

# The relationship between sexual function and body mass index in menopause: a systematic review and meta-analysis

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## Systematic Review

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# Abstract

## Background

Female Sexual Dysfunction (FSD) is a common and multifactorial problem in postmenopausal women that affects their quality of life. Given the increasing global prevalence of obesity and the potential role of Body Mass Index (BMI) as a contributing factor, this systematic review and meta-analysis was conducted to determine the relationship between BMI and sexual function in postmenopausal women.

## Methods

This systematic review and meta-analysis were performed according to PRISMA guidelines by searching international (PubMed, Scopus, Web of Science, ScienceDirect, Embase, Cochrane) and Iranian (IranMedex, Magiran, IranDoc, SID) databases up to August 2025. Inclusion criteria consisted of observational studies (cross-sectional, cohort, and case-control) on postmenopausal or middle-aged women that investigated the relationship between BMI and sexual function. No restrictions were applied regarding language or publication date. Study quality was assessed using Joanna Briggs Institute (JBI) checklists.

## Results

Out of 127 identified studies, 23 met the eligibility criteria and were included in the qualitative synthesis. These studies were conducted in 13 different countries between 1996 and 2025. The main instrument for assessing sexual function was the FSFI questionnaire, which was used in ten studies. Other studies utilized instruments including Cervantes, MHR-QOL, McCoy, CSFQ-14, SAQ, or researcher-designed questionnaires. The systemic review of 23 study showed that 18 studies (78.3%) reported a statistically significant inverse relationship between increased BMI and decreased sexual function, particularly in domains of satisfaction, desire, and arousal. However, 4 studies (17.4%) reported no significant relationship, and one study (4.3%) found a positive relationship. The meta-analysis of four studies showed no significant pooled association between overweight BMI and sexual dysfunction (OR = 1.00, 95% CI: 0.81–1.24).

## Conclusion

The findings of this systematic review indicate that most studies reported a negative association between higher BMI and reduced sexual function in postmenopausal women. However, the meta-analysis—based on a limited number of eligible studies—did not show a significant pooled effect. These results suggest that although elevated BMI is frequently correlated with poorer sexual function, the

current evidence is insufficient to support BMI as an independent causal factor. Additional high-quality longitudinal studies are needed to clarify the nature and direction of this relationship.

## Background

Female sexual dysfunction (FSD) is a common and multifactorial issue in the postmenopausal period that can affect physical, psychological, and social dimensions of life. This disorder includes reduced sexual desire, decreased arousal, vaginal dryness, difficulty achieving orgasm, pain during intercourse, and reduced overall satisfaction [1, 2]. Hormonal changes resulting from a sustained decline in estrogen levels, along with neuroendocrine alterations, affect genital tissue function, sexual responsiveness, psychological state, and relationship quality [3].

Symptoms of sexual dysfunction affect more than 40% of adult women worldwide [4]. Approximately 25 to 43% of women experience some form of FSD related to the aging process and hormonal changes—a figure that increases significantly during the menopausal years [5]. In fact, a comprehensive international clinical study found that the prevalence of this disorder during menopause ranges from 25% to 79% [6]. However, this rate only reflects reported cases, and the actual prevalence is likely higher, as many women rarely disclose this issue and often endure it in silence and suffering [7].

Sexual function declines as menopausal status advances. The most commonly reported symptoms include reduced libido (40–55%), impaired vaginal lubrication (25–30%), and dyspareunia or pain during intercourse (12–45%), which is one of the complications of genitourinary syndrome of menopause (GSM). Although first-line treatment strategies for menopause-related sexual dysfunction primarily focus on modifiable factors, numerous treatment options—both hormonal and non-hormonal, topical and systemic—are now available [8].

In addition to hormonal changes, lifestyle factors and anthropometric indicators—particularly body mass index (BMI)—play a significant role in women's sexual health. Changes in the hormonal environment during menopause are associated with increased total body fat and abdominal fat accumulation, and during menopause, fat distribution shifts toward central (android) accumulation [3, 9]. Body weight is a sensitive aspect of postmenopausal women's lives and acts as a mediator between weight concerns and the occurrence of sexual disorders [10]. Obesity and overweight, which are common among middle-aged and elderly women, are often associated with chronic diseases such as type 2 diabetes, cardiovascular disease, and metabolic syndrome. These conditions can affect sexual function through hormonal pathways (aromatase activity, androgen balance), inflammatory-vascular pathways (endothelial dysfunction, reduced genital blood flow), musculoskeletal pathways (impaired pelvic floor function), and psychosocial pathways (negative body image, reduced sexual self-esteem) [3, 9].

Due to increasing global prevalence of obesity and its role as a major risk factor for various chronic diseases, obesity is one of the most significant threats to public health [11]. The worldwide prevalence of obesity is increasing at such an alarming rate that the World Health Organization has identified obesity as a major neglected public health problem globally [12].

Evidence has shown that obesity is associated with sexual dysfunction in both women and men, and numerous studies have reported a positive correlation between obesity and sexual disorders in both sexes [12]. Strong research evidence (from animal to human studies) confirms the link between obesity and male sexual health (particularly erectile dysfunction) [13]. Given sex-specific patterns in adipose tissue accumulation, obesity may affect sexual function differently in women and men [14]. On the other hand, while the association between obesity and male sexual dysfunction has been extensively studied, the relationship between obesity and female sexual dysfunction has received less attention [12]. Recent studies have reported significant correlations between obesity indicators and scores on validated sexual function assessment tools such as the FSFI in postmenopausal women [1, 2]. However, the existing evidence is scattered and heterogeneous, differing in study design, assessment tools, and control of confounding variables [9, 15].

Given the high prevalence of obesity in modern societies and increased life expectancy among women, investigating the relationship between BMI and sexual function in the postmenopausal period can help identify high-risk groups and develop targeted interventions. This not only contributes to improving women's quality of life but can also provide healthcare professionals with more effective preventive and therapeutic strategies.

In light of these research gaps, an up-to-date systematic review that applies clear inclusion/exclusion criteria, validated assessment tools, and advanced statistical analysis to control for confounding variables appears necessary. Therefore, this systematic review was conducted to examine the relationship between body mass index and sexual function in postmenopausal women. The results of such a study can serve as a basis for developing clinical guidelines and effective interventions for the prevention and treatment of sexual dysfunction in overweight or obese postmenopausal women.

## Methods

The present systematic review was conducted based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 checklist [16]. This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (approval code: IR.SBMU.PHARMACY.REC.1404.167). The **PECO** framework [17] of this systematic review was defined as follows:

- **Population (P):** Postmenopausal women
- **Exposure (E):** Body Mass Index (BMI)
- **Comparison (C):** Women with different BMI categories (e.g., normal weight vs. overweight/obesity)
- **Outcome (O):** Sexual function (measured using validated instruments for assessing female sexual function after menopause)

## Search strategy

In this systematic review, the following electronic databases were searched: PubMed (including MEDLINE), Web of Science, Scopus, Embase, ScienceDirect, and Cochrane, as well as Persian databases including IranMedex, Magiran, IranDoc, and SID. The search was conducted using predefined keywords without any time restrictions, up to August 2025.

The main search terms included: Menopause, Postmenopause, Body Mass Index, BMI, Weight, Obese, Obesity, Overweight, Sexual Function, Sexuality, Sexual, sexual behavior. The search was carried out using two operators “AND” and “OR”; for keywords belonging to the same category, the operator “OR” was used, and “AND” was applied to combine different categories of terms. The detailed search strategy is presented in Table 1.

Table 1  
Final Search Strategy and Results

| Database                            | Search string                                                                                                                                                                                                                                                                                                                                                                                               | Results |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| PubMed (including MEDLINE)          | ("Menopause"[MeSH Terms] OR "Postmenopause"[MeSH Terms] OR "postmenopausal women"[Title/Abstract]) AND ("Body Mass Index"[MeSH Terms] OR "BMI"[Title/Abstract] OR "Weight"[Title/Abstract] OR "Obesity"[MeSH Terms] OR "Obese"[Title/Abstract] OR "Overweight"[Title/Abstract]) AND ("Sexual Function"[MeSH Terms] OR "Sexuality"[MeSH Terms] OR "Sexual"[Title/Abstract] OR "sexual behavior"[MeSH Terms]) | 307     |
| Scopus                              | TITLE-ABS-KEY(("menopause" OR "postmenopause" OR "postmenopausal women") AND ("body mass index" OR "BMI" OR "weight" OR "obesity" OR "obese" OR "overweight") AND ("sexual function" OR "sexuality" OR "sexual" OR "sexual behavior"))                                                                                                                                                                      | 129     |
| Embase                              | ('menopause'/exp OR 'postmenopause'/exp OR 'postmenopausal women':ab,ti) AND ('body mass index'/exp OR 'BMI':ab,ti OR 'weight':ab,ti OR 'obesity'/exp OR 'obese':ab,ti OR 'overweight':ab,ti) AND ('sexual function'/exp OR 'sexuality'/exp OR 'sexual':ab,ti OR 'sexual behavior'/exp)                                                                                                                     | 93      |
| ScienceDirect                       | TITLE-ABSTR-KEY("menopause" OR "postmenopause" OR "postmenopausal women") AND TITLE-ABSTR-KEY("body mass index" OR "BMI" OR "weight" OR "obesity" OR "obese" OR "overweight") AND TITLE-ABSTR-KEY("sexual function" OR "sexuality" OR "sexual" OR "sexual behavior")                                                                                                                                        | 251     |
| Cochrane Library                    | (menopause OR postmenopause OR "postmenopausal women") in Title Abstract Keyword AND ("body mass index" OR BMI OR weight OR obesity OR obese OR overweight) in Title Abstract Keyword AND ("sexual function" OR sexuality OR sexual OR "sexual behavior") in Title Abstract Keyword                                                                                                                         | 140     |
| Web of Science                      | TS=((("menopause" OR "postmenopause" OR "postmenopausal women") AND ("body mass index" OR "BMI" OR "weight" OR "obesity" OR "obese" OR "overweight") AND ("sexual function" OR "sexuality" OR "sexual" OR "sexual behavior"))                                                                                                                                                                               | 153     |
| IranMedex / Magiran / IranDoc / SID | ("مناopause" OR "پست‌مناopause" OR "پست‌مناopauseal women") AND ("Body Mass Index" OR "BMI" OR "Weight" OR "Obesity" OR "Obese" OR "Overweight") AND ("Sexual Function" OR "Sexuality" OR "Sexual" OR "sexual behavior")                                                                                                                                                                                    | 103     |

No restrictions were applied regarding language or publication date. Additionally, the reference lists of retrieved articles and previous reviews were screened manually to identify further eligible studies.

## **Inclusion and exclusion criteria**

All observational studies, including cross-sectional, cohort, and case-control designs, conducted on postmenopausal women were considered. Non-original publications such as editorials, letters, reviews, commentaries, meeting abstracts, and case reports were excluded.

Inclusion criteria were human studies examining the association between BMI or weight and sexual function in postmenopausal women. Exclusion criteria were studies unrelated to the research question, qualitative designs, and studies with unavailable full texts.

## **Study selection**

The study selection process was conducted in four stages:

1. Importing all retrieved records into the Endnote reference manager and removing duplicates.
2. Screening titles, abstracts, and keywords to exclude irrelevant studies.
3. Assessing abstracts and full texts for the presence of PECO criteria, followed by quality appraisal of cross-sectional, case-control, and cohort studies using the JBI checklist [18], and selecting studies eligible for the systematic review.
4. Extracting relevant data from the final included studies, including: first author's name, article title, year of publication, study location, study design, journal name, sample size, group characteristics, tools used to assess sexual function, and main findings.

## **Data extraction**

Data were extracted independently by two reviewers using a pre-designed standardized form in Microsoft Excel. Extracted variables included:

- Study characteristics: first author, year of publication, country, study design
- Participant characteristics: sample size, mean age
- BMI: either continuous values or categorized as normal weight, overweight, or obese
- Sexual function assessment tool
- Main results

Discrepancies between the two reviewers were resolved through discussion and consensus with a third reviewer. This process ensured accuracy and minimized bias in data extraction.

# Quality assessment

The quality and risk of bias of the included studies were independently assessed by two researchers using the Joanna Briggs Institute (JBI) checklists. Among the 23 included studies, 20 were cross-sectional, 2 were cohort studies, and 1 was a case-control study. The total number of women studied was 16984.

For cross-sectional studies, the JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies was used. This tool covers eight domains including: clarity of inclusion criteria, detailed description of participants and study setting, valid and reliable measurement of exposures, use of objective and standard criteria for measuring the condition, identification of confounding factors and strategies to control them, valid and reliable outcome measurement, and appropriate statistical analysis [19].

For cohort studies, the JBI Critical Appraisal Checklist for Cohort Studies was applied. This checklist evaluates eleven domains including: similarity of groups and recruitment from the same population, comparable measurement of exposures for both exposed and unexposed groups, validity and reliability of exposure measurement, identification of confounding factors and strategies to control them, confirmation that participants were free of the outcome at baseline, valid and reliable outcome measurement, sufficient follow-up time, completeness of follow-up and explanation of losses, and appropriate statistical analysis [20, 21].

For the case-control study, the JBI Critical Appraisal Checklist for Case-Control Studies was utilized. This tool covers ten domains including: appropriate matching of cases and controls, comparability of groups beyond the disease status, consistent criteria for identifying cases and controls, standard valid and reliable measurement of exposure, identical exposure measurement methods for both groups, identification of confounding factors, strategies to address confounding factors, standard valid and reliable assessment of outcomes, meaningful exposure period length, and appropriate statistical analysis [22]

In all tools, each item was rated as "Yes," "No," "Unclear," or "Not applicable." For cross-sectional studies, the percentage of "Yes" responses was calculated, and overall study quality was classified as:

- Strong:  $\geq 75\%$  "Yes" responses
- Moderate: 50–74% "Yes" responses
- Weak:  $< 50\%$  "Yes" responses

For cohort studies, each "Yes" response was scored 1 and other responses 0. The total score was then used to classify study quality as:

- Weak: 0–5.5
- Moderate: 6–8.5
- Strong: 9–11

For the case-control study, the number of "Yes" responses was counted and converted to a percentage. Study quality was classified using the same thresholds as cross-sectional studies:

- Strong:  $\geq 75\%$  "Yes" responses
- Moderate: 50–74% "Yes" responses
- Weak:  $< 50\%$  "Yes" responses

Studies rated as moderate or strong were considered for the final analysis.

It is important to note that this percentage-based scoring system and qualitative classification (strong/moderate/weak) is based on a practical and conventional approach and is not part of the official JBI guidelines."

Inter-rater reliability between reviewers was assessed using Cohen's Kappa statistic to evaluate the consistency of the quality appraisal of included studies.

Disagreements between the two reviewers were resolved through discussion or, when necessary, by adjudication from a third researcher. Only studies with a methodological quality rated as moderate or higher were included in the final synthesis.

## Statistical analysis

All statistical analyses were conducted using STATA version 18 (Stata Corp, TX, USA). The primary effect size was expressed as an odds ratio (OR) for the association between BMI and sexual dysfunction in postmenopausal women, assessed with the Female Sexual Function Index (FSFI). For meta-analytic computations, ORs were log-transformed (Log OR) to stabilize variance and approximate normality. The corresponding standard errors (SE) of the Log ORs were used to weight studies according to precision.

## Heterogeneity assessment

Between-study heterogeneity was evaluated using Cochrane's Q test and the  $I^2$  statistic, with  $I^2$  values of 25%, 50%, and 75% interpreted as low, moderate, and high heterogeneity, respectively. When heterogeneity was high, a random-effects model was applied using the restricted maximum likelihood (REML) estimator. This approach was chosen because REML provides unbiased estimates of between-study variance, accounts for variability across populations and study designs, and yields more conservative confidence intervals compared to fixed-effect models [23, 24].

## Publication bias

Potential publication bias was assessed through visual inspection of funnel plots and formally tested using Egger's regression test. Funnel plots were constructed by plotting Log ORs against their standard

errors or precision, with pseudo 95% confidence limits to evaluate symmetry. Egger's test quantified small-study effects, with a p-value < 0.05 considered indicative of bias [25].

Results are reported as odds ratios (ORs) with 95% confidence intervals (CI), and all statistical tests were two-tailed with a significance threshold of  $p < 0.05$ .

## Results

### Study selection (identification of included studies)

The process of identifying and selecting studies included in this systematic review was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 guidelines. A flowchart of this process is provided in Fig. 1.

The initial search in electronic databases, including PubMed, Web of Science, Scopus, Embase, ScienceDirect, Cochrane Library, IranMedex, Magiran, IranDoc, and SID, using predefined keywords, identified a total of 127 records. After removing 35 duplicate records, 92 unique records remained for the initial screening stage based on title and abstract.

Based on the title and abstract screening, 67 records were excluded for various reasons, including: irrelevant topic ( $n = 41$ ), inappropriate study type (review articles, case reports, guidelines, and letters to the editor) ( $n = 12$ ), and lack of access to the full text ( $n = 14$ ). Consequently, 25 articles were deemed eligible for full-text assessment.

Following retrieval and detailed evaluation of the full text of these articles, 2 studies were excluded from the review process due to a lack of a clear and transparent methodology.

Ultimately, after this rigorous screening process, 23 studies that met the inclusion criteria for this systematic review and meta-analysis were selected for qualitative synthesis.

These 23 studies were included in the qualitative synthesis. The results of these 23 studies are presented in Table 2. Among these, 4 studies that reported the necessary data for calculating effect sizes (such as correlation coefficients, means, and standard deviations) were also included in the meta-analysis (quantitative synthesis).

### Results of the quality assessment of included studies

Based on the assessment conducted using the standardized JBI critical appraisal tools - the JBI checklist for cross-sectional studies for the 20 cross-sectional studies, the JBI checklist for cohort studies for the 2 cohort studies, and the JBI checklist for case-control studies for the 1 case-control study - the methodological quality of all 23 included studies was rated as moderate to strong. No study was identified with weak methodological quality, and all studies met the minimum required score for

inclusion in the meta-analysis. Inter-rater reliability between reviewers was excellent, with a Cohen's Kappa of 0.92. The detailed results of the quality assessment for each study are presented in Table 3.

Table 3  
Quality Assessment of Cross-Sectional Analytical Studies/Cohort Studies Based on JBI Checklist

| NO. | Authors                               | JBI Score | Percentage | Quality Level |
|-----|---------------------------------------|-----------|------------|---------------|
| 1   | Liang et al., 2025                    | 8/8       | 100%       | Strong        |
| 2   | Coronado et al., 2025                 | 8/8       | 100%       | Strong        |
| 3   | Mundhra et al., 2024                  | 5/8       | 62.5%      | Medium        |
| 4   | Terauchi et al., 2022                 | 8/8       | 100%       | Strong        |
| 5   | Logan et al., 2021                    | 8/8       | 100%       | Strong        |
| 6   | Nazarpour et al., 2020                | 7.5/8     | 93.75%     | Strong        |
| 7   | Faubion et al., 2020                  | 8/8       | 100%       | Strong        |
| 8   | Dutra da Silva et al., 2020           | 8/8       | 100%       | Strong        |
| 9   | Powell et al., 2020                   | 8/8       | 100%       | Strong        |
| 10  | da Silva et al., 2019                 | 8/8       | 100%       | Strong        |
| 11  | Zhou et al., 2019                     | 6.5/8     | 81.25%     | Strong        |
| 12  | Naworska & Bak-Sosnowska, 2019        | 7.5/8     | 93.75%     | Strong        |
| 13  | Simoncig Netjasov et al., 2016        | 7/8       | 87.50%     | Moderate      |
| 14  | Kutheerawong & Vichinsartvichai, 2016 | 6.5/8     | 81.25%     | Moderate      |
| 15  | Llaneza et al., 2011                  | 8/8       | 100%       | Strong        |
| 16  | Hess et al., 2009                     | 8/8       | 100%       | Strong        |
| 17  | Llaneza et al., 2007                  | 8/8       | 100%       | Strong        |
| 18  | Castelo-Branco et al., 2009           | 8/8       | 100%       | Strong        |
| 19  | Kirchengast et al., 1996              | 4.5/8     | 56.25%     | Moderate      |
| 20  | Pace et al., 2009                     | 8/8       | 100%       | Strong        |
| 21  | Dutra da Silva et al., 2017           | 6/10      | 60%        | Moderate      |
| 22  | Tang et a, 2022                       | 9/11      | 100%       | Strong        |
| 23  | Nackers et al., 2015                  | 11/11     | 100%       | Strong        |

# Characteristics of included studies

A total of 23 studies that met the inclusion criteria were included in the systematic review. These studies were conducted between 1996 and 2025 across 13 different countries (including China, Spain, India, Japan, Singapore, Brazil, the United States, Iran, Poland, Serbia, Thailand, Austria, and Italy). In terms of study design, the vast majority of studies (20 studies) utilized a cross-sectional design, while 2 studies were cohort studies and 1 study was a case-control study.

All studies investigated the relationship between BMI and sexual function in menopausal or middle-aged women (aged 40–79 years). The primary tools for measuring sexual function included the following international and specific standardized questionnaires:

- FSFI (Female Sexual Function Index) in 10 studies [7, 10, 15, 26–32]
- Cervantes Scale in 3 studies [5, 33–35]
- MENQOL (Menopause-Specific Quality of Life Questionnaire) in 2 studies [11, 36]
- MHR-QOL (Menopause Health-Related Quality of Life Questionnaire) in 1 study (includes items on painful intercourse and vaginal dryness) [37]
- McCoy Sexual Questionnaire in 1 study [38]
- CSFQ-14 (Changes in Sexual Functioning Questionnaire) in 1 study [39]
- SAQ (Sexual Activity Questionnaire) in 1 study [40]
- Study-specific questionnaires (researcher-developed) in 4 studies [41–44]

Notably, two of the studies utilizing FSFI employed additional instruments to complement their findings:

- Faubion et al. (2020) used both FSFI and FSDS-R (Female Sexual Distress Scale-Revised)[28]
- Dutra da Silva et al. (2020) used FSFI alongside DSM-IV diagnostic criteria [27]

The sample sizes ranged from 73 to 6,833 participants across the studies.

## Study populations

Given the objective of this systematic review, which is to investigate the relationship between body mass index and sexual function in postmenopausal women, it should be noted that among the 23 included studies, 12 studies (52.2%) specifically focused solely on postmenopausal populations. Two studies (8.7%) jointly examined both perimenopausal and postmenopausal women, while the remaining 9 studies (39.1%) included a broader spectrum of women spanning various menopausal transition stages, including premenopausal, perimenopausal, and postmenopausal periods, or generally involved middle-aged women. This diversity in the definition of the study populations should be taken into consideration when interpreting the overall findings and their generalizability to the specific population of postmenopausal women. However, in the subsequent quantitative synthesis (meta-analysis), subgroup

analysis based on menopausal status has been conducted to examine this relationship more precisely within the primary target population (postmenopausal women).

## Quantitative and qualitative findings of studies

Analysis of the results from the included studies showed that 17 out of 23 studies (73.9%) reported a significant inverse relationship between increased BMI and decreased sexual function in postmenopausal women. In contrast, 3 studies (13.0%) identified no significant independent association between BMI and sexual function, and 3 study (13.0%) even reported a positive relationship between increased BMI and improved sexual function. It is worth noting that in the study by Hess et al. (No. 16), an inverse relationship between body mass index and sexual activity was also found in the univariate analysis, but this association was not observed after multivariate adjustment [41]. Additionally, the classification of BMI varied across the included studies, which may have contributed to the inconsistencies in the reported associations.

## Results of subgroup analysis and sexual function domains

The analysis of studies revealed that 18 studies reported a significant inverse relationship between increased BMI and decreased sexual function in postmenopausal women. Overall, in univariate analysis, higher BMI was associated with lower FSFI scores. However, the pattern of this association was not consistent across studies and BMI subgroups. It should also be noted that the instruments used to assess sexual function varied across these 18 studies.

Analysis of different sexual function domains revealed that BMI does not uniformly affect all aspects of sexual function. Based on the results of these studies, the negative effects of BMI on scores of various sexual function domains, in order of frequency, are as follows: **satisfaction** (decreased sexual satisfaction with increased BMI) reported in 5 studies [15, 26–28, 32], **desire** (decreased sexual desire with higher BMI) reported in 4 studies [15, 26, 30, 44], **arousal** (decreased arousal with higher BMI) reported in 4 studies [15, 26, 28, 32], **orgasm** (difficulty achieving orgasm with increased BMI) reported in 3 studies [28, 32, 38], and **lubrication** (decreased lubrication with higher BMI) reported in 2 studies [28, 32]. In contrast, findings regarding the **pain** domain were conflicting. Some studies have associated higher BMI with lower scores in this domain (i.e., greater pain during intercourse or dyspareunia) [28, 31]. However, other studies have reported that obese women experience less pain during sexual intercourse [37, 38]

## Meta-analysis results

This analysis examined the association between BMI and sexual dysfunction in postmenopausal women, using ORs derived from studies employing the Female Sexual Function Index (FSFI). Four studies met inclusion criteria: Logan et al. (2021), Faubion et al. (2020), Pace et al. (2009), and Nazarpour et al. (2020). The pooled sample included diverse populations across clinical and community settings.

## Forest plot and pooled effect

Figure 2 presents the forest plot of individual and pooled effect sizes. The random-effects model (REML) yielded a pooled OR of 1.00 (95% CI: 0.81–1.24), indicating no significant association between overweight BMI and sexual dysfunction in menopause. Individual study ORs ranged from 0.60 to 1.22. The largest weights were assigned to Faubion et al. (37.32%) and Pace et al. (36.70%), reflecting their larger sample sizes and narrower confidence intervals.

Heterogeneity was moderate to substantial ( $I^2 = 70.46\%$ ), suggesting variability in effect sizes across studies. The test for heterogeneity was statistically significant ( $Q(3) = 9.10$ ,  $p = 0.03$ ), while the test for overall effect was not ( $z = 0.01$ ,  $p = 0.99$ ).

## Assessment of publication bias

The funnel plot was used to assess potential publication bias. Figure 3 plots standard error against log OR, centered on the estimated overall effect. The distribution of studies appears relatively symmetric around the pooled estimate, with most points falling within the pseudo 95% confidence region.

Egger's regression test yielded an intercept coefficient of -2.04 ( $p = 0.230$ ), indicating no statistically significant evidence of small-study effects or publication bias.

## Discussion

The relationship between BMI and sexual function in postmenopausal women remains a controversial topic without a definitive consensus. The present systematic review, conducted to investigate this relationship, reveals inconsistent findings across existing studies. Although our overall findings indicate that 17 out of 23 studies (73.9%) reported a significant inverse association between increased BMI and diminished sexual function, this association was not uniform across all studies. However, 3 studies (13.0%) reported no significant association and 3 studies (13.0%) found a positive relationship between the two variables.

The meta-analysis of four eligible studies showed no significant association between BMI and sexual dysfunction (OR = 1.00, 95% CI: 0.81–1.24). While this finding is generally consistent with the inconsistent results reported across other studies, it should be interpreted cautiously when considering the general population of postmenopausal women, as the included studies involved limited and specific samples rather than a representative population.

Nevertheless, the findings from the systematic review highlight that a substantial proportion of individual studies (17 out of 23, 73.9%) reported a significant inverse association between increased BMI and sexual function. This suggests that, while the pooled analysis did not confirm a statistically significant relationship, there is evidence in the literature indicating that higher BMI may negatively affect sexual function in postmenopausal women.

The precise mechanism underlying this association is not fully understood. It remains unclear whether obesity directly increases the risk of sexual disorders or whether its effects on sexual function are

primarily mediated through comorbidities and complications associated with obesity [45]. However, it is certain that the potential mechanisms linking high BMI to reduced sexual function are multidimensional. These mechanisms include hormonal pathways (increased aromatase activity and altered androgen-estrogen balance), vascular-inflammatory pathways (endothelial dysfunction and reduced genital blood flow), metabolic changes (insulin resistance), musculoskeletal factors (impaired pelvic floor function), and psychosocial factors [3, 12, 15].

This significant heterogeneity in the results may be attributed to several factors. These include differences in sexual function assessment tools (such as FSFI, Cervantes, MENQOL, MHR-QOL, McCoy, CSFQ-14, SAQ, etc., each emphasizing different dimensions), diverse demographic and cultural characteristics of the studied samples, varying definitions of BMI subgroups, and most importantly, the extent and precision of controlling for confounding variables (such as age, comorbidities, and mental health) in study design and statistical analyses. For instance, in the study by Hess et al. (2009), the relationship between BMI and sexual functioning was complex and model-dependent. Although an inverse relationship was observed in univariate analysis and a higher BMI initially appeared to be associated with lower sexual engagement, this correlation became statistically non-significant after adjusting for confounding variables. [41]. This means that when other lifestyle and psychosocial factors were considered, the relationship lost its statistical significance. These findings clearly indicate that other factors, like physical activity and social support, may influence BMI's impact on sexual function. This suggests that obesity is unlikely to be an independent direct cause of sexual dysfunction, but rather exerts its effects primarily through mediating variables.

Among the mechanisms of the relationship between BMI and sexual function, psychosocial factors seem to play a prominent role. Beauty standards promoted by the media can be perceived as unfair and harmful to those who fall outside this framework. Obesity is often described merely as an aesthetic issue, whereas its psychological dimensions are far broader and more complex. Dissatisfaction with body image can lead to reduced feelings of attractiveness, diminished self-esteem, and social withdrawal, all of which decrease the likelihood of a healthy sexual life. Individuals with higher body weight may perceive themselves as sexually unattractive, which can result in avoidance of new experiences [27].

Furthermore, postmenopausal women with obesity are exposed to a wide range of biopsychosocial risk factors and chronic diseases. Obesity is associated with an increased risk of type 2 diabetes, cardiovascular diseases, metabolic syndrome, and other conditions that can directly or indirectly impact sexual function [3, 12]. Psychological stress, negative body image, low self-esteem, and poor perceived general health, commonly observed in this population, can significantly interfere with sexual function [46, 47].

A key finding of this review is that the relationship between BMI and sexual dysfunction is neither simple nor linear. Studies show that after adjusting for important confounding factors such as mood disorders, age, and medication use, this association is often weakened or becomes statistically insignificant [28].

Even in studies examining severe obesity, findings have been inconsistent. For example, one study reported relatively improved sexual function scores in Class III obesity (BMI  $\geq 40$ ) compared to Class II obesity [28]. These findings clearly indicate that obesity is probably not an independent and direct cause of sexual dysfunction but rather influences it primarily through mediating variables. This perspective highlights the importance of a biopsychosocial approach in assessing and treating postmenopausal women with sexual concerns. Consequently, interventional strategies should focus on the comprehensive management of mediating factors such as mood, relationship dynamics, and body image concerns, rather than solely on weight loss as an independent goal.

## Limitations

In interpreting these findings, several limitations of this systematic review and meta-analysis should be acknowledged. The most significant limitation was the considerable heterogeneity among studies in terms of design, methodology, measurement tools for sexual function, and characteristics of the study populations, which challenged the robustness and interpretability of the meta-analysis. Additionally, the inconsistent categorization of BMI across studies—with varying cut-off points and definitions for normal weight, overweight, and obesity—may have contributed to the divergent findings and complicated direct comparisons. The meta-analysis itself included only four studies, limiting its statistical power and generalizability. Furthermore, the predominance of cross-sectional designs precludes causal inferences between BMI and sexual dysfunction. Variability in sexual function assessment tools and potential residual confounding by psychosocial and medical factors also warrant consideration when interpreting the results.

## Conclusion

The systematic review of 23 studies indicates a marked inverse association between higher BMI and sexual function in postmenopausal women, with approximately 75% of the included studies reporting this significant relationship. However, this association was not confirmed by the subsequent meta-analysis of the limited subset of studies with quantitatively poolable data. This discrepancy suggests that obesity (high BMI) is likely a risk marker rather than a direct or independent cause of sexual dysfunction in this population, with its effects largely mediated through intertwined psychosocial and comorbid pathways.

These results underscore the necessity of moving beyond a purely biomedical or weight-centric view. In clinical practice, assessing and addressing the potential mediating pathways—including mental health, relationship dynamics, body image concerns, and the management of obesity-related comorbidities—may be more impactful for sexual health than focusing on weight reduction as a solitary goal.

Future research should prioritize longitudinal designs with standardized assessment tools and rigorous control for key confounders to clarify the nature of this association and the role of specific mediators.

Such studies are essential for developing evidence-based, individualized clinical guidelines for postmenopausal women experiencing sexual dysfunction.

## Abbreviations

BMI

Body Mass Index

CI

Confidence Intervals

CSFQ-14

14-item Changes in Sexual Functioning Questionnaire

FSD

Female Sexual Dysfunction

FSDS-R

Female Sexual Distress Scale-Revised

FSFI

Female Sexual Function Index

GSM

Genitourinary Syndrome of Menopause

HRQOL

Health-Related Quality of Life

JBI

Joanna Briggs Institute

MENQOL

Menopause-specific Quality of Life

MHR-QOL

Menopausal Health-Related Quality of Life

MSCL

The Menopausal Symptom Checklist

OR

Odds Ratio

ORs

Odds Ratios

PRISMA

Preferred Reporting Items for Systematic Reviews and Meta-Analyses

RRSO

Pre- or Post-menopausal Risk-reducing Salpingo-Oophorectomy

REML

Restricted Maximum Likelihood)

SAQ

The Sexual Activity Questionnaire

SE

Standard Errors

WHR

Waist to Hip Ratio

## Declarations

### **Ethics approval and consent to participate**

This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (approval code: IR.SBMU.PHARMACY.REC.1404.167).

### **Consent for publication**

Not applicable.

## Competing interests

The authors declare that they have no competing interests.

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## Author Contribution

SN wrote the main manuscript text, prepared the figures and tables, and conducted the systematic review. MS supervised the project, critically reviewed the manuscript, and provided revisions. ZK contributed to the critical review and editing of the manuscript. RT performed the meta-analysis and statistical calculations. All authors read and approved the final manuscript. All authors contributed to the assessment of the risk of bias.

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## Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Table

Table 2 is available in the Supplementary Files section.

Figures

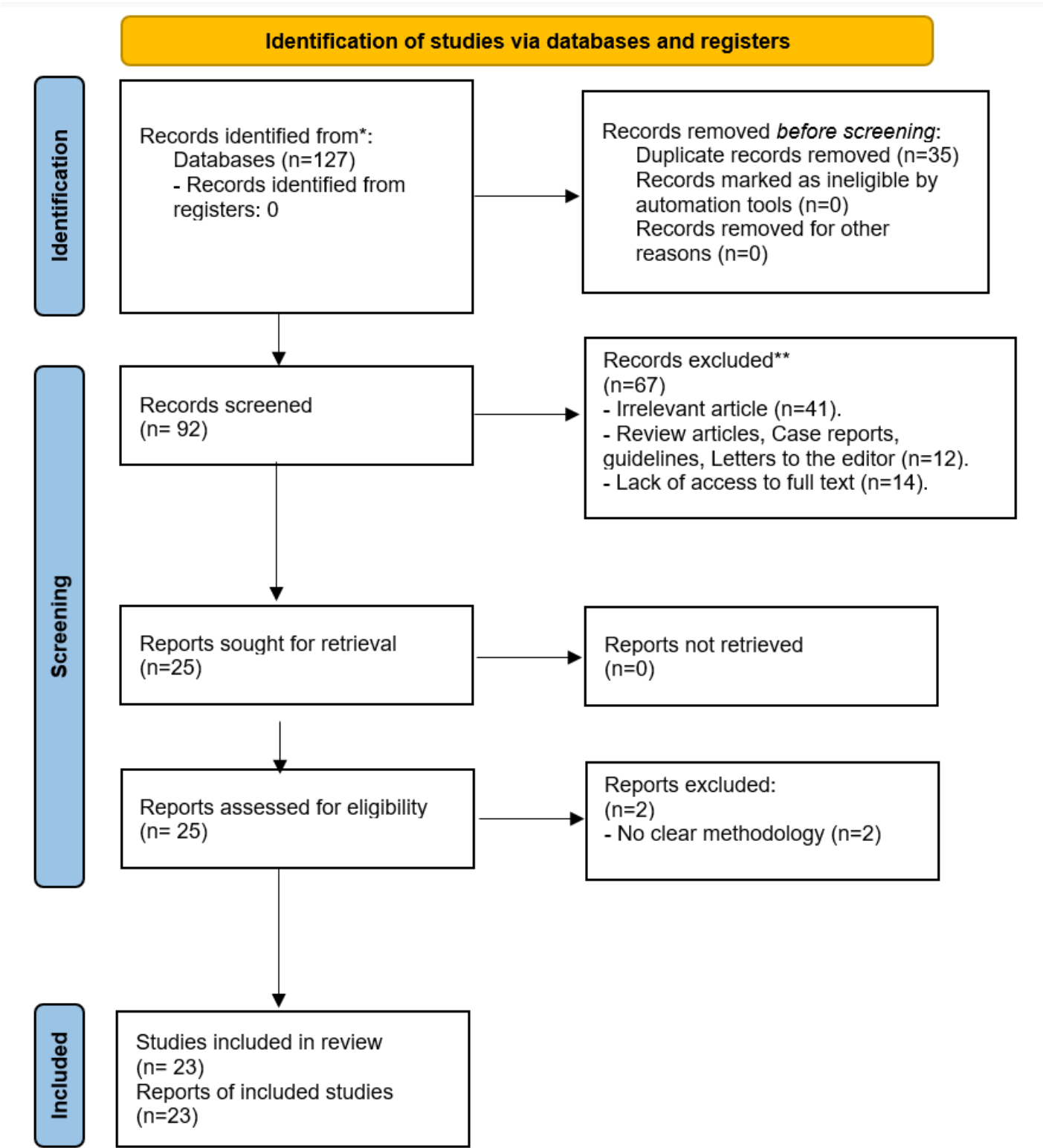


Figure 1

The PRISMA flow diagram

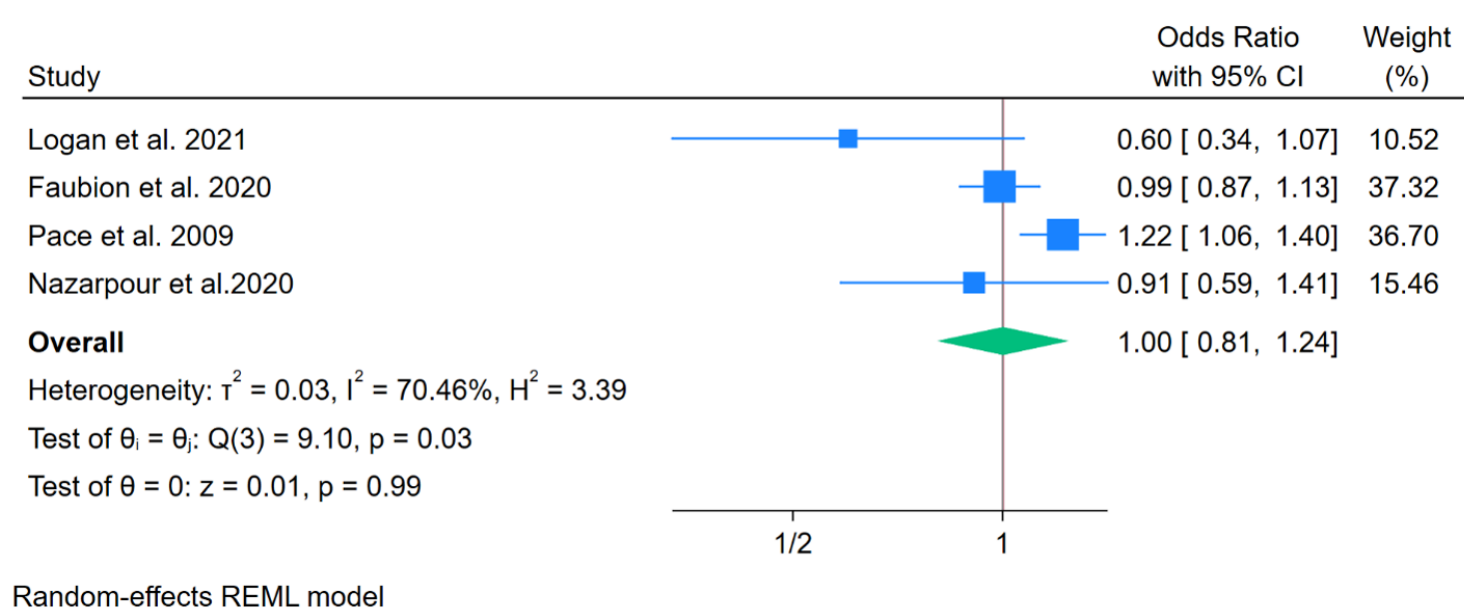
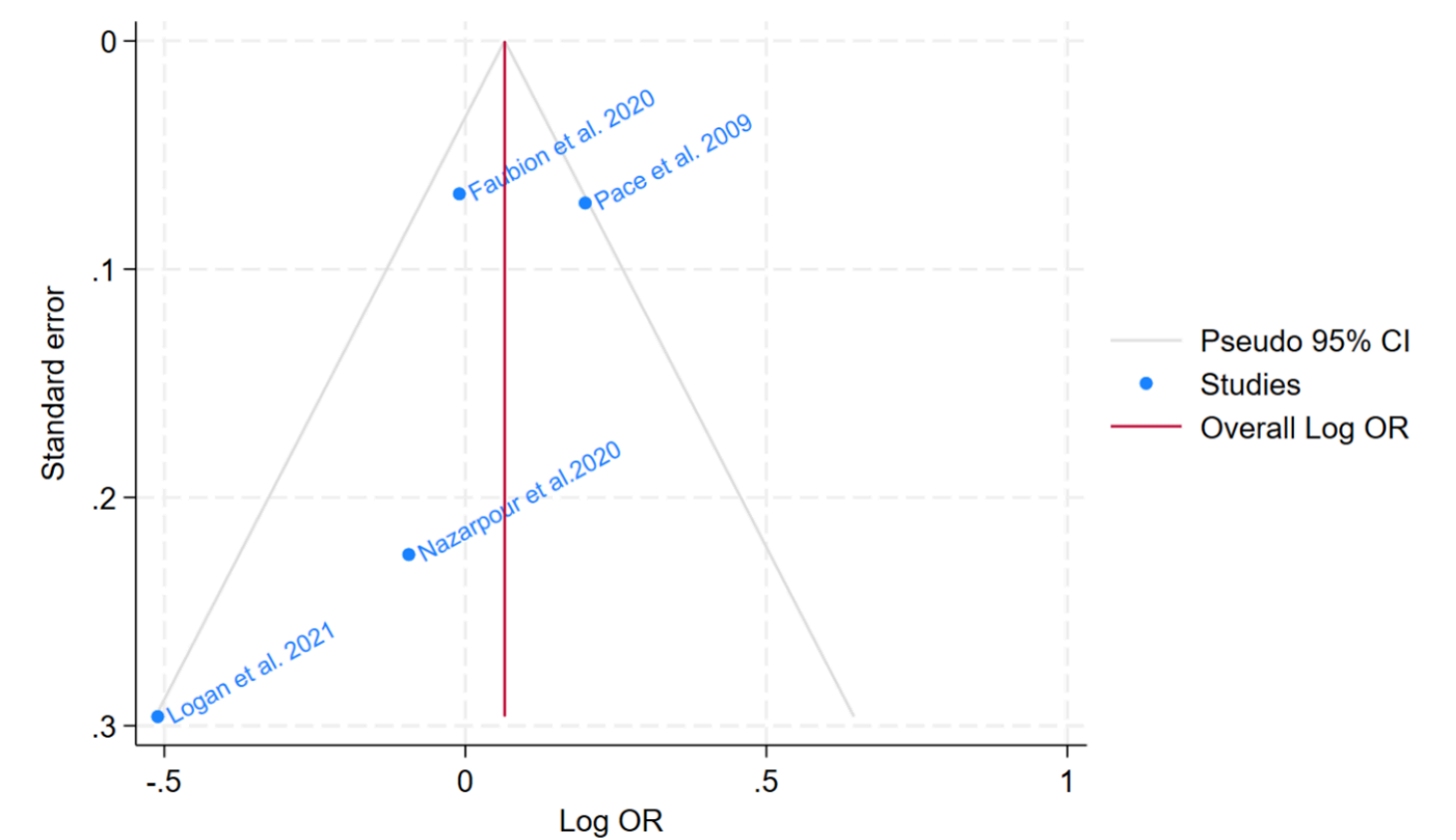


Figure 2

Forest plot showing odds ratios (ORs) and 95% confidence intervals for the association between overweight BMI and sexual dysfunction in postmenopausal women, assessed by FSFI



### Figure 3

Funnel plot of standardized log odds ratios against precision, assessing publication bias in the meta-analysis

## Supplementary Files

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- [Table2.Studies1.docx](#)