



REVIEW

Obesity and female sexual dysfunctions: A systematic review of prevalence with meta-analysis



A. Ferrández Infante^{a,*}, B. Novella Arribas^b, K.S. Khan^{c,d}, J. Zamora^{e,c},
A.R. Jurado López^f, M. Frago Pasero^g, C. Suárez Fernández^h

^a Coordinator of the Primary Care Physicians Spanish Society (SEMERGEN) Sexology Working Group, Guadarrama Continuity Care Center, 28440 Madrid, Spain

^b Grupo de Investigación 49, Instituto de Investigación del Hospital Universitario de La Princesa, Foundation for Biomedical Research and Innovation in Primary Care of the Community of Madrid (FIIBAP), 28006 Madrid, Spain

^c Consortium for Biomedical Research in Epidemiology and Public Health (CIBERESP), 28029 Madrid, Spain

^d Department of Preventive Medicine and Public Health, University of Granada, 18016 Granada, Spain

^e Head of the Clinical Biostatistics Unit, Hospital Ramón y Cajal, IRYCIS, 28034 Madrid, Spain

^f Member of the Primary Care Physicians Spanish Society (SEMERGEN) Sexology Working Group, President of the European Institute of Sexology, 29602 Marbella, Spain

^g Biostatistician, Grupo de Investigación 49, Instituto de Investigación del Hospital Universitario de La Princesa, Foundation for Biomedical Research and Innovation in Primary Care of the Community of Madrid (FIIBAP), 28006 Madrid, Spain

^h Head of the Internal Medicine Service of the Hospital Universitario de La Princesa, 28006 Madrid, Spain

Received 5 March 2023; accepted 24 May 2023

Available online 16 June 2023

KEYWORDS

Female sexual dysfunctions;
FSFI;
Female sexual function index;
Obesity;
Prevalence;
Morbid obesity;
Class III obesity

Abstract Obesity represents a major global health challenge. Female sexual dysfunctions have a negative impact on quality of life and overall health balance. A higher rate of female sexual dysfunctions in obese women has been suggested. This systematic review summarized the literature on female sexual dysfunction prevalence in obese women. The review was registered (Open Science Framework OSF.IO/7CG95) and a literature search without language restrictions was conducted in PubMed, Embase and Web of Science, from January 1990 to December 2021. Cross-sectional and intervention studies were included, the latter if they provided female sexual dysfunction rate data in obese women prior to the intervention. For inclusion, studies should have used the female sexual function index or its simplified version. Study quality was assessed to evaluate if female sexual function index was properly applied using six items. Rates of female sexual dysfunctions examining for differences between obese vs class III obese and high vs low quality subgroups were summarized. Random effects meta-analysis was performed, calculating 95% confidence intervals (CI) and examining heterogeneity with I^2 statistic. Publication bias was evaluated with funnel plot. There were 15 relevant studies (1720 women participants in total with 153 obese and 1567 class III obese women). Of these, 8 (53.3%) studies complied

* Corresponding author.

E-mail address: aferrandezinfante@gmail.com (A. Ferrández Infante).

with >4 quality items. Overall prevalence of female sexual dysfunctions was 62% (95% CI 55–68%; I^2 85.5%). Among obese women the prevalence was 69% (95% CI 55–80%; I^2 73.8%) vs 59% (95% CI 52–66%; I^2 87.5%) among those class III obese (subgroup difference $p=0.15$). Among high quality studies the prevalence was 54% (95% CI 50–60%; I^2 46.8%) vs 72% (95% CI 61–81%; I^2 88.0%) among low quality studies (subgroup difference $p=0.002$). There was no funnel asymmetry. We interpreted that the rate of sexual dysfunctions is high in obese and class III obese women. Obesity should be regarded as a risk factor for female sexual dysfunctions.

© 2023 Sociedad Española de Médicos de Atención Primaria (SEMERGEN). Published by Elsevier España, S.L.U. All rights reserved.

PALABRAS CLAVE

Disfunciones sexuales femeninas;
FSFI;
Índice de función sexual femenina;
Obesidad;
Prevalencia;
Obesidad mórbida;
Obesidad clase III

Obesidad y disfunciones sexuales femeninas: revisión sistemática y metaanálisis de la prevalencia

Resumen La obesidad representa un importante desafío para la salud mundial. Las disfunciones sexuales femeninas tienen un impacto negativo en la calidad de vida y en el estado general de la salud. Se ha sugerido una mayor tasa de disfunciones sexuales femeninas en mujeres obesas. Esta revisión sistemática resumió la literatura sobre la prevalencia de las disfunciones sexuales femeninas en las mujeres obesas. Se registró la revisión (Open Science Framework OSF.IO/7CG95) y se realizó una búsqueda bibliográfica sin restricciones de idioma en PubMed, Embase y Web of Science, desde enero de 1990 hasta diciembre de 2021. Se incluyeron estudios transversales y de intervención, estos últimos solo si proporcionaron datos de tasa de disfunción sexual femenina en mujeres obesas antes de la intervención. Para la inclusión, los estudios debieron haber utilizado el índice de función sexual femenina o su versión simplificada. Se evaluó la calidad del estudio para determinar si el índice de función sexual femenina se aplicó correctamente utilizando seis ítems. Se resumieron las tasas de disfunciones sexuales femeninas examinando las diferencias entre obesas frente a obesas clase III y subgrupos de alta frente a baja calidad. Se realizó un metaanálisis de efectos aleatorios, se calcularon los intervalos de confianza (IC) del 95% y se examinó la heterogeneidad con la estadística I^2 . El sesgo de publicación se evaluó con un gráfico en embudo (*funnel plot*). Hubo 15 estudios relevantes (1.720 mujeres participantes en total, con 153 obesas, y 1.567 mujeres con obesidad clase III). De estos, 8 (53,3%) estudios cumplieron con > 4 ítems de calidad. La prevalencia general de disfunciones sexuales femeninas fue del 62% (IC 95%: 55–68%; I^2 : 85,5%). En las mujeres obesas, la prevalencia fue del 69% (IC 95%: 55–80%; I^2 : 73,8%) frente al 59% (IC 95%: 52–66%; I^2 : 87,5%) en las obesas clase III (diferencia de subgrupos $p=0,15$). En los estudios de alta calidad, la prevalencia fue del 54% (IC 95%: 50–60%; I^2 : 46,8%) frente al 72% (IC 95%: 61–81%; I^2 : 88,0%) en los estudios de baja calidad (diferencia de subgrupos $p=0,002$). No hubo asimetría de embudo. Se interpretó que la tasa de disfunciones sexuales es alta en mujeres obesas y obesas clase III. La obesidad debe ser considerada como un factor de riesgo para las disfunciones sexuales femeninas.

© 2023 Sociedad Española de Médicos de Atención Primaria (SEMERGEN). Publicado por Elsevier España, S.L.U. Todos los derechos reservados.

Introduction

Sexual dysfunctions, a heterogeneous group of disorders that alter a person's ability to respond sexually or experience sexual pleasure, have a negative impact on self-esteem, often in couple relationships, as well as on the quality of life and overall health balance.^{1,2} The worldwide prevalence of female sexual dysfunctions (FSD) is estimated to be high.³ Obesity represents a major health challenge with a growing global prevalence.^{4,5}

Key general health including cardiovascular and metabolic disease such as arterial hypertension^{6,7} and

diabetes mellitus^{8,9} have been shown to be risk factors for FSD through systematic reviews and meta-analyses. There are several non-systematic reviews that suggest a higher FSD rate in obese women^{10–18} and some systematic reviews that show the recovery of female sexual functionality in class III obese women who undergo bariatric surgery.^{19–23} Unlike what happens with male sexual dysfunctions, the extent to which obesity and FSD are linked is not formally systematically reviewed. Given the gap identified above, we undertook a comprehensive and systematic review of studies that deployed formal instruments to evaluate the rate of FSD associated with obesity.

Methods

The systematic review was registered (<https://osf.io/7cg95>) and reported following the PRISMA checklist.²⁴

Search strategy and study selection

Through the Community of Madrid Department of Health Virtual Library (Biblioteca Virtual de la Consejería de Sanidad de la Comunidad de Madrid), a systematic search for research^{25,26} was carried out with no language limitation in three electronic bibliographic databases from January 1990 to December 2021 including Pubmed, Embase, and Web of Science (WOS). The search term combination included keywords, free-text words and word variants based on the following concept: ((female sexual function index OR female sexual dysfunction) AND women) AND (overweight OR obesity). We limited our search to women of any age, excluding any studies that included only male participants. Supplementary electronic searches were conducted looking for other female sexual dysfunctions not captured by the above using the terms corresponding to vaginismus, low sexual desire, low libido, decreased libido, anorgasmia, arousal disorder, genital arousal, dyspareunia, sexual pain, sexual pain disorder, vaginal pain. Reference lists of the meta-analyses and systematic reviews found^{27,28,23,29,30} were examined for potentially relevant citations. All citations found were exported to Zotero, where duplicates were removed.

Two independent reviewers, a medical methodologist and a medical expert in sexology, reviewed the titles and abstracts of all the citations found. We excluded studies conducted in women with diabetes, metabolic syndrome, endometriosis, or urinary incontinence, as these are known to increase the risk of FSD.^{7,31–35} Studies in obese women with polycystic ovarian syndrome (PCOS) were also excluded, as there is some evidence of a relationship with risk of FSD.^{36–41} Studies that did not report the presence of FSD, or did not specify BMI, or did not include obese women, or did not distinguish between obese and non-obese women, were discarded. We only included studies reporting the rate of FSD, or at least one female sexual dysfunction in obese women, whether they were prevalence studies or obesity intervention studies reporting pre-intervention prevalence. After each reviewer independently applied these criteria, a third reviewer, a methodologist, arbitrated on the decision to accept or reject the studies in which there was disagreement. The reviewers who assessed the relevance of the studies for the present investigation knew the names of the authors, but not the institutions, nor the journal of publication, nor the results, when they applied the eligibility criteria.

Data extraction and study quality assessment

Data were extracted and the quality of the selected studies assessed. The information extraction was recorded in Microsoft Excel, including the following parameters: Author, year, type of obesity, population, type of study, country, age range, number of women, FSD Definition, FSD prevalence

(%), and female sexual function Index (FSFI) total score. The quality of the selected studies was based on the recommendations to facilitate the comparability of future studies that use the FSFI.⁴² There were 6 quality items. They covered the examination of all exclusion criteria for data sampling and analysis, especially whether or not sexually active women were excluded from the analysis, presentation of the means or medians and standard deviations or percentiles of all subscales and of the total score of the FSFI, and the use of the cutoff point of Wiegel et al.⁴³ for the detection of FSD (≤ 26.55 points). We regarded compliance with $>4/6$ items ($>67\%$) to reflect good quality.

Data synthesis

From the numerical data reported, we tabulated reported FSD rate of all the studies and FSFI total score where reported. We also tabulated study quality, age groups, menopausal status, and level of obesity, as factors related to FSDs. To investigate heterogeneity statistically, we examined for differences between obese vs class III obese and high vs low quality subgroups, calculated I^2 statistic, and performed subgroup and meta-regression analysis. Overall meta-analysis using random effects model.⁴⁴ We evaluated publication bias and small study effects using funnel plot of logit of prevalence vs its standard error. We used Stata software for statistical analysis.

Results

Fig. 1 describes the process of the search, identification and selection of studies. A total of 195 studies were obtained. After reading the titles and abstracts, a total of 62 studies were examined in full text by pairs, and 15 studies were finally selected^{45–59} There was 100% agreement between reviewers regarding selection. There were 5 cross-sectional studies (one providing two rates),⁴⁷ 7 prospective cohort studies (one providing two rates),⁵⁸ 1 retrospective cohort study, and 2 clinical intervention trials (one providing two rates),⁴⁶ which together included a total of 1720 women. The sample size ranged from 12 to 623 women, with a mean (standard deviation) of 95.5 (154.3) women and a median of 48.5. All the studies had as reference population people who attended specialized clinical units, of which 5 were medical units and 10 were surgical. The age groups of 11 of the 15 included adult women of any age with a lower age limit of 18 years, and an upper limit of indefinite or up to 64 years. Two studies focused on premenopausal women, setting an upper age limit of up to 50 years,^{46,47} one study focused on fertile age⁵⁶ and another study focused on postmenopause,⁵¹ setting limits of 45–65 years. The investigations covered a wide geographical distribution: Europe ($n=7$), North America ($n=3$), Asia ($n=3$) and South America ($n=2$). The results of the studies are presented in Table 1.

The quality of the included studies is summarized in Table 2. Of the total, 8 (53.3%) studies complied with >4 quality items. Only 5 studies^{49,50,52,53,56} did not report the condition of sexual activity as an inclusion criterion. The majority, 12 studies,^{45,52,54,55,57–59} reported the mean or median of the total score of the FSFI, and of these, all except two,^{49,57} also reported its standard deviation or

Table 1 Characteristics of the selected studies in the systematic review on prevalence of female sexual dysfunctions in obesity.

Author, year	Type of obesity	Population	Type of study	Country	Age range	No of women	FSD definition	FSD %	FSD total score
Aversa, 2013 (sample 1)	Obesity	Endocrinology and Internal Medicine Clinic	Clinical trial – Intervention	Italy	18–49	21	FSFI-6 \leq 19	55	14 \pm 1.8
Aversa, 2013 (sample 2)	Obesity	Endocrinology and Internal Medicine Clinic	Clinical trial – Intervention	Italy	18–49	23	FSFI-6 \leq 19	55	15 \pm 1.3
Dombek, 2016	Obesity	Endocrinology and Gynecology Clinic	Cross-sectional study	Brazil	45–65	45	FSFI \leq 26.55	66.7	Not provided
Castro, 2018	Obesity	Obesity Unit	Clinical trial – Intervention	Spain	Not provided	12	FSFI \leq 26.55	100	9.55
Lechmiannandan, 2019	Obesity	Bariatric Surgery Unit	Prospective cohorts	Malaysia	Not provided	52	FSFI \leq 26.55	75	18.73 \pm 9.7
Bond, 2011	Class III	Bariatric Surgery Unit	Retrospective cohorts	USA	25–61	54	FSFI \leq 26.55	63	24.0 \pm 6.3
Hur, 2013	Class III	Bariatric Surgery Unit	Prospective cohorts	South Korea	Not provided	67	FSFI < 26.55	86.4	Not provided
Sarwer, 2013 (sample 1)	Class III	Obesity, Neuropsychiatric and Medical Units	Prospective cohorts	USA	25–60	87	FSFI < 26	51.4	26 (21.9, 30.0)
Sarwer, 2013 (sample 2)	Class III	Obesity, Neuropsychiatric and Medical Units	Prospective cohorts	USA	20–64	76	FSFI < 26	40.9	28.1 (23.9, 31.6)

Table 1 (Continued)

Author, year	Type of obesity	Population	Type of study	Country	Age range	No of women	FSD definition	FSD %	FSD total score
Janik, 2014	Class III	Surgery Unit	Cross-sectional study	Poland	Not provided	20	FSFI < 26.55	50	26.9 (24.3, 30.7)
Goitein, 2015	Class III	Surgery Unit	Prospective cohorts	Israel	Not provided	34	FSFI < 24.66	59	24 ± 9.6
Bond (migraine), 2016	Class III	Bariatric Surgery Unit, Neurology	Cross-sectional study	USA	≤50	37	FSFI < 26.55	56.8	24.5 ± 7.2
Bond (control), 2016	Class III	Bariatric Surgery Unit, Neurology	Cross-sectional study	USA	≤50	37	FSFI < 26.55	54.1	25.5 ± 4.6
Oliveira, 2019	Class III	Bariatric Surgery Unit	Prospective cohorts	Brazil	Not provided	62	FSFI ≤ 26.55	62	22.8
Pichlerova, 2019	Class III	Bariatric Surgery Unit	Prospective cohorts	Czech Rep.	21–63	60	FSFI ≤ 26.55	51.6	20.1 ± 11.7
Wałędziak, 2020	Class III	Bariatric Surgery Unit	Cross-sectional study	Poland	>18	623	FSFI ≤ 26.55	57.5	22.3 ± 9.5
Di Goia, 2021	Class III	Bariatric Surgery Unit	Prospective cohorts	Italy	>18	389	FSFI	73.8	19.6 ± 8.8
Martinez-Rosales, 2021	Class III	Gynecology Unit	Cross-sectional study	Spain	Fertile age	21	FSFI-6 ≤ 19	52.4	Not provided

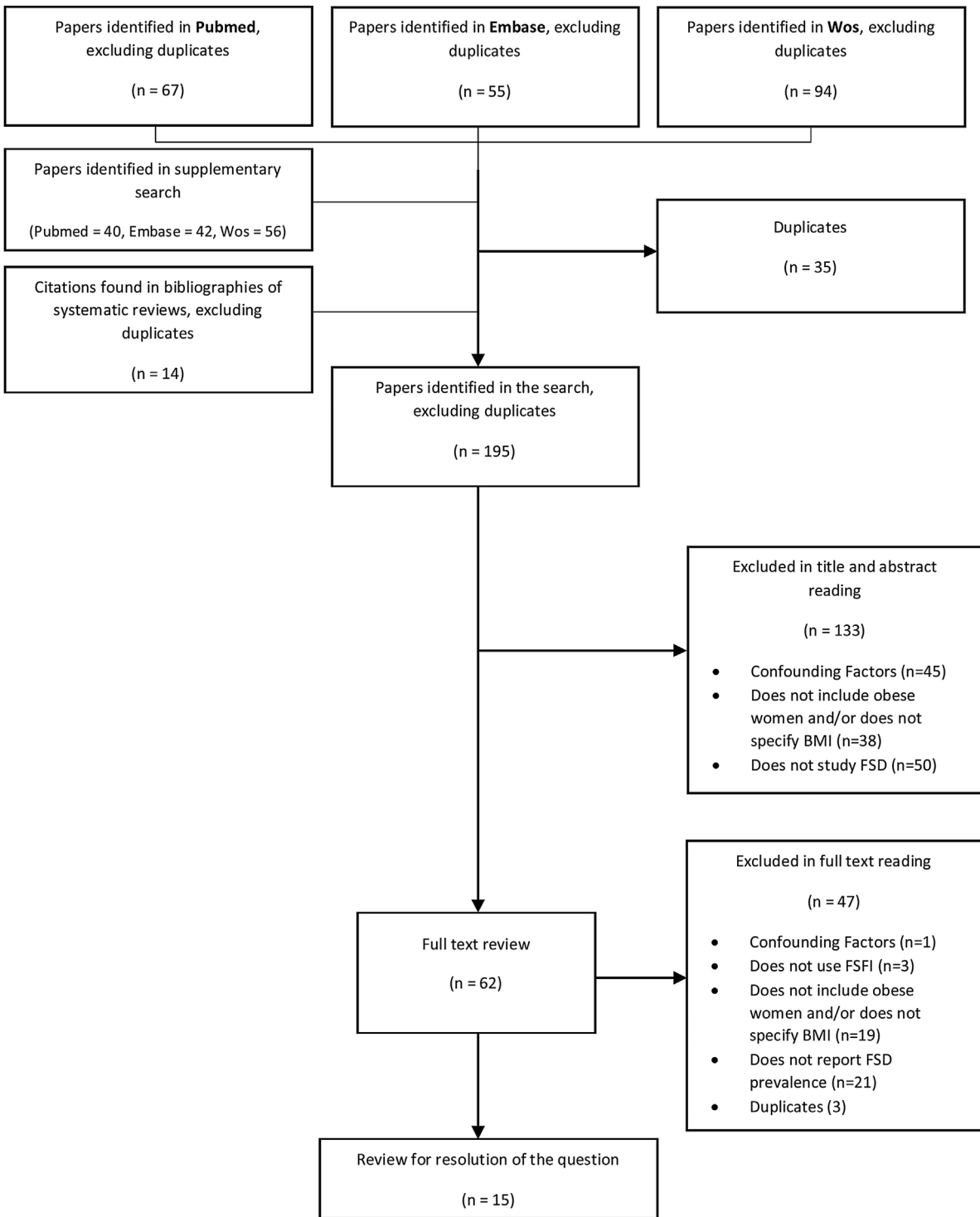


Figure 1 Flowchart of study selection in the systematic review on prevalence of female sexual dysfunctions in obesity.

percentiles. Regarding the subscales or items of the FSFI, 10 studies^{45-48,52,54,55,57-59} reported the mean or median of the total score of each subscale, and all but one⁵⁷ also reported the standard deviation or percentiles of each item. Full version of FSFI was used in 13 and its simplified version (FSFI-6) in 2.^{46,56} Twelve of them^{45-49,51,53-57,59} used the pre-established and statistically validated cut-off point to detect the presence of FSD⁴³: 26.55 points for the FSFI

and 19 for the FSFI-6. Only Sarwer et al.⁵⁸ and that of Goitein et al.⁵² used a different scale: 26 and 24.66 points respectively. Di Goia et al.⁵⁰ did not report the cut-off point used. The average total score obtained in the FSFI or FSFI-6 (Table 1), was included in 12 of the 15 selected papers, with a range of values between 9.55 and 28.1 points for the FSFI, and it was lower than the cut-off point established for the detection of FSD in 10 of these 12 studies, with the

Table 2 Summary of the quality of the studies included in the systematic review on prevalence of female sexual dysfunctions in obesity.

Author, year	Sex activ	Score tot MMd	Score tot SDP	Items MMd	Items SDP	Wiegel
Aversa, 2013	+	+	+	+	+	+
Dombek, 2016	+	—	—	—	—	+
Castro, 2018	—	+	—	—	—	+
Lechmiannandan, 2019	+	+	+	+	+	+
Bond, 2011	+	+	+	+	+	+
Hur, 2013	—	—	—	—	—	+
Sarwer, 2013	+	+	+	+	+	—
Janik, 2014	+	+	+	+	+	+
Goitein, 2015	—	+	+	+	+	—
Bond, 2016	+	+	+	+	+	+
Oliveira, 2019	+	+	—	+	—	+
Pichlerova, 2019	+	+	+	+	+	+
Wałędziak, 2020	+	+	+	+	+	+
Di Goia, 2021	—	+	+	—	—	—
Martinez-Rosales, 2021	—	—	—	—	—	+

Sex Activ: presents as inclusion criteria the condition of sexually active woman, Score tot MMd: presents the result of the mean or median of the total score of the FSFI, Score tot SDP: presents the result of the standard deviation of the mean or percentiles of the median of the FSFI, Items MMd: presents the result of the total score of the mean or median of the subscales (items) of the FSFI, Items SDP: presents standard deviation or percentile results of the subscales (items) of the FSFI, Wiegel: uses a cut-off point of 26.55 points to detect DSF.

exception of the studies by Sarwer et al.⁵⁸ (26 and 28.1 respectively in each sample) and Janik et al.⁵⁴ (26.9), the same ones whose prevalence of FSD was not higher than 50%.

The FSD prevalence ranged from 51.4% to 100% across all studies. Some studies provided rates for more than sample and in total there were 18 samples for statistical synthesis. In one of the samples of the study by Sarwer et al.⁵⁸ rate was 40.9% and the studies by Janik et al.⁵⁴ (50%), both in women with class III obesity and with a lower number of participants compared to the rest of the studies reviewed. The four studies carried out in women with any kind of obesity (not only class III) had values above 50% in a range of 55–100% of prevalence of FSD. Among obese women the median rate of female sexual dysfunctions was 66.7% (range 55–100%, $n=5$), and among class III obese women it was 56.8% (range 40.9–86.4%, $n=13$).

As shown in Fig. 2, there was no significant difference between the obese and class III obese subgroups ($p=0.15$). Overall prevalence of female sexual dysfunctions was 62% (95% CI 55–68%; I^2 85.5%). Among obese women the prevalence was 69% (95% CI 55–80%; I^2 73.8%) vs 59% (95% CI 52–66%; I^2 87.5%) among those class III obese (subgroup difference $p=0.15$). Among high quality studies the prevalence was 54% (95% CI 50–60%; I^2 46.8%) vs 72% (95% CI 61–81%; I^2 88.0%) among low quality studies (subgroup difference $p=0.002$). Meta-regression confirmed FSFI was highly correlated with prevalence ($p=0.001$). It also showed that age and obesity levels ($p=0.79$ and 0.16 respectively) were not associated with prevalence but study quality was ($p=0.001$). There was no funnel asymmetry (Fig. 3).

Discussion

Our systematic review, where over half of the studies had good quality, found that over two-thirds of obese women

suffered FSD while over half of those with class III obesity suffered FSD. FSD prevalence exceeded 50% in all but two small studies among class III obese women. We found heterogeneity that could not be explained by difference in level of age and obesity, but it was related to study quality. The observed prevalence rates in obese women were above the estimated worldwide FSD prevalence for any age group.³

We did not find any systematic review that studies the prevalence of FSD in obese women, and in the very limited number of studies that study FSD prevalence in general population, very few record the body mass index (BMI). The prevalence of FSD in the samples analyzed was higher than that established by the ICSM worldwide and regardless of age (40–50%).³ Based on the results of our review, we recommend carrying out new studies on the prevalence of FSD in which BMI is recorded in order to determine and compare the rate of obese and not obese women with FSD in the community setting. Also, based on these advantages and disadvantages of the FSFI and in order to improve the accuracy and quality of future studies on the epidemiology of DSF, we propose the use of the FSM-2 questionnaire, a questionnaire validated in Spanish⁶⁰ which presents several advantages compared to the FSFI, because in addition to exploring all the phases of the female sexual response (desire, arousal, orgasm, satisfaction), it is more adapted to the diagnostic criteria of the DSM-V, it allows to know key aspects of sexual activity (sexual performance anxiety, initiative, confidence to communicate preferences, etc.) and contains fewer items.

We can conclude that obesity may be regarded a risk factor for FSD, as there is a very high prevalence of FSD in obese and class III obese women.

We conducted the review with a broad, comprehensive search. Even though the number of selected papers was small and the ranges of prevalence rates wide, the

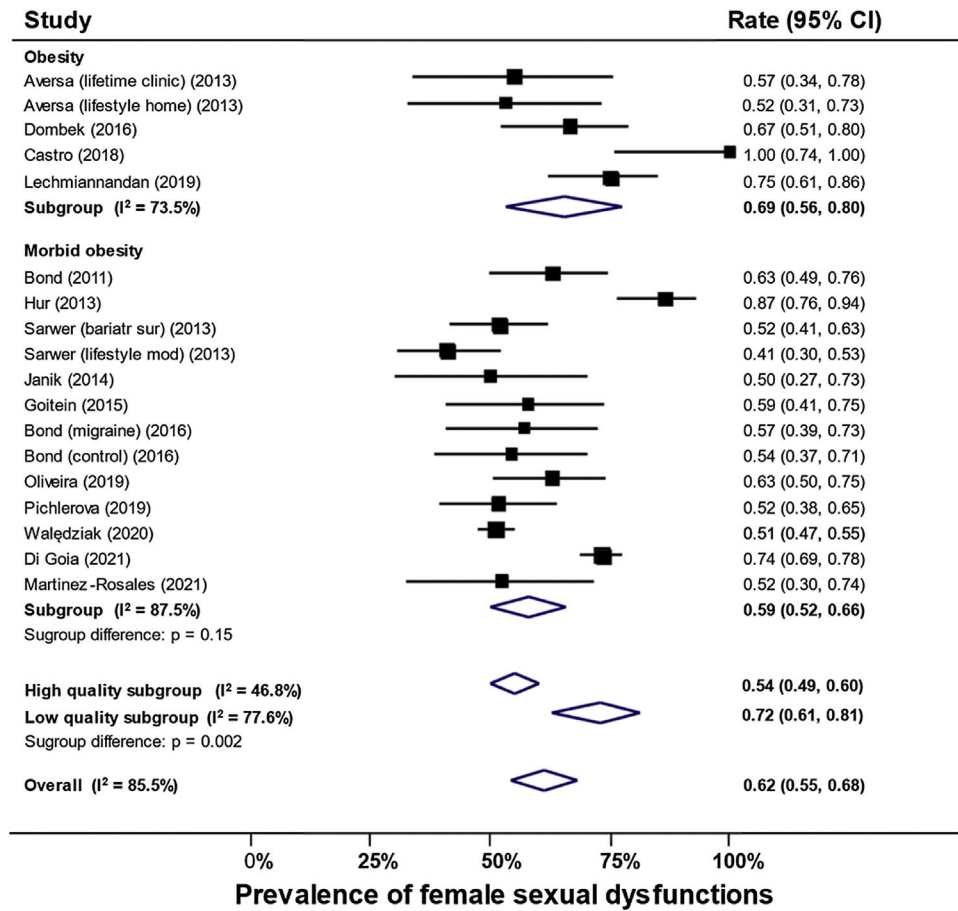


Figure 2 Overall and subgroup meta-analysis of prevalence of female sexual dysfunctions in obesity.

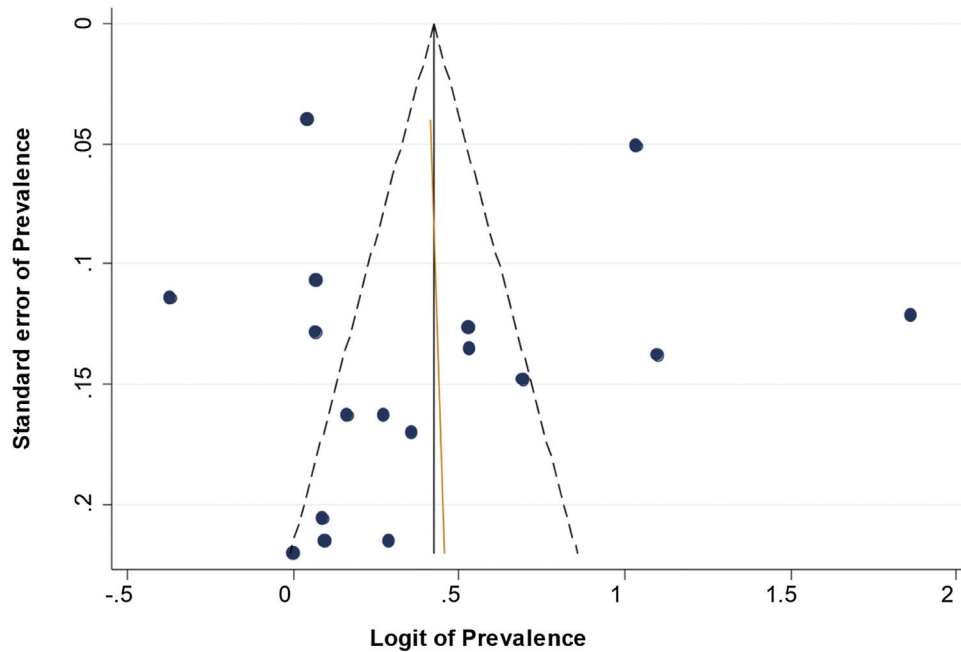


Figure 3 Funnel plot analysis.

meta-analysis produced precise confidence intervals. Since the data presented for analysis were prevalences -in cross-sectional studies- or the prevalences before the study, we preferred to use FSFI⁴² over other quality tools such as the JBI checklist because the former is specifically developed for comparison between studies and assessment of the quality of the information provided by the FSFI, and thus it was not relevant to assess the overall quality of the studies. One of the main limitations of this systematic review is the high level of heterogeneity, which remained unexplained despite subgroup comparison. It is likely that this type of heterogeneity is unavoidable in prevalence reviews. Another criticism may be that there is a type of selection bias in that the samples were derived from clinical care units where women attended due to their obesity. However, this is a limitation of the published literature, not of our systematic review methodology. Our selection criteria were guided by scientific reasoning²⁶ to exclude literature potentially biased by co-morbidities related to obesity. Fig. 1 illustrates transparently the amount of research excluded with the reasons for exclusion stated. The selection criterion requiring the use the FSFI, either full version or simplified, to detect the presence of FSD added quality to our review with respect to measurement. Despite limitations,⁴² FSFI is a widely used validated tool to detect FSD and it evaluates the relevant domains including desire, arousal, lubrication, orgasm, satisfaction and pain related to vaginal penetration.⁴³ The FSFI-6 questionnaire, the simplified and validated version of the FSFI,⁶¹ has similar characteristics. Given the established measurement properties of FSFI, we can conclude that obesity is a risk factor for FSD confidently based on the high prevalence observed in our review.

Conflicts of interest

There are no conflicts of interest.

Acknowledgments

KSK is Distinguished Investigator at University of Granada funded by the Beatriz Galindo (senior modality) Program of the Spanish Ministry of Education.

References

1. Nappi RE, Cucinella L, Martella S, Rossi M, Tiranini L, Martini E. Female sexual dysfunction (FSD): prevalence and impact on quality of life (QoL). *Maturitas*. 2016;94:87–91.
2. Barata BC. Affective disorders and sexual function: from neuroscience to clinic. *Curr Opin Psychiatry*. 2017;30:396–401.
3. McCabe MP, Sharlip ID, Atalla E, Balon R, Fisher AD, Laumann E, et al. Definitions of sexual dysfunctions in women and men: a consensus statement from the fourth international consultation on sexual medicine 2015. *J Sex Med*. 2016;13:135–43.
4. Chooi YC, Ding C, Magkos F. The epidemiology of obesity. *Metabolism*. 2019;92:6–10.
5. Blüher M. Obesity: global epidemiology and pathogenesis. *Nat Rev Endocrinol*. 2019;15:288–98.
6. Santana LM, Perin L, Lunelli R, Inácio JFS, Rodrigues CG, Eibel B, et al. Sexual dysfunction in women with hypertension: a

- systematic review and meta-analysis. *Curr Hypertens Rep*. 2019;21:25.
7. Choy CL, Sidi H, Koon CS, Ming OS, Mohamed IN, Guan NC, et al. Systematic review and meta-analysis for sexual dysfunction in women with hypertension. *J Sex Med*. 2019;16:1029–48.
8. Pontiroli AE, Cortelazzi D, Morabito A. Female sexual dysfunction and diabetes: a systematic review and meta-analysis. *J Sex Med*. 2013;10:1044–51.
9. Rahmanian E, Salari N, Mohammadi M, Jalali R. Evaluation of sexual dysfunction and female sexual dysfunction indicators in women with type 2 diabetes: a systematic review and meta-analysis. *Diabetol Metab Syndr*. 2019;11:73.
10. Larsen SH, Wagner G, Heitmann BL. Sexual function and obesity. *Int J Obes (Lond)*. 2007;31:1189–98.
11. Esposito K, Giugliano F, Ciotola M, De Sio M, D’Armiento M, Giugliano D. Obesity and sexual dysfunction, male and female. *Int J Impot Res*. 2008;20:358–65.
12. Shah MB. Obesity and sexuality in women. *Obstet Gynecol Clin North Am*. 2009;36:347–60, ix.
13. Borges R, Temido P, Sousa L, Azinhais P, Conceição P, Pereira B, et al. Metabolic syndrome and sexual (dys)function. *J Sex Med*. 2009;6:2958–75.
14. Kaneshiro B. Contraceptive use and sexual behavior in obese women. *Semin Reprod Med*. 2012;30:459–64.
15. Kolotkin RL, Zunker C, Østbye T. Sexual functioning and obesity: a review. *Obesity (Silver Spring)*. 2012;20:2325–33.
16. Rowland DL, McNabney SM, Mann AR. Sexual function obesity, and weight loss in men and women. *Sex Med Rev*. 2017;5:323–38.
17. Towe M, La J, El-Khatib F, Roberts N, Yafi FA, Rubin R. Diet and female sexual health. *Sex Med Rev*. 2020;8:256–64.
18. Ferrández A, Mendoza N, San Martín C, Jurado AR. Diabetes mellitus y disfunciones sexuales femeninas. *Rev Desexol*. 2019;8:94–103. ISSN: 2174-4068.
19. Janik MR, Bielecka I, Paśnik K, Kwiatkowski A, Podgórska L. Female sexual function before and after bariatric surgery: a cross-sectional study and review of literature. *Obes Surg*. 2015;25:1511–7.
20. Escobar-Morreale HF, Santacruz E, Luque-Ramírez M, Botella Carretero JI. Prevalence of ‘obesity-associated gonadal dysfunction’ in severely obese men and women and its resolution after bariatric surgery: a systematic review and meta-analysis. *Hum Reprod Update*. 2017;23:390–408.
21. Lian W, Zheng Y, Huang H, Chen L, Cao B. Effects of bariatric surgery on pelvic floor disorders in obese women: a meta-analysis. *Arch Gynecol Obstet*. 2017;296:181–9.
22. Montenegro M, Slongo H, Juliato CRT, Minassian VA, Tavakkoli A, Brito LGO. The impact of bariatric surgery on pelvic floor dysfunction: a systematic review. *J Minim Invasive Gynecol*. 2019;26:816–25.
23. Gao Z, Liang Y, Deng W, Qiu P, Li M, Zhou Z. Impact of bariatric surgery on female sexual function in obese patients: a meta-analysis. *Obes Surg*. 2020;30:352–64.
24. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71.
25. Khan KS, Bueno Cavanillas A, Zamora J. Systematic reviews in five steps: I. Framing questions to obtain valid answers. *Semerger*. 2022;48:356–61.
26. Khan KS, Bueno-Cavanillas A, Zamora J. Systematic reviews in five steps: II. Identifying relevant literature. *Semerger*. 2022;48:431–6.
27. Wen JP, Wen LY, Zhao YJ, Li Q, Lin W, Huang HB, et al. Effect of bariatric surgery on sexual function and sex hormone levels in obese patients: a meta-analysis. *J Endocr Soc*. 2018;2:117–32.

28. Lian W, Zheng Y, Huang H, Chen L, Cao B. Effects of bariatric surgery on pelvic floor disorders in obese women: a meta-analysis. *Arch Gynecol Obstet.* 2017;296:181–9.
29. Ramalingam K, Vincent L, Monga AK. Obesity, bariatric surgery & sexual function: a systematic review. *Int Urogynecol J Pelvic Floor Dysfunct.* 2014;25:S126–7.
30. Montenegro M, Slongo H, Juliato CRT, Minassian VA, Tavakkoli A, Brito LGO. The impact of bariatric surgery on pelvic floor dysfunction: a systematic review. *J Minim Invasive Gynecol.* 2019;26:816–25.
31. Pérez-López FR, Ornat L, Pérez-Roncero GR, López-Baena MT, Sánchez-Prieto M, Chedraui P. The effect of endometriosis on sexual function as assessed with the Female Sexual Function Index: systematic review and meta-analysis. *Gynecol Endocrinol.* 2020;36:1015–23.
32. Pinheiro Sobreira Bezerra LR, Britto DF, Ribeiro Frota IP, Lira do Nascimento S, Morais Brilhante AV, Lucena SV, et al. The impact of urinary incontinence on sexual function: a systematic review. *Sex Med Rev.* 2020;8:393–402.
33. Shaw C. A systematic review of the literature on the prevalence of sexual impairment in women with urinary incontinence and the prevalence of urinary leakage during sexual activity. *Eur Urol.* 2002;42:432–40.
34. Balzarro M, Rubilotta E, Mancini V, Trabacchin N, Oppedi L, Li Marzi V, et al. Impact of overactive bladder-wet syndrome on female sexual function: a systematic review and meta-analysis. *Sex Med Rev.* 2019;7:565–74.
35. Hammad FT. Prevalence, social impact and help-seeking behaviour among women with urinary incontinence in the Gulf countries: a systematic review. *Eur J Obstet Gynecol Reprod Biol.* 2021;266:150–6.
36. Zhao S, Wang J, Xie Q, Luo L, Zhu Z, Liu Y, et al. Is polycystic ovary syndrome associated with risk of female sexual dysfunction? A systematic review and meta-analysis. *Reprod Biomed Online.* 2019;38:979–89.
37. Yin X, Ji Y, Chan CLW, Chan CHY. The mental health of women with polycystic ovary syndrome: a systematic review and meta-analysis. *Arch Womens Ment Health.* 2021;24:11–27.
38. Firmino Murgel AC, Santos Simões R, Maciel GAR, Soares JM Jr, Baracat EC. Sexual dysfunction in women with polycystic ovary syndrome: systematic review and meta-analysis. *J Sex Med.* 2019;16:542–50.
39. Loh HH, Yee A, Loh HS, Kanagasundram S, Francis B, Lim LL. Sexual dysfunction in polycystic ovary syndrome: a systematic review and meta-analysis. *Hormones (Athens).* 2020;19:413–23.
40. Pastoor H, Timman R, de Klerk C, Bramer M, Laan W, Laven ETJS. Sexual function in women with polycystic ovary syndrome: a systematic review and meta-analysis. *Reprod Biomed Online.* 2018;37:750–60.
41. Thannickal A, Brutocao C, Alsawas M, Morrow A, Zaiem F, Murad MH, et al. Eating, sleeping and sexual function disorders in women with polycystic ovary syndrome (PCOS): a systematic review and meta-analysis. *Clin Endocrinol (Oxf).* 2020;92:338–49.
42. Koops TU, Briken P. Prevalence of female sexual function difficulties and sexual pain assessed by the female sexual function index: a systematic review. *J Sex Med.* 2018;15:1591–9.
43. Wiegel M, Meston C, Rosen R. The Female Sexual Function Index (FSFI): cross-validation and development of clinical cutoff scores. *J Sex Marital Ther.* 2005;31:1–20.
44. Barker TH, Migliavaca CB, Stein C, et al. Conducting proportional meta-analysis in different types of systematic reviews: a guide for synthesizers of evidence. *BMC Med Res Methodol.* 2021;21:189.
45. Pichlerova D, Bob P, Zmolikova J, Herlesova J, Ptacek R, Laker MK, et al. Sexual dysfunctions in obese women before and after bariatric surgery. *Med Sci Monit.* 2019;25:3108–14.
46. Aversa A, Bruzziches R, Francomano D, Greco EA, Violi F, Lenzi A, et al. Weight loss by multidisciplinary intervention improves endothelial and sexual function in obese fertile women. *J Sex Med.* 2013;10:1024–33.
47. Bond DS, Pavlović JM, Lipton RB, Graham Thomas J, Digre KB, Roth J, et al. Sexual dysfunction in women with migraine and overweight/obesity: relative frequency and association with migraine severity. *Headache.* 2017;57:417–27.
48. Bond DS, Wing RR, Vithianathan S, Sax HC, Roye GD, Ryder BA, et al. Significant resolution of female sexual dysfunction after bariatric surgery. *Surg Obes Relat Dis.* 2011;7:1–7.
49. Castro AI, Gomez-Arbelaiz D, Crujeiras AB, Granero R, Aguera Z, Jimenez-Murcia S, et al. Effect of a very low-calorie ketogenic diet on food and alcohol cravings, physical and sexual activity sleep disturbances, and quality of life in obese patients. *Nutrients.* 2018;10:10.
50. Di Gioia L, Perrini S, Braun A, Caruso I, Giordano F, Guarini F, et al. Effects of bariatric surgery on quality of life, body image and sex life in obese women. *Diabetologia.* 2021;64 Suppl. 1:279–80.
51. Dombek K, Capistrano EJM, Costa ACC, Marinheiro LPF. Risk factors associated with sexual dysfunction in Brazilian postmenopausal women. *Int J Impot Res.* 2016;28:62–7.
52. Goitein D, Zendel A, Segev L, Feigin A, Zippel D. Bariatric surgery improves sexual function in obese patients. *Isr Med Assoc J.* 2015;17:616–9.
53. Hur K, Kim Y. Female sexual dysfunction in women seeking bariatric surgery. *Obes Surg.* 2013;23:1115.
54. Janik MR, Swist, Bielecka I, Pasnik K. Sexual quality of life and prevalence of female sexual dysfunction among women before and after bariatric surgery. *Obes Surg.* 2014;24:1299–300.
55. Lechmiannandan S, Lo WHL, Panirselvam M, Muninathan P, Hussin N, Rajan R, et al. Female sexual dysfunction (FSD); the highly prevalent yet neglected disease among the obese Malaysian women Is bariatric surgery the solution? A prospective pilot study in Malaysia. *Int J Urol.* 2019;26:77–8.
56. Martínez-Rosales E, Hernández-Martínez A, Carretero-Ruiz A, Martínez-Forte S, Ferrer-Márquez M, Artero EG, et al. 135 association of sexual function with BMI and cardiorespiratory fitness in morbid obese women awaiting bariatric surgery: EMOVAR study. *J Sex Med.* 2021;18:S72.
57. Oliveira CFdA, Dos Santos PO, de Oliveira RA, Leite-Filho H, de Almeida Oliveira AF, Bagano GO, et al. Changes in sexual function and positions in women with severe obesity after bariatric surgery. *Sex Med.* 2019;7:80–5.
58. Sarwer DB, Spitzer JC, Wadden TA, Rosen RC, Mitchell JE, Lancaster K, et al. Sexual functioning and sex hormones in persons with extreme obesity and seeking surgical and nonsurgical weight loss. *Surg Obes Relat Dis.* 2013;9:997–1007.
59. Różańska-Wałędzia A, Bartnik P, Kacperczyk-Bartnik J, et al. The effect of bariatric surgery on female sexual function: a cross-sectional study. *Sci Rep.* 2020;10:12138.
60. Sánchez F, Ferrer C, Ponce B, Sipán Y, Jurado AR, San Martín C, et al. Diseño y validación de la segunda edición del Cuestionario de Función Sexual de la Mujer, FSM-2. *Semergen.* 2020;46:324–30.
61. Isidori AM, Pozza C, Esposito K, Giugliano D, Morano S, Vignozzi L, et al. Development and validation of a 6-item version of the female sexual function index (FSFI) as a diagnostic tool for female sexual dysfunction. *J Sex Med.* 2010;7:1139–46.