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Global prevalence of female sexual dysfunction based on physical activity: a systematic review and meta-analysis

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Abstract

Background There is a strong connection between physical activity and major non-communicable diseases. Women's sexual health is a vital aspect of life at any age; however, it is influenced by many factors. The aim of this study is to investigate the global prevalence of female sexual dysfunction based on physical activity through a systematic review and meta-analysis.

Methods In this study, electronic repositories including PubMed, Google scholar, Scopus, Web of Science, Embase, and ScienceDirect were systematically searched using specified keywords, without a lower time limit, up until March 2025. A random effects model was employed to perform the meta-analysis. The heterogeneity of the studies was assessed using the I^2 index. Data analysis was conducted within the Comprehensive Meta-Analysis (CMA) software (version 2).

Results In the review of 7 studies with a sample size of 1,776 participants, the pooled prevalence of female sexual dysfunction with high physical activity was estimated to be 47% (95% CI: 28.8–65.9). Also, in the review of 6 studies with a sample size of 2,094 participants, the pooled prevalence of female sexual dysfunction among those with low physical activity or a sedentary lifestyle was found to be 64.6% (95% CI: 44.5–80.6).

Conclusion In this meta-analysis, the pooled prevalence of sexual dysfunction among inactive women was reported to be higher and more significant than that of physically active women. Thus, it is necessary for health policymakers to further promote the importance of physical activity to prevent and reduce female sexual dysfunction.

Keywords Female sexual dysfunction, Sexual function, Physical activity, Sedentary, Systematic review

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Background

Women's sexual health is a vital aspect of life at any age; however, it is affected by many factors [1]. Female sexual dysfunction (FSD) is a complex phenomenon [2] that the Sexual Function Health Council of the American Foundation for Urologic Disease has classified into five main categories: libido disorder, sexual aversion disorder, sexual arousal disorder, orgasm disorder, and sexual pain disorder [3]. FSD is also a widespread sexual problem worldwide with a prevalence ranging from 25.8 to 67% [4].

The term 'physical activity' refers to any body movement produced by skeletal muscles that requires energy expenditure above baseline [5]. Physical activity does not necessarily involve participations in sports. It entails all types of activities including body movement such as work, play, exercise, housework, and recreational activities [6].

Physical inactivity is recognized as the fourth leading risk factor for global mortality, causing approximately 3 million preventable deaths worldwide [7]. Routine physical activity is associated with a reduced risk of premature mortality, the risks associated with more than 25 chronic medical diseases [8], symptoms of anxiety and depression, and improvements in mental health [9]. Recognizing this strong relationship between physical activity and major non-communicable diseases, the member countries of the World Health Organization have established 'physical activity' as one of the 9 global goals aimed at improving, preventing, and reducing the prevalence of insufficient physical activity by 10% by 2025, along with the treatment of related diseases [10, 11]. Furthermore, the World Health Organization has reported that, in general, the level of physical activity decreases with age, and that the amount of physical activity of women is lower than that of men [5].

Women's sexual performance can be affected by musculoskeletal conditions, pelvic floor muscles (PFM), and other muscle groups. Although research on how specific musculoskeletal conditions that limit mobility and strength affect sexual performance is still limited [12], it seems that the improvements in physiological sexual arousal after acute exercise are due to increased activity of sympathetic nerves and endocrine factors [13], as well as enhanced relaxation, leanness, muscularity, and more comfort. Physical exercise also improves self-confidence and body confidence, which can enrich one's sex life [14].

Considering the increase in urbanization and decrease in mobility and physical activity among women, as well as the effects of these conditions on women's sexual performance, and considering that the studies conducted in this field in different regions of the world have reported different prevalences and heterogeneity, the aim of this study is to investigate the global prevalence of female sexual dysfunction in relation to physical activity through a systematic review and meta-analysis.

Methods

Database search process

We conducted our initial search in June 2022. In this systematic review, the PubMed, Web of Science, Google Scholar, Scopus, ScienceDirect, and Embase repositories were searched using the keywords "Female Sexual Dysfunction", "FSD", "Physical Activity", "Sedentary", "Inactivity", and "Lack of Physical Activity". To maintain the comprehensiveness of the search, no restrictions were applied in on the year of publication of the articles and information of the identified articles was transferred into the EndNote reference management software. In order to maximize the number of relevant studies, the references list of the identified related articles was reviewed manually. The searches were last updated in March 2025. The search strategies for the selected databases are reported in Table 1.

Our study aimed to answer the following research question "What is the global prevalence of female sexual dysfunction based on physical activity?" This is based on the PICOS framework: (Population): includes women worldwide, (Intervention): refers to physical activity, (Comparison) involves high and low physical activity, (Outcome): includes the prevalence of female sexual dysfunction, and (study design) pertains to observational studies (case-control, cohort, cross-sectional). The

Table 1 Search strategy based on desired databases

Database	Search strategy
PubMed	("female sexual function"[tiab] OR "female sexual Dysfunction"[tiab] OR FSD [tiab]) AND (Sedentary[tiab] OR Inactivity[tiab] OR" Lack of Physical Activity" [tiab])
ScienceDirect	("female sexual function" OR FSD OR "female sexual Dysfunction") AND (Sedentary OR Inactivity OR" Lack of Physical Activity")
Scopus	TITLE-ABS-KEY ("female sexual function" OR FSD OR "female sexual Dysfunction") AND TITLE-ABS-KEY (Sedentary OR Inactivity OR" Lack of Physical Activity")
WOS	TS= ("female sexual dysfunction" OR FSD OR "female sexual function") AND TS= ("Metabolic Syndrome")
Embase	('female sexual dysfunction': ta, ab OR fsd: ta, ab OR 'female sexual function':ta, ab) AND (sedentary: ta, ab OR inactivity: ta, ab OR 'lack of physical activity':ta, ab)
Google scholar	allintitle: "female sexual dysfunction" OR FSD OR "female sexual function" Sedentary OR Inactivity OR" Lack of Physical Activity"

duration for the search included no lower time limit until July 2022.

Inclusion and exclusion criteria

Study inclusion criteria were:

1. Studies that reported the prevalence of female sexual dysfunction in relation to physical activity.
2. Observational studies (case-control, cohort, cross-sectional).
3. Studies with full-text available.
4. Studies that provided sufficient data (including details of the sample size).
5. Studies published in English.

Exclusion criteria were:

1. Case reports, and case series.
2. Review studies.
3. Duplicates.
4. Studies with insufficient data (no reported information on the prevalence of sexual dysfunction in women in relation to physical activity), and sample size.
5. Studies that were published in languages other than English.

Study selection

Study selection was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. At first, the studies that were duplicates across different databases were excluded. The initial selection and review of the articles began by reviewing the titles and abstracts, and irrelevant articles were removed based on the inclusion and exclusion criteria. Subsequently, the full texts of the remaining articles were evaluated according to the same criteria, and any irrelevant studies were removed at this stage. To avoid bias, all steps of reviewing sources and extracting data were conducted independently by two reviewers. In cases where there was a difference of opinion between the two reviewers, the article was reviewed by a third person.

Quality assessment and risk of bias

The Newcastle-Ottawa Scale (NOS) is a quality assessment tool for observational studies that is recommended by the Cochrane Collaboration. The NOS assigns a maximum of nine points for the least risk of bias across three domains: selection of study groups (4 points); comparability of groups (2 points); and ascertainment of exposure and outcomes (3 points) for case-control and cohort studies, respectively, and resulting in a total of 11 possible points. Articles were classified as high quality (scoring ≥ 5 points) or low quality (scoring < 5 points). All articles that obtained five or more points were included in this meta-analysis.

Data extraction

Data extraction was conducted by two researchers using a different pre-prepared checklist. This checklist included first author's name, year of publication, study location, sample size, women's age group, prevalence of female sexual dysfunction according to the presence or absence of physical activity, and study methods.

Statistical analysis

The heterogeneity of the studies was tested using the I^2 test. If high heterogeneity is observed (i.e., I^2 greater than 75%), the random effects model is used for the meta-analysis of studies. Conversely, if low heterogeneity is observed (i.e., I^2 less than 25%), the fixed effects model is applied. To examine the publication bias, the Egger's test was used at a significance level of 0.05, and corresponding funnel plots were drawn. Data were analyzed using Comprehensive Meta-analysis software (Biostat, Englewood, NJ, USA, version 2).

Results

In this systematic review and meta-analysis, the global prevalence of female sexual dysfunction in relation to physical activity was systematically evaluated according to the PRISMA guidelines. For study selection, 283 articles were initially identified after searching the above-mentioned databases. Additionally, 6 further related articles were identified through manual searches. Details of all identified articles were transferred into the EndNote reference management software. Subsequently, 166 articles were omitted due to duplication. In the screening phase, the titles and abstracts of the studies were examined and a further 81 articles were excluded based on the inclusion and exclusion criteria. In the eligibility evaluation stage, 27 articles were excluded after full-text review and the application of the inclusion and exclusion criteria. In the quality evaluation phase, studies with low methodological quality were excluded after full-text review and scoring using the STROBE checklist, resulting in 7 studies being selected for the final evaluation. The information of these 7 selected studies is outlined in Fig. 1; Table 2. All included studies were cross-sectional, and most conducted in Asia and South America.

Considering Table 2, the highest prevalence of FSD (80.1%) was reported in Masroli et al.'s study in 2021, which involved 217 sedentary women in Italy with an average age of 45.7 ± 12.3 [15]. The lowest prevalence of FSD (18.6%) was reported in Lotfi et al.'s study in 2009 among women aged 30–70 who engaged in physical activity in the Boston area [16].

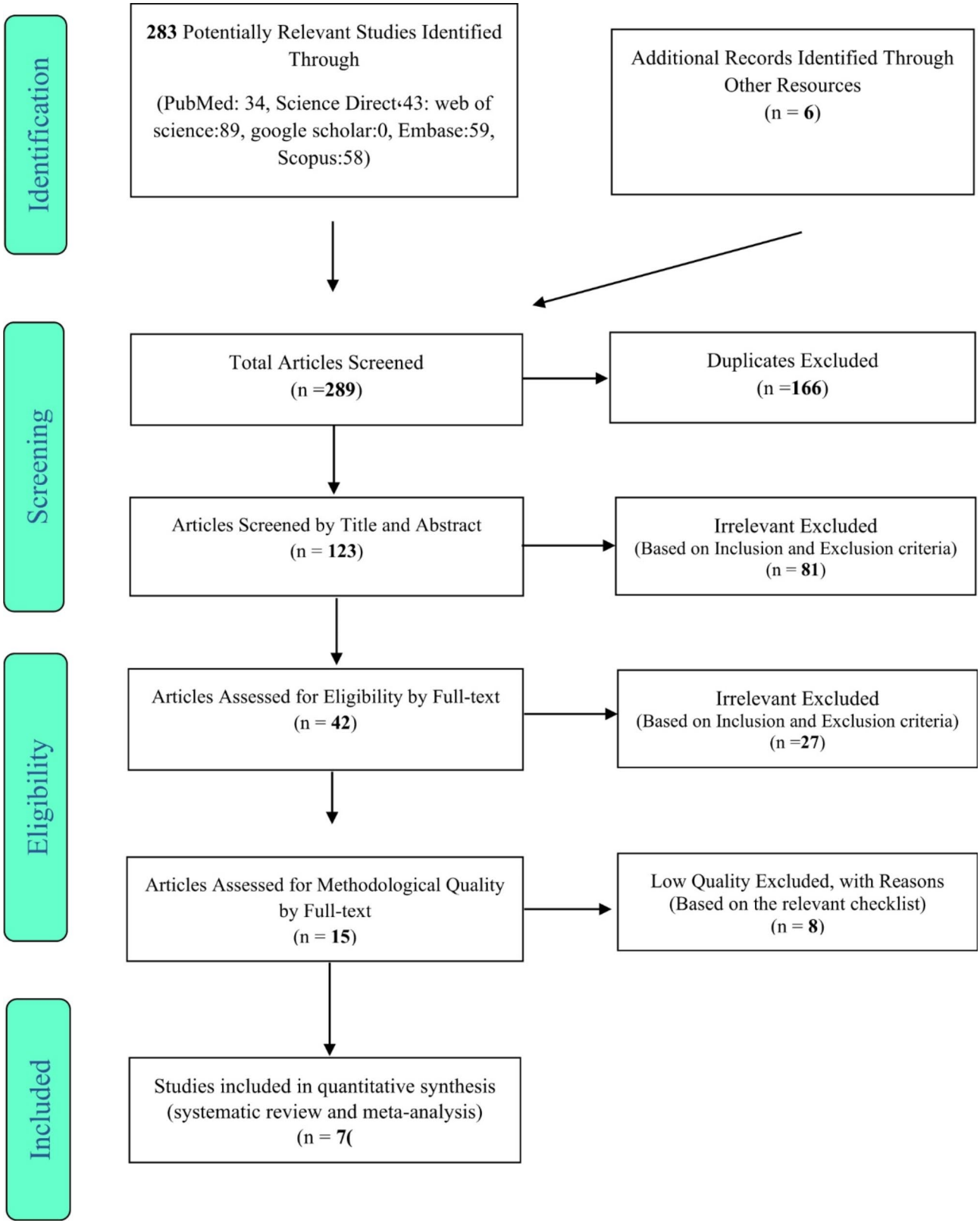

Fig. 1 PRISMA flow diagram for study selection

Table 2 Information extracted from studies

Author	Year	Location	Age	Total women sample size	Physical Activity	Prevalence of FSD in Active and Sedentary	Instrument
Cabral et al. [17]	2014	Brazil	40–65	370	YES:132 NO:109	Active: 57.6% Sedentary: 78.9%	IPAQ[1], FSFI[2]
Amidu et al. [20]	2010	Ghana	18–58	301	YES:109 NO:107	Active: 73.2% Sedentary: 71.3%	GRISS[3]
Valadares et al. [21]	2016	Brazil	45–60	749	YES:250 NO:494	Active: 32.9% Sedentary: 52.8%	SPEQ[4]
Çayan et al. [18]	2016	Turkey	≥ 18	1217	YES:308	Active: 22.8%	FSFI
Lutfey et al. [16]	2009	Boston Area	30–79	3205	YES:596 NO:891	Active: 18.6% Sedentary: 27.8%	Self-administered questionnaire
Maseroli et al. [15]	2021	Italy	45.7 ± 12.3	322	YES:105 NO:217	Active: 62.1% Sedentary: 80.1%	FSFI, BUT[5], MHQ[6], FSDS-R[7]
Logan et al. [19]	2021	Singapore	45-69	498	YES:276 NO:276	Active: 69.1% Sedentary: 71%	GPAQ[8], FSFI

[1] physical activity level

[2] Female Sexual Function Index

[3] The Golombok Rust Inventory of Sexual Satisfaction

[4] Short Personal Experiences Questionnaire

[5] Body Uneasiness Test

[6] Middlesex Hospital Questionnaire

[7] Female Sexual Distress Scale-Revised

[8] The Global Physical Activity Questionnaire

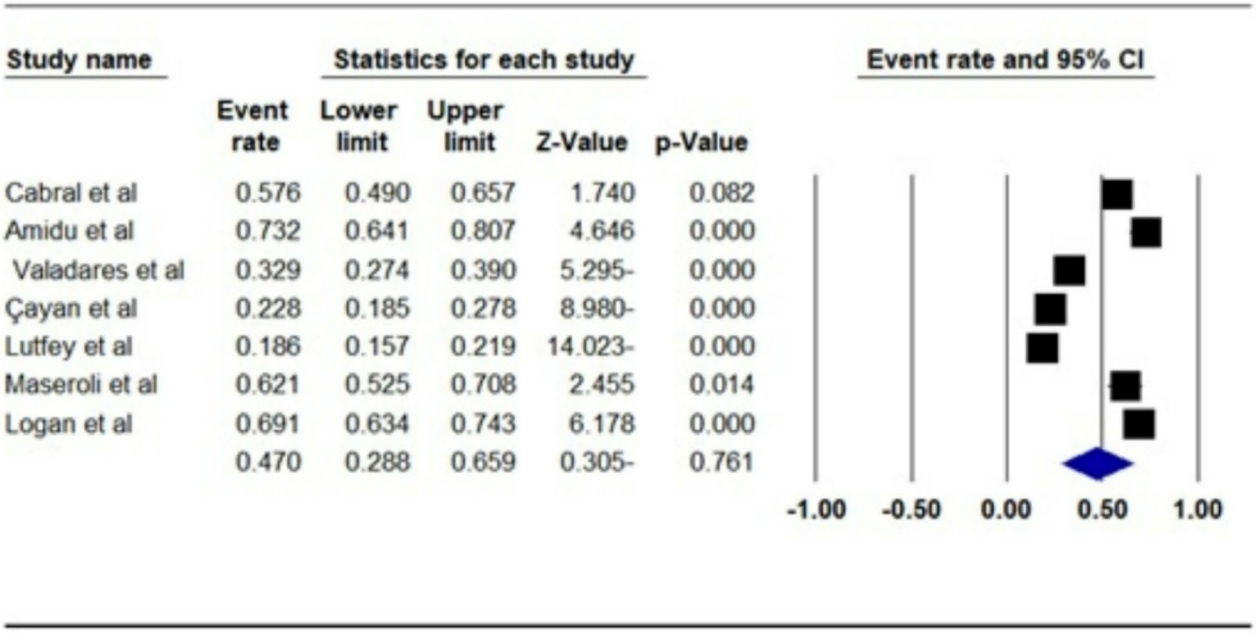

Fig. 2 Forest plot of prevalence of female sexual dysfunction among women with high physical activity based on random effects method

Four studies utilized the FSFSI tool along with other instruments [15, 17–19]. In contrast, the remaining studies used various other tools to measure the presence of sexual dysfunction among women based on physical activity.

High physical activity

In the review of 7 studies with a total sample size of 1,776, the results of the I^2 test showed high heterogeneity (I^2:98.06%), thus the meta-analysis was performed using the random effects method. Accordingly, the pooled prevalence of female sexual dysfunction with high

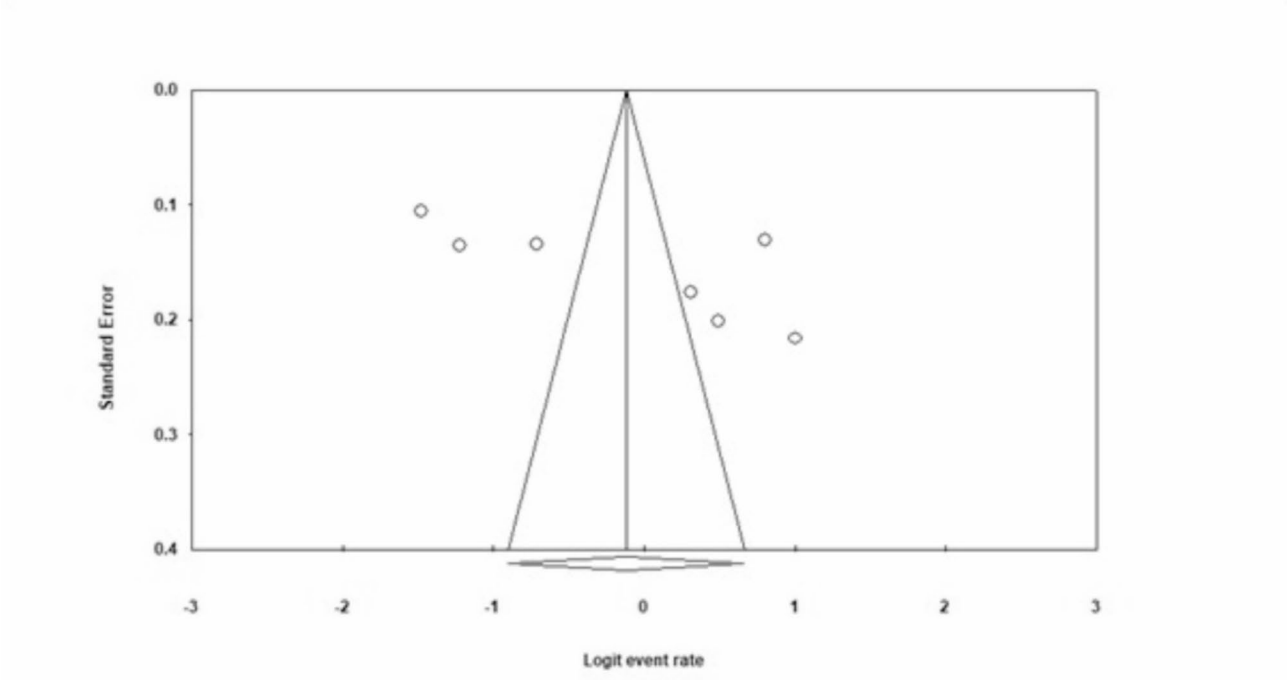

Fig. 3 Funnel plot for the examination of publication bias

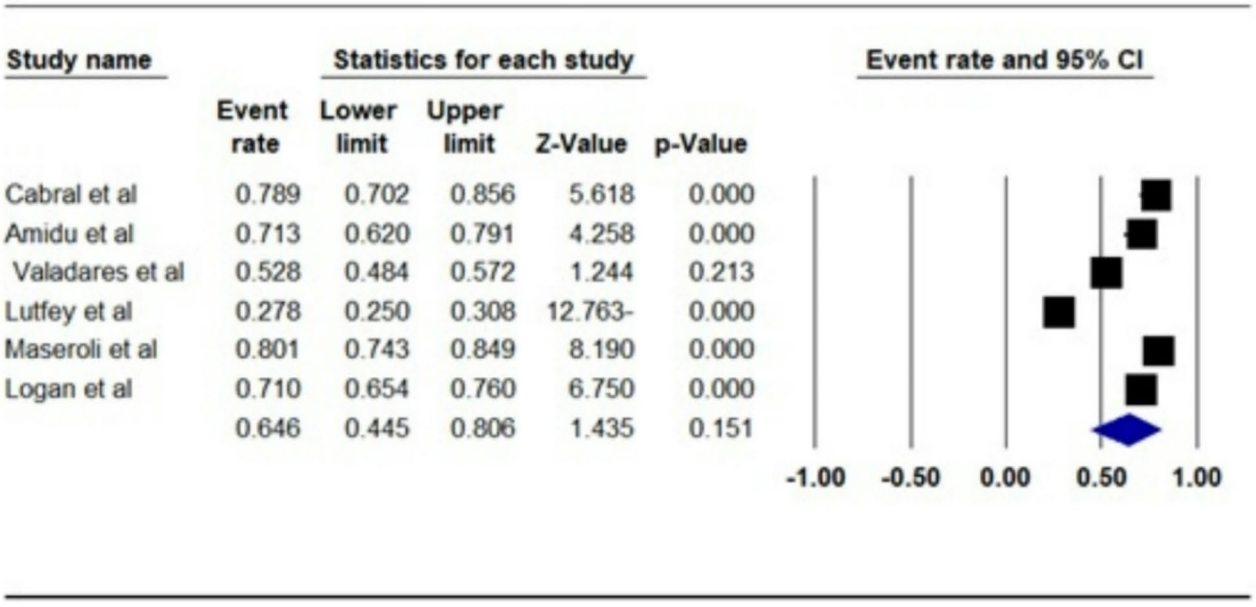

Fig. 4 Forest plot of prevalence of sexual dysfunction among sedentary women based on random effects method

physical activity, based on the meta-analysis, was estimated to be 47% (95% CI: 28.8–65.9) (Fig. 2). Publication bias, considering the large sample size of the studies, was examined using Egger's test at a significance level of 0.05. Publication bias was not found to be statistically significant (p: 0.087) (Fig. 3).

Low physical activity (sedentary women)

In the review of 6 studies with a total sample size of 2,094, the results of the I^2 test showed high heterogeneity (I^2: 98.4%). As a result, the random effect method was applied for the meta-analysis. Based on this, the pooled prevalence of female sexual dysfunction with low physical activity or sedentary lifestyles was estimated to be 64.6% (95%CI: 44.5–80.6) (Fig. 4). Considering the large sample

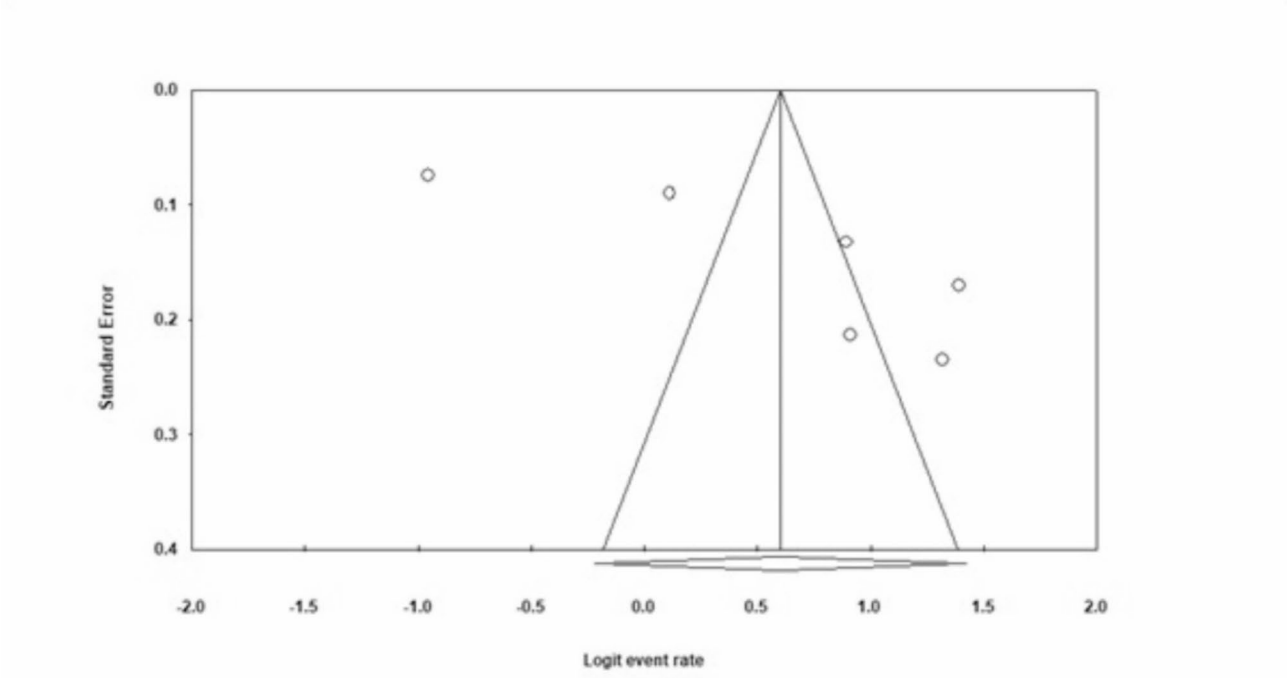

Fig. 5 Funnel plot for the examination of publication bias among selected papers

size of the studies, publication bias was assessed using Egger's test at a significance level of 0.05, and results indicated that publication bias was statistically significant (p: 0.03) (Fig. 5).

Discussion

The present study is the first systematic review and meta-analysis on the global prevalence of female sexual dysfunction in relation to physical activity. To our knowledge, there is currently no existing systematic review study with this specific focus. This study was conducted using the meta-analysis techniques and included 7 selected original studies, all of which were cross-sectional.

In the review of 7 studies with a total sample size of 1,776, the prevalence of sexual dysfunction in women with high physical activity was estimated to be 47% (95% CI: 28.8–65.9) based on meta-analysis (p: 0.087). Moreover, in the review of 6 studies with a sample size of 2,094, the prevalence of sexual dysfunction among sedentary women was found to be 64.6% (95% CI: 44.5–80.6) based on meta-analysis (p: 0.03). This finding indicates a higher prevalence of sexual dysfunction among women with little or no physical activity.

Despite compelling evidence for a link between physical inactivity and various health outcomes, studies have shown that physical inactivity is common worldwide, with data from 122 countries showing that 31.1% of adults (15 years or older) are physically inactive [11]. The analysis of a cross-sectional study on 370 middle-aged Brazilian women showed that women with an inactive lifestyle were 78.9% sexually dysfunctional, while women with an active or very active lifestyle had lower rates of sexual dysfunction at 57.6% and 66.7%, respectively [17]. These results are in-line with the results of our meta-analysis, where inactivity is identified as one of the factors that increase the prevalence of female sexual dysfunction.

In a sample of 214 American women aged 40 to 55 who were 'relatively active' and 'active' compared to 'inactive' women (as assessed by the Women's Health Assessment Scale), active and relatively active women, showed less uncomfortable sexual activity, including fewer symptoms of vaginal dryness and decreased sexual desire [22]. Furthermore, in another study, risk of sexual dysfunction (FSFI ≤ 26.55) was recorded as 67%, for 243 women out of the population of 370. This risk was strongly associated with a sedentary lifestyle, with inactive women showing a higher prevalence of sexual dysfunction compared to their active counterparts (78.9% vs. 57.6%). Therefore, similar to the results of the present study, there is an inverse relationship between both variables, where higher levels of physical activity are associated with lower prevalence of sexual dysfunction [17].

Exercise is related to various hormones such as cortisol [23], estrogen [24], prolactin [25], oxytocin [26] and testosterone [27, 28], all of which influence sexual arousal. The effects of exercise on testosterone depend on the type of exercise; for instance, resistance exercise does not increase testosterone [29, 30], while testosterone increases after aerobic exercise in premenopausal women

[31]. A study showed that the level of oxytocin does not increase after certain types of exercise such as short-term and high-intensity exercise or steady running on a treadmill [25].

Randomized clinical trials on middle-aged women have also shown that aerobic exercise can lead to significant improvements in a number of menopausal symptoms such as mood and insomnia, physical and mental health, and quality of life, which may contribute to enhanced sexual performance [32].

Lee et al. evaluated 214 perimenopausal women and observed that relatively active or very active women reported lower rates of sexual dysfunction, particularly with symptoms such as vaginal dryness, and decreased libido, compared to sedentary women [22]. Dabruska et al. also studied 336 Polish women aged 45–55 years with the FSFI and IPAQ tools, and found a correlation between high levels of general physical activity and better sexual performance (32); these findings align with the results of our study.

One of the limitations of this meta-analysis is that it only included studies published in English, potentially overlooking relevant research in other languages. In addition, several studies were excluded due to low quality and insufficient reporting of prevalence data. Additionally, social factors such as presence of a life partner, sexual distress, and certain medical conditions such as pelvic floor muscles (PFM) disorders can affect sexual performance, and these factors may have not been adequately considered in the included studies.

Perspectives and implication

There is a strong connection between physical activity and major non-communicable diseases. Women's sexual health is a vital and important part of life at any age, yet it is influenced by many factors. In this study, electronic repositories including PubMed, Google Scholar, Scopus, Web of Science, Embase, and ScienceDirect were systematically searched using specified keywords, without a lower time limit, up until July 2022. In the review of 7 studies with a total sample size of 1,776 people, the pooled prevalence of sexual dysfunction in women with physical activity was estimated to be 47%.

Conclusion

According to the results of the present study, inactive women experience more sexual dysfunction compared to women who are physically active. Sexual dysfunction is associated with interpersonal relationships and can negatively affect quality of life. Moreover, since physical activity is recognized as one of the 9 global goals for the improvement, prevention and treatment of diseases, as well as enhancing the state of global female sexual dysfunction, health policy makers can use the evidence presented in the present meta-analysis to increase women's awareness about the importance of physical activity and its positive effect on sexual performance. It is suggested that future research focus on interventional studies in this area to examine the impact of higher physical activity on reducing sexual disorders in women.

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Author contributions
NS and RH and MM contributed to the design, MM statistical analysis, participated in most of the study steps. MM and AH prepared the manuscript. RH and MM assisted in designing the study, and helped in the, interpretation of the study. All authors have read and approved the content of the manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
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Competing interests
The authors declare no competing interests.

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