers (A.K., V.L.) determined study selection based on selection criteria using titles, abstracts, and full-text analysis. Data was extracted in a Google spreadsheet on the following parameters: Title, author, link, DOI, key findings regarding study designs and results, and whether the study should be included or not included in the systematic literature review.

Assessment of Risk of Bias

Two researchers (A.K., V.L.) separately evaluated the methodologic qualities of each study, assessing the risk for bias of RCT. Any disagreement was resolved through discussion.

Results

A total of 13,713 studies were initially identified across PubMed, Embase, and the Cochrane Central Register of Controlled Trials using combinations of keywords and MeSH terms related to "Paragard," "Copper IUD," "LNG-IUS/IUD," and "obesity." After application of inclusion and exclusion criteria (English language,

Table 2: Findings from included studies on the impact of obesity on hormonal and copper IUD failure.

Reference	Impact on IUD/Contraceptive Efficacy	Relevance to Obesity	Limitations
Sznajder & Jamshidi [12]	Copper IUD is the most effective EC method with ~0.14% failure rate, unaffected by BMI. Oral EC methods (LNG, UPA) are less effective in obese women (LNG 4.4× higher risk of failure, UPA trend but NS).	Confirms copper IUD retains high efficacy in obese women; hormonal oral EC is compromised by obesity.	No BMI-stratified analysis of IUD failure/expulsion; limited comparison of copper vs LNG-IUS in obese populations.
Wu & Pickle [13]	Copper IUD efficacy is unaffected by weight. LNG-IUS maintains local contraceptive effect despite lower serum levels in obese women. Extended use is safe and effective.	Supports IUDs as reliable in obese women, reducing unintended pregnancy risk when other methods fail.	Few BMI-specific outcomes; studies mostly parous women ≥25; lack of data on post-bariatric surgery or expulsion risk.
Glasier et al. [14]	Obese women (BMI ≥30) had >3× risk of pregnancy; LNG users >4× risk vs normal-weight. UPA showed an elevated, non-significant risk. Local IUD mechanisms are not impaired by BMI.	Demonstrates that obesity reduces systemic hormonal contraceptive efficacy but not IUDs.	Data primarily from oral EC; limited direct evidence on IUDs; expulsion risk in obesity not explored.
Yuk et al. [15]	In non-obese women, LNG-IUS is superior to MPA. In obese women, regression rates are similar, based on one RCT (n=60).	Suggests obesity may reduce LNG-IUS advantage over oral therapy, but contraceptive implications remain unclear.	Minimal obesity-stratified data; morbid obesity underrepresented; contraceptive outcomes not the primary endpoint.
Ramanadhan et al. [16]	Copper IUD is highly effective across BMI groups. LNG-IUS is also effective, but has higher expulsion rates in class III obesity (BMI ≥40). No BMI-linked rise in pregnancy rates.	Reinforces the weight-independent contraceptive efficacy of IUDs; the main concern is expulsion in very high BMI.	Sparse BMI-specific failure/expulsion rates; limited data in severe obesity and post-weight-loss patients.
Elassall et al. [17]	LNG-IUS more effective than systemic progestins for endometrial hyperplasia (higher regression, lower failure/ hysterectomy).	Notes obesity as major EC risk factor; highlights LNG-IUS as highly effective and safe in morbid obesity.	Studies are heterogeneous (different histologic subtypes, designs). Limited subgroup analysis specific to obese women. Focus on endometrial hyperplasia, not contraception, but findings reinforce LNG-IUS effectiveness in obese populations.
Black et al. [18]	States LARC efficacy (implants, DMPA, IUC) remains high across BMI; CHOICE data: <1% 3-yr cumulative failure in implants, identical to IUC users.	Implies IUD efficacy is stable across BMI; indirect evidence supporting IUD reliability in obesity.	Guideline-based (not primary research). Data on IUD-specific failure in obese women is limited; it relies heavily on observational data. Focuses more on implants/DMPA, with extrapolation to IUDs.
Carocha et al. [19]	Oral EC shows reduced effectiveness with higher BMI—obese women had ~2× higher failure with ulipristal; levonorgestrel EC in overweight/obese not clearly effective vs no medication. Copper IUD remains highly effective for EC and is unaffected by weight.	Explicitly addresses obesity: recommends copper IUD as first-line EC for overweight/obese because efficacy is not reduced.	Very few studies were available (only 2 included). Focuses on EC, not routine IUD contraception. Cannot generalize beyond the EC context.

publication years 2010–2025, meta-analysis classification), eight studies met the eligibility criteria and were included in the final analysis (Figure 1). This represents an inclusion yield of only 0.06% of the total retrieved articles.

The included studies explored the impact of obesity on contraceptive efficacy and failure rates of copper IUDs and hormonal IUDs (LNG-IUS). Findings are summarized in Table 2. While several studies assessed contraceptive outcomes broadly, only a few provided obesity-stratified data specifically for IUD users.

Copper IUDs

Multiple studies confirmed that the contraceptive efficacy of the copper IUD is largely unaffected by BMI [12,13,16]. Sznajder & Jamshidi and Wu & Pickle both reported that copper IUDs maintain high effectiveness across all BMI categories, with failure rates as low as ~0.14% [12,13].

Ramanadhan et al. similarly found no BMI-related increase in pregnancy rates with copper IUD use, reinforcing its weight-independent performance. Notably, Ramanadhan et al. identified increased expulsion rates in class III obesity (BMI ≥40), although this did not translate into increased failure rates [16]. Carocha et al. further emphasized the copper IUD as the most reliable form of emergency contraception in women with elevated BMI, reporting that while oral methods (levonorgestrel and ulipristal) lost efficacy in obese populations, copper IUD performance was unaffected

[19]. Together, these findings position the copper IUD as the most consistent contraceptive option for individuals with obesity, particularly when rapid protection is required for emergency contraception.

Hormonal IUDs (LNG-IUS)

Studies examining the LNG-IUS revealed mixed findings. While local uterine action remains the primary contraceptive mechanism and appears preserved in obese individuals, systemic hormonal levels are often lower in this population. Wu & Pickle found that despite reduced serum levels of levonorgestrel in obese women, contraceptive efficacy remained high [13]. Glasier et al. noted a significantly increased risk of pregnancy among obese women using systemic hormonal contraception; however, no similar compromise was observed in IUD users, suggesting preserved local efficacy [14].

Yuk et al. observed that LNG-IUS was more effective than medroxyprogesterone acetate (MPA) in non-obese women, but this benefit was diminished in obese participants. Nevertheless, contraceptive outcomes were not the primary endpoint in that study [15]. Ramanadhan et al. also identified higher rates of expulsion with LNG-IUS in women with BMI ≥40, which may impact overall effectiveness, although no direct increase in failure rates was reported [16]. Elassall et al. expanded on this by demonstrating that LNG-IUS was more effective than systemic progestins for endometrial hyperplasia, with higher regression and lower hysterectomy rates, even in obese and morbidly obese women [17]. While this evidence derives from therapeutic rather than contraceptive contexts, it reinforces the local efficacy and safety of LNG-IUS across BMI categories.

Additional Evidence from Guidelines

Beyond primary research, guideline-based evidence adds context to IUD use in obesity. Black et al., drawing on Canadian Contraception Consensus data, reported that long-acting reversible contraceptives—including implants, depot medroxyprogesterone acetate (DMPA), and intrauterine contraception (IUC)—demonstrate uniformly high efficacy across BMI strata, with <1% three-year cumulative failure in both implant and IUC users [18]. Although the data for IUDs were indirect, these findings provide supportive evidence that IUD efficacy is preserved in individuals with obesity.

Limitations Across Studies

Although most studies supported IUD efficacy regardless of BMI, few conducted robust, BMI-stratified analyses, especially among individuals with morbid obesity (BMI ≥40). Several studies lacked data on expulsion rates, post-bariatric surgery patients, or differences in efficacy between copper and hormonal IUDs in obese populations. Only a limited number of RCTs were available, and many meta-analyses combined data from diverse contraceptive methods, limiting IUD-specific conclusions.

With the limited studies currently available, BMI had no effect on pregnancy rates with both hormonal and copper IUDs. Though one study showed higher rates of expulsion in both hormonal and copper IUDs in women with a BMI greater than 40, there was no direct association in the failure rates of IUDs.

One major limitation of the study was that although our initial inclusion criteria required meta-analyses, the search of PubMed, Embase, and CENTRAL yielded a combination of systematic reviews and meta-analyses, and we elected to include both. Of the eight studies retained, two were systematic reviews without formal meta-analysis, while the remaining six incorporated quantitative synthesis as meta-analyses. Including systematic reviews alongside meta-analyses may introduce some heterogeneity in the level of evidence, as systematic reviews provide narrative synthesis without pooled effect estimates. Nevertheless, given the limited research directly addressing IUD failure in the context of obesity, this approach allowed us to capture the full breadth of available evidence. Another limitation is the variability in how "IUD failure" is defined as pregnancy, expulsion, discontinuation, or malposition. Though we accounted for device heterogeneity through the search terms, there are different LNG-IUD brands, such as Mirena, Kyleena, Liletta, and Skyla, that we did not individually search for, which could limit the total papers identified through the search terms. One inclusion criterion of the studies included in this review was English, potentially excluding relevant articles in other languages.

This review highlights the lack of research on obesity and IUD failure, hindering reproductive care for all individuals. Additional high-quality studies are needed to clarify this relationship and inform clinical guidance for contraceptive use in individuals with obesity. Ultimately, there is a need for future research on the impact that varying levels of obesity have on IUD effectiveness.

Despite the limited breadth of this study, it is one of the first of its kind to provide a comprehensive analysis evaluating the literature on obesity and IUD failure.

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