Neurological Sciences (2023) 44:59–66
https://doi.org/10.1007/s10072-022-06406-z

REVIEW ARTICLE

The global prevalence of sexual dysfunction in women with multiple sclerosis: a systematic review and meta-analysis

Nader Salari[1,2] · Razie Hasheminezhad[3] · Amir Abdolmaleki[4] · Aliakbar Kiaei[5] · Nazanin Razazian[6] · Shamarina Shohaimi[7] · Masoud Mohammadi[8]

Received: 8 August 2022 / Accepted: 12 September 2022 / Published online: 17 September 2022

Abstract

Background Sexual function is often impaired following neurological disorders such as multiple sclerosis (MS). Young women with MS encourage disruptions in sexual function, sexual behaviors, and family formation as common global problems. Thus, the aim of the present systematic review and meta-analysis study was to investigate the global prevalence of female sexual dysfunction (FSD) worldwide.

Methods Various databases (PubMed, Scopus, Web of Science, Embase, and ScienceDirect) along with Google Scholar search engine were hired for systematic searching in the field of the prevalence of FSD (by July 2022). The heterogeneity of the studies was assessed using I^2 index, and random effects model was used to perform the analysis (CMA software, v.2).

Results Following assessment of 14 included studies with the sample size of 2115 women, a total prevalence of sexual dysfunction (SD) in women with MS was reported 62.5% (95% CI 53.9–70.5). Meta-regression assessment also showed that FSD accelerates following increasing the sample size and the year of the studies.

Conclusion The total prevalence of SD in women with MS was found considerably high (62.5%) in the world, which needs more serious attention by health policymakers. Correct implementation of health policies can potentially increase the society's awareness and successful treatment of SD in MS patients.

Keywords Female sexual dysfunction · FSD · Multiple sclerosis · MS

✉ Masoud Mohammadi
Masoud.mohammadi1989@yahoo.com

Nader Salari
n_s_514@yahoo.com

Razie Hasheminezhad
raziehasheminezhad@gmail.com

Amir Abdolmaleki
enjoyanatomy@gmail.com

Aliakbar Kiaei
kiaei@ce.sharif.edu

Nazanin Razazian
nrazazian@kums.ac.ir

Shamarina Shohaimi
shamarina@upm.edu.my

[1] Department of Biostatistics, School of Health, Kermanshah University of Medical Sciences, Kermanshah, Iran

[2] Sleep Disorders Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

[3] Student Research Committee, Kermanshah University of Medical Sciences, Kermanshah, Iran

[4] Department of Anatomical Sciences, Medical School, Baqiyatallah University of Medical Sciences, Tehran, Iran

[5] Department of Computer Engineering, Sharif University of Technology, Tehran, Iran

[6] Department of Neurology, School of Medicine, Kermanshah University of Medical Sciences, Kermanshah, Iran

[7] Department of Biology, Faculty of Science, University Putra Malaysia, Serdang, Selangor, Malaysia

[8] Cellular and Molecular Research Center, Gerash University of Medical Sciences, Gerash, Iran

Background

MS is one of the main neurological disorders associated with neuron demyelination and axonal loss [1]. This pathology is the primary cause of progressive neurological disability in young adults [2]. Genetic alterations and environmental factors have synergistic roles in MS development [3]. The prevalence of MS is estimated at 28,000,000 individuals by 2020 [4], which is more common in women than men [1]. Mostly, the incidence of MS appears in the age of 20–30 [5]. FSD is defined as dyspareunia, lack of sexual desire, disturbance in arousal, and the absence of orgasm [6].

Sexual function is often impaired following the presence of neurological disorders such as MS [2]. FSD is a widespread sexual problem with the prevalence of 25.8–67%, globally [7].

Sexual dysfunction is a problem that can happen during any phase of the sexual response cycle. This cycle traditionally includes excitement, plateau, orgasm, and resolution [3–8]. This dysfunction generally is classified into four categories: lack of sexual desire or interest in sex, inability to become physically aroused or excited during sexual activity, delay or absence of orgasm, and pain during intercourse [3–8].

There are a number of causes of sexual dysfunction. Physical causes include urological infections or cancer, diabetes, cardiovascular disease, high blood pressure, high cholesterol, hormonal imbalances, alcoholism, and neurological disorders, and psychological causes include depression, stress, anxiety self-esteem or body image issues, and the effects of past sexual trauma, such as rape, molestation, or a negative sexual experience [3–8].

Patients with MS have different complications such as depression, anxiety, and sexual irregularities [1]. Among these, SD is one of the most common [8], affecting more than 74% of women with MS [9]. This complication can also lead to various social problems, such as marriage [10].

Some studies revealed that the SD could also have a more significant impact on individuals' morals and quality of life. However, while 83% of women with MS have the tendency to talk about the disease, 63–94% of which deny visiting doctor [2]. Frequent sexual changes reported by women with MS included partial or total loss of libido, vaginal dryness, lack of vaginal stimulation, decreased status of orgasm, and the presence of unpleasant feelings in the genital system [5].

The exact causes of SD in MS patients are unclear; however, it is estimated that various interfering physical, psychological, and social factors caused by MS can eventually lead to the occurrence of SD [11]. Also, several studies revealed that the SD is associated with the neural lesions in the central nervous system (CNS) responsible for sexual behaviors. Some symptoms related to MS, including urinary and digestive problems, fatigue, neurological disorders, and spasticity, can also indirectly affect the sexual activity in MS patients [12, 13].

According to the high rate of MS incidence, especially in females, along with the crucial role of SD in women, the authors of this systematic review and meta-analysis study aimed to investigate the global prevalence of SD in women with MS. We believe that the findings of this present study can guide the legislators of the field of health sciences to manage the MS patients.

Methods

Initial systematic searching was conducted in July 2022 using PubMed, Web of Science, Scopus, ScienceDirect, and Embase databases. For systematic searching, the main keywords of "Female Sexual Dysfunction," "FSD," "Multiple Sclerosis," and "MS" were also hired. For the preservation of comprehensive searching protocol, no time restriction was considered, and to increase the number of collected articles, the citations of the included papers along with final screening using Google Scholar search engine were also hired. All gathered data were transferred to the Information Management Software (EndNote, v.×8).

Inclusion and exclusion criteria

English studies reporting the prevalence of SD in women with MS and English investigations with available full texts or sufficient data for meta-analysis (such as sample size and MS prevalence) were included in this systematic review and meta-analysis. Besides, other assessments such as case reports and case series, reviews, and the studies with insufficient data or provided in non-English languages were totally excluded.

Study selection

Investigations were included in this study based on the PRISMA guideline. First, duplicated studies were removed and then followed by primary screening according to the titles and abstracts. In this stage, the irrelevant papers were excluded based on the inclusion and exclusion criteria. Full texts were prepared and evaluated, and other non-eligible papers were also removed from the investigation. To avoid potential bias during the assessments, all the abovementioned stages were conducted by two researchers independently. Also, following detection of inconsistency among

the findings, the third author (corresponding author) was responsible for disagreement management.

Quality evaluation of the included papers

The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) as an observational-associated checklist was hired to evaluate the quality of articles. Different parts of the manuscript (title, abstract, introduction, methods, results, and discussion) were assessed by the STROBE checklist using 32 different items of title, problem statement, study objectives, type of study, statistical population, sampling method, determination of appropriate sample size, variables and procedures definition, data collection tools, statistical analysis methods, and findings. The STROBE scoring ≥ 16 was considered good and moderate methodological quality papers, and articles < 16 were poor and excluded from the study.

Data extraction

Two authors conducted this procedure based on a predesigned checklist including first author's name, publication year, study location, sample size, age group of women, SD prevalence in women with MS, and study tools.

Statistical analysis

Following data extraction, the CMA software (Comprehensive Meta-Analysis, v.2) was used for data analysis. The heterogeneity of the studies was assessed through the I^2 test, and the Egger test and the Funnel plot were used to check the publication bias at a significance level of 0.05.

Results

In this systematic review and meta-analysis, the global prevalence of SD in women with MS was assessed. Following systematic and manual searching, 292 and 10 papers were selected, respectively. Using Information Management Software (EndNote × 8), 96 duplicated articles were detected and removed. Following title and abstract assessment, 139 irrelevant articles were excluded in the screening stage. Through the deep investigation of full texts, 36 papers and other poor studies were ignored, and finally, 14 investigations were included for meta-analysis assessment (Fig. 1) (Table 1).

Primary assessments revealed that all included studies were cross-sectional and mostly conducted in Asia. According to Table 1, the highest prevalence of FSD (82.5%) was related to the study of Lew-Starowicz et al. conducted by SFQ28 and clinimetric scales with the age group > 18 years [22]. Besides, the lowest prevalence (27.9%) of FSD was associated with the study of Bartnik et al. conducted by the FSFI and EDSS questionnaires with a mean age of 32.3 ± 7.22 [17]. Also, the overall prevalence of SD in women MS patients was 62.5% (95% CI 53.9–70.5). In 9 studies, the scales of FSFI and EDSS were used together, and in other remaining papers, these scales were hired individually or along with other questionnaires. Following an assessment of studies with the sample size of 2115 women with MS, the heterogeneity was found $I^2 = 92.6\%$; thus, the random effect model was used for meta-analysis. The overall prevalence of SD in women with MS was reported 62.5% (95% CI 53.9–70.5) (Fig. 2). Besides, the results of the Egger test representing the publication bias showed non-significant ($p = 0.570$) alteration (Fig. 3).

In order to investigate the interfering factor affecting the heterogeneity index, a meta-regression test was used for the sample size and year of the study publication. The results showed that by increasing the sample size and year of the study, the overall prevalence of SD was accelerated significantly ($p < 0.05$) (Figs. 4 and 5).

Discussion

In this systematic review and meta-analysis study, the authors aimed to report the global prevalence of SD in women with MS, which was found 62.5%. Also, the results showed that following increasing the sample size and the year of the study, the overall prevalence of SD in women with MS was accelerated. This finding showed that the FSD prevalence increases over the time.

SD is one of the most common complications of MS with considerable impacts on quality of life. Many studies reported a higher incidence of SD in patients with MS. In fact, MS is one of the most common causes of SD among patients with neurological disorders [26–28]. As mentioned previously, the overall prevalence of SD in women with MS was 62.5%. Although there are different findings representing the percentage of SD in MS women, the general results were consistent with this finding that MS patients contain SD complications [29–31]. Similar to the results of our study, in some other investigations, the SD was reported as a common complication among women with MS [14, 25, 32–35]. Other studies reporting the prevalence of SD in MS patients showed that 40–80% of women and 50–90% of men have sexual complaints or concerns [32, 35–37]. In the study of Hadjimichail et al. conducted on 107 MS patients, 29.9% of individuals experienced the SD symptoms (40.0% and

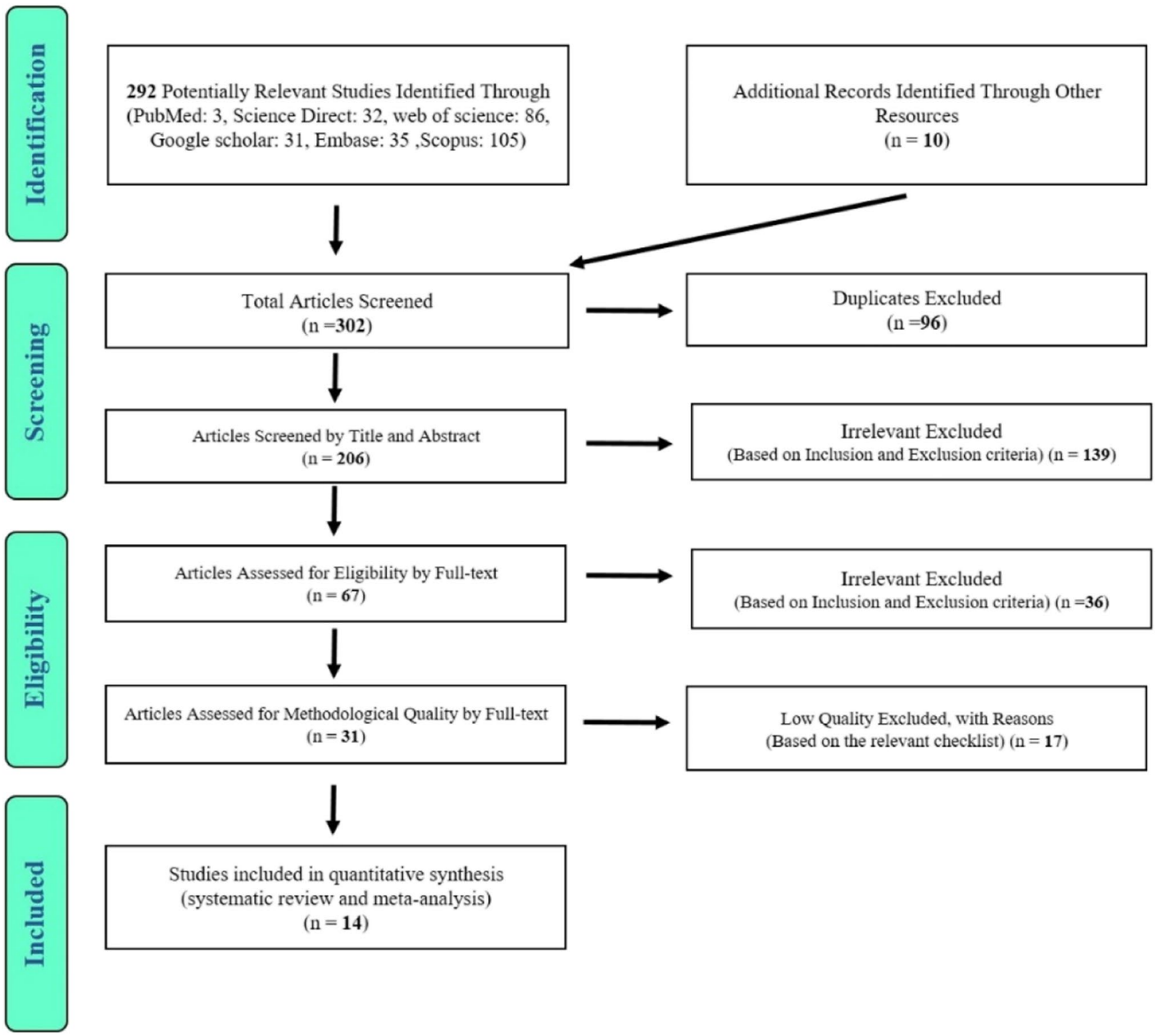

Fig. 1 The PRISMA flowchart (2009) represents the stages of study screening in this systematic review and meta-analysis

23.9% for males and females, respectively), while in the healthy population as the control group, this value was found 12.5% [38]. Probably, this difference can be associated with the small sample size. Konstantinidis et al. reported that 64.5% of Greek women with MS represented SD, along with high rates of depression (57.3%) and anxiety (58.1%) [39]. Also, Tzortzis et al. found this value 34.9% compared to the control group (21.31%) [25]. The results of these studies were consistent with the findings of the present investigation. Following an assessment of other reports, it is believed that women with MS have low living satisfaction levels according to sexual performance disorders [23, 40]. Orasanu et al. found that the severe FSD symptoms were positively correlated with the duration of MS and the high clinical score [41], which were similar to our findings. They also reported a high prevalence of SD (62.5%) in women with MS. In these studies, the alteration in sexual performance of women with MS was reported including decreased libido, vaginal lubrication, and decreased orgasm [26, 42]. A few studies have also investigated the relationship between neural demyelination in lesions and the prevalence of SD in MS patients concluding that the MS lesions were directly associated with SD incidence [12, 13, 43]. In this era, Barak et al. described the relationship between anorgasmia and the lesions in brainstem or

Table 1 Characteristics of included studies of the prevalence of sexual dysfunction in women with MS

Assessment tool	FSD prevalence	Sample size	Age	Location	Year	First author
SEA-MS-F, self-report	59.8%	87	47.3 ± 10.1	France	2022	Audrey et al. [2]
MSISQ-19 score, EDSS	63.8%	271	19–50	Iran	2013	Ashtari et al. [14]
FSFI, EDSS	61%	41	21–56	Haifa	2007	Gruenwald et al. [15]
FSFI, EDSS	75%	40	24–47	Turkey	2007	Sec¸ıl et al. [16]
FSFI, EDSS	27.9%	86	32.03 ± 7.22	Poland	2017	Bartnik et al. [17]
FSFI, SSEQ	82.3%	260	18–30	Iran	2019	Manouchehri et al. [18]
FSFI, EDSS	56.4%	55	26–44	Italy	2011	Lombardi et al. [19]
FSFI, EDSS	64.5%	248	> 18	Greece	2018	Konstantinidis et al. [10]
FSFI, EDSS	42%	306	26–74	Bologna	2019	Gava et al. [20]
MSISQ19, EDSS	81.9%	182	18–49	Iran	2017	Dehghan-Nayeri et al. [21]
SFQ28, clinimetric scales	82.5%	137	> 18	Poland	2013	Lew-Starowicz et al. [22]
FSFI, EDSS	69.7%	300	22–50	Iran	2020	Nazari et al. [23]
FSFI, EDSS	55.3%	226	35.7	Iran	2013	Mohammadi et al. [24]
FSFI, EDSS	34.9%	63	> 18	Greece	2008	Tzortzis et al. [25]

Sexual Dysfunction Management and Expectations Assessment in Multiple Sclerosis-Female, The Female Sexual Function Index, Expanded Disability Status Scale, Multiple Sclerosis Intimacy and Sexuality Questionnaire, The Female Sexual Function Questionnaire

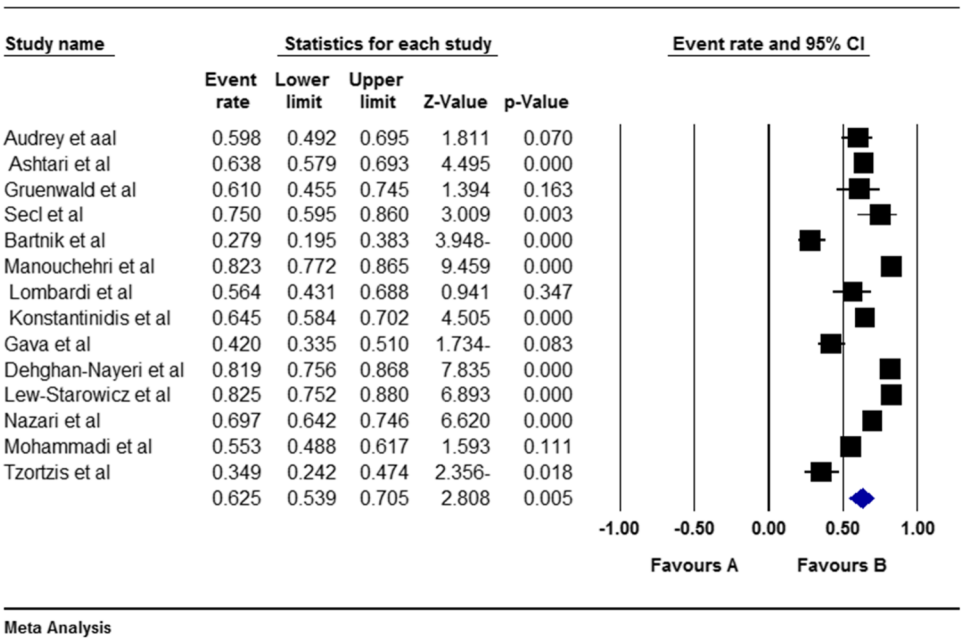

Fig. 2 The forest plot represents the overall prevalence of sexual dysfunction in women with MS based on the random effect model

corticospinal system in male and female patients with MS [43]. Zivadinov et al. and Zorzon et al. found a considerable relationship between SD and pontine lesions [12, 13]. Another study detected a relationship between right occipital lesions and arousal disorders or left insular lesions and decreased sexual lubrication [44]. Also, a significant relationship was found between MS lesions around the left temporal ventricle and visual communication areas, which can potentially endanger orgasm performance [45]. Besides, chronic diseases such as MS can lead to feelings of hopelessness, guilt, pain, and sexual disorders in patients with MS [46].

Due to the high global prevalence of MS, more updated investigations with a high sample size are needed, as the major limitation in the present study. Also, since the SD can be affected by various factors which were not considered in the included studies, the final results probably contained bias. The inclusion of English-based papers was also another limitation of this meta-analysis. In addition, several papers were excluded due to low quality or low sample size.

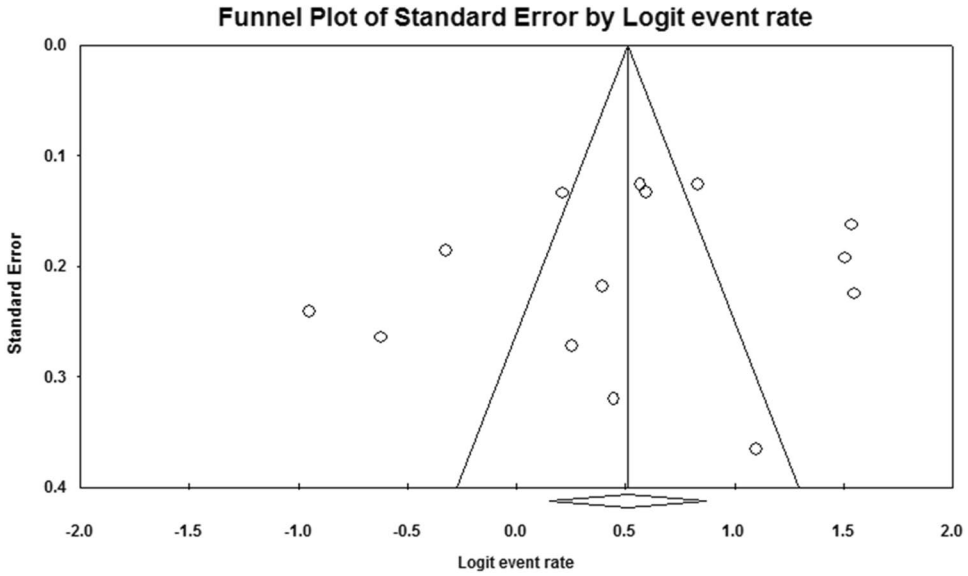

Fig. 3 Funnel plot representing distribution bias of included studies

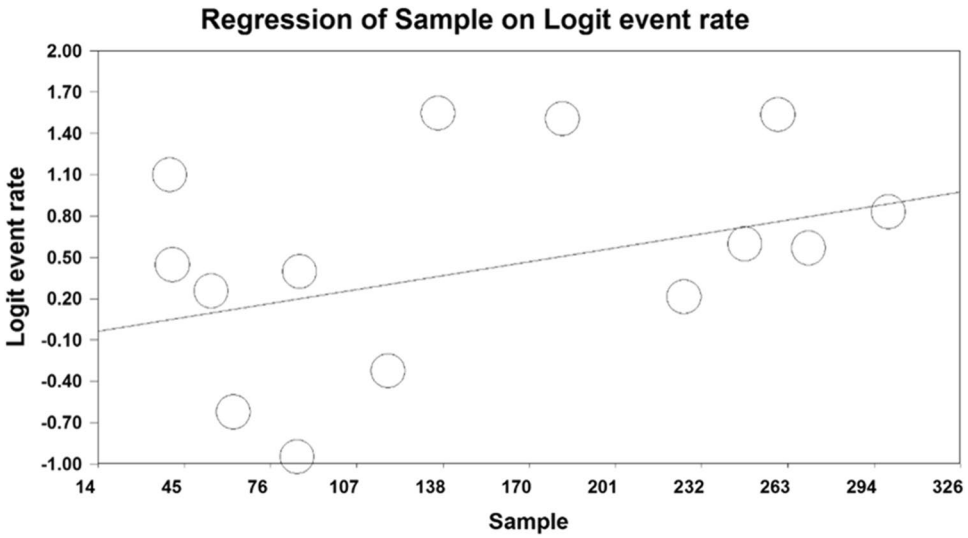

Fig. 4 Metaregression represents the effect of sample size on the overall prevalence of sexual dysfunction in women with MS

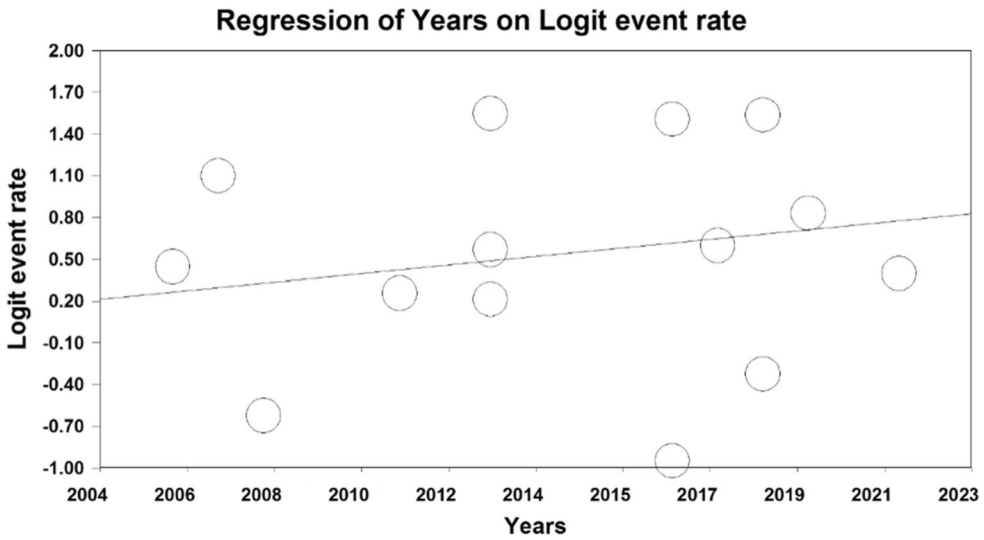

Fig. 5 Metaregression represents the effect of the year of the study on the overall prevalence of sexual dysfunction in women

Conclusion

According to the results of the present study, the overall prevalence of SD in women with MS was found 62.5%. Thus, the results seem worthwhile for health policymakers to have more consideration of sexual dysfunction in women with MS. Deep attention to the sexual health of MS patients and sexual performance as a research priority is also suggested.

Abbreviations *MS*: Multiple sclerosis; *FSD*: Female sexual dysfunction; *CNS*: Central nervous system; *WoS*: Web of Science; *PRISMA*: Preferred Reporting Items for Systematic Reviews and Meta-Analysis; *STROBE*: Strengthening the Reporting of Observational Studies in Epidemiology for Cross-Sectional Study

Acknowledgements The Student Research Committee of Kermanshah University of Medical Sciences.

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

Funding We would like to thank the esteemed officials of the center for the financial affords of this study.

Data availability Datasets are available through the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate Not applicable.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

References

1. Aydın T, Onger ME (2022) Depression, sexual dysfunction, life satisfaction and marriage satisfaction in women with multiple sclerosis. Egypt J Neurol Psychiatry Neurosurg 58(1):73. https://doi.org/10.1186/s41983-022-00501-w
2. Audrey SB, Marion R, Béatrice M, Stéphane V, Katelyne H (2022) Sexual dysfunction in women with multiple sclerosis: expectations regarding treatment and information, and utility of the SEAMS-F Questionnaire. Sexual Med 10(3). https://doi.org/10.1016/j.esxm.2022.100502
3. Ehtesham N, Rafie MZ, Mosallaei M (2021) The global prevalence of familial multiple sclerosis: an updated systematic review and meta-analysis. BMC Neurol 21(1):246. https://doi.org/10.1186/s12883-021-02267-9
4. Walton C, King R, Rechtman L, Kaye W, Leray E, Marrie RA et al (2020) Rising prevalence of multiple sclerosis worldwide: insights from the Atlas of MS, third edition. Mult Scler 26(14):1816–1821. https://doi.org/10.1177/1352458520970841
5. Tzitzika M, Daoultzis C, Konstantinidis C, Kordoutis P (2021) The Multiple Sclerosis Intimacy and Sexuality Questionnaire (MSISQ-15): validation and cross-cultural adaptation of the Greek version in MS patients. Sex Disabil 39:1–12. https://doi.org/10.1007/s11195-020-09635-2
6. Starc A, Jukić T, Poljšak B, Dahmane R (2018) Female sexual function and dysfunction: a cross-national prevalence study in Slovenia. Acta Clin Croat 57(1):52–60. https://doi.org/10.20471/acc.2018.57.01.06
7. Zhao S, Wang J, Liu Y, Luo L, Zhu Z, Li E et al (2018) Association between multiple sclerosis and risk of female sexual dysfunction: a systematic review and meta-analysis. J Sex Med 15(12):1716–1727. https://doi.org/10.1016/j.jsxm.2018.09.016
8. Hösl KM, Deutsch M, Wang R, Roy S, Winder K, Niklewski G et al (2018) Sexual dysfunction seems to trigger depression in female multiple sclerosis patients. Eur Neurol 80(1–2):34–41. https://doi.org/10.1159/000492126
9. Scheepe JR, Alamyar M, Pastoor H, Hintzen RQ, Blok BF (2017) Female sexual dysfunction in multiple sclerosis: results of a survey among Dutch urologists and patients. Neurourol Urodyn 36(1):116–120. https://doi.org/10.1002/nau.22884
10. Konstantinidis C, Tzitzika M, Bantis A, Nikolia A, Samarinas M, Kratiras Z (2019) Female sexual dysfunction among Greek women with multiple sclerosis: correlations with organic and psychological factors. Sex Med 7(1):19–25. https://doi.org/10.1016/j.esxm.2018.11.003
11. Mirmosayyeb O, Nafari A, Mahdi Hosseinabadi A, Malekzadeh A, Ghasemi M, Barzegar S et al (2022) Sexual dysfunction in women with neuromyelitis optica spectrum disorders and multiple sclerosis. Sex Disabil 40(2):381–392. https://doi.org/10.1007/s11195-022-09731-5
12. Zorzon M, Zivadinov R, Locatelli L, Stival B, Nasuelli D, Bratina A et al (2003) Correlation of sexual dysfunction and brain magnetic resonance imaging in multiple sclerosis. Mult Scler 9(1):108–110. https://doi.org/10.1191/1352458503ms881sr
13. Zivadinov R, Zorzon M, Locatelli L, Stival B, Monti F, Nasuelli D et al (2003) Sexual dysfunction in multiple sclerosis: a MRI, neurophysiological and urodynamic study. J Neurol Sci 210(1–2):73–76. https://doi.org/10.1016/S0022-510X(03)00025-X
14. Ashtari F, Rezvani R, Afshar H (2014) Sexual dysfunction in women with multiple sclerosis: dimensions and contributory factors. J Res Med Sci 19(3):228–233
15. Gruenwald I, Vardi Y, Gartman I, Juven E, Sprecher E, Yarnitsky D et al (2007) Sexual dysfunction in females with multiple sclerosis: quantitative sensory testing. Mult Scler 13(1):95–105. https://doi.org/10.1177/1352458506071134
16. Seçil Y, Yetimalar Y, Gedizlioğlu M, Arpaci E, Tokuçoğlu F, İnceoğlu Kendir A et al (2007) Sexual dysfunction and sympathetic skin response recorded from the genital region in women with multiple sclerosis. Mult Scler 13(6):742–748. https://doi.org/10.1177/1352458506073647
17. Bartnik P, Wielgoś A, Kacperczyk J, Pisarz K, Szymusik I, Podlecka-Piętowska A et al (2017) Sexual dysfunction in female patients with relapsing-remitting multiple sclerosis. Brain Behav 7(6). https://doi.org/10.1002/brb3.699
18. Manouchehri E, Saeedi M, Mirzaei Najmabadi K (2021) Evaluation of sexual self-efficacy and sexual function in women with multiple sclerosis in Mashhad, Iran, in 2019: a cross-sectional study. Current J Neurol (Iran J Neurol) 20(1). https://doi.org/10.18502/cjn.v20i1.6376
19. Lombardi G, Celso M, Bartelli M, Cilotti A, Del Popolo G (2011) female sexual dysfunction and hormonal status in multiple

sclerosis patients. J Sex Med 8(4):1138–1146. https://doi.org/10.1111/j.1743-6109.2010.02161.x
20. Gava G, Visconti M, Salvi F, Bartolomei I, Seracchioli R, Meriggiola MC (2019) Prevalence and psychopathological determinants of sexual dysfunction and related distress in women with and without multiple sclerosis. J Sex Med 16(6):833–842. https://doi.org/10.1016/j.jsxm.2019.03.011
21. Dehghan-Nayeri N, Khakbazan Z, Ghafoori F, Nabavi SM (2017) Sexual dysfunction levels in iranian women suffering from multiple sclerosis. Mult Scler Relat Disord 12:49–53. https://doi.org/10.1016/j.msard.2017.01.005
22. Lew-Starowicz M, Rola R (2013) Prevalence of sexual dysfunctions among women with multiple sclerosis. Sex Disabil 31(2):141–153. https://doi.org/10.1007/s11195-013-9293-9
23. Nazari F, Shaygannejad V, Mohammadi Sichani M, Mansourian M, Hajhashemi V (2020) Sexual dysfunction in women with multiple sclerosis: prevalence and impact on quality of life. BMC Urol 20(1). https://doi.org/10.1186/s12894-020-0581-2
24. Mohammadi K, Rahnama P, Mohseni SM, Sahraian MA, Montazeri A (2013) Determinants of sexual dysfunction in women with multiple sclerosis. BMC Neurol 13:83. https://doi.org/10.1186/1471-2377-13-83
25. Tzortzis V, Skriapas K, Hadjigeorgiou G, Mitsogiannis I, Aggelakis K, Gravas S et al (2008) Sexual dysfunction in newly diagnosed multiple sclerosis women. Mult Scler 14(4):561–563. https://doi.org/10.1177/1352458508014004090 1
26. Gumus H, Akpinar Z, Yilmaz H (2014) Effects of multiple sclerosis on female sexuality: a controlled study. J Sex Med 11(2):481–486. https://doi.org/10.1111/jsm.12397
27. Firdolas F, Ozan T, Onur R, Bulut S, Orhan I (2013) Evaluation of sexual function in women at two stages of multiple sclerosis. World J Urol 31(4):929–933. https://doi.org/10.1007/s00345-012-0891-4
28. Khakbazan Z, Daneshfar F, Behboodi-Moghadam Z, Nabavi SM, Ghasemzadeh S, Mehran A (2016) The effectiveness of the Permission, Limited Information, Specific suggestions, Intensive Therapy (PLISSIT) model based sexual counseling on the sexual function of women with multiple sclerosis who are sexually active. Mult Scler Relat Disord 8:113–119. https://doi.org/10.1016/j.msard.2016.05.007
29. Fraser C, Mahoney J, McGurl J (2008) Correlates of sexual dysfunction in men and women with multiple sclerosis. J Neurosci Nurs 40(5):312–317. https://doi.org/10.1097/01376517-200810000-00010
30. Calabrò RS, Russo M, Dattola V, De Luca R, Leo A, Grisolaghi J et al (2018) Sexual function in young individuals with multiple sclerosis: does disability matter? J Neurosci Nurs 50(3):161–166. https://doi.org/10.1097/JNN.0000000000000367
31. Domingo S, Kinzy T, Thompson N, Gales S, Stone L, Sullivan A (2018) Factors associated with sexual dysfunction in individuals with multiple sclerosis: implications for assessment and treatment. Int J MS Care 20(4):191–197. https://doi.org/10.7224/1537-2073.2017-059
32. Nortvedt MW, Riise T, Frugård J, Mohn J, Bakke A, Skår AB et al (2007) prevalence of bladder, bowel and sexual problems among multiple sclerosis patients two to five years after diagnosis. Mult Scler 13(1):106–112. https://doi.org/10.1177/1352458506071210
33. Scheepe JR, Alamyar M, Pastoor H, Hintzen RQ, Blok BF (2017) Female sexual dysfunction in multiple sclerosis: results of a survey among Dutch urologists and patients. Neurourol Urodyn 36(1):116–120. https://doi.org/10.1002/nau.22884
34. Szasz G, Paty D, Lawton-Speert S, Eisen K (1984) A sexual functioning scale in multiple sclerosis. Acta Neurol Scand 70(101 S):37–43. https://doi.org/10.1111/j.1600-0404.1984.tb02550.x
35. Zorzon M, Zivadinov R, Bosco A, Bragadin LM, Moretti R, Bonfigli L et al (1999) Sexual dysfunction in multiple sclerosis: a case-control study. I. Frequency and comparison of groups. Mult Scler 5(6):418–427. https://doi.org/10.1191/135245899678846456
36. Kessler TM, Fowler CJ, Panicker JN (2009) Sexual dysfunction in multiple sclerosis. Expert Rev Neurother 9(3):341–350. https://doi.org/10.1586/14737175.9.3.341
37. Lew-Starowicz M, Rola R (2013) Prevalence of sexual dysfunctions among women with multiple sclerosis. Sex Disabil 31(2):141–153. https://doi.org/10.1007/s11195-013-9293-9
38. Hadjimichail K, Asimakopoulou E, Charalambous D, Pantzaris M, Theodosis-Nobelos P, Triantis C (2020) The prevalence of sexual dysfunction in patients with multiple sclerosis in Cyprus: a cross-sectional study. J Neurosci Nurs 52(6):302–307. https://doi.org/10.1097/JNN.0000000000000551
39. Konstantinidis C, Tzitzika M, Bantis A, Nikolia A, Samarinas M, Kratiras Z et al (2019) Female sexual dysfunction among Greek women with multiple sclerosis: correlations with organic and psychological factors. Sex Med 7(1):19–25. https://doi.org/10.1016/j.esxm.2018.11.003
40. Zamani M, Tavoli A, Khasti BY, Sedighimornani N, Zafar M (2017) Sexual therapy for women with multiple sclerosis and its impact on quality of life. Iran J Psychiatry 12(1):58–65
41. Orasanu B, Frasure H, Wyman A, Mahajan ST (2013) Sexual dysfunction in patients with multiple sclerosis. Mult Scler Relat Disord 2(2):117–123. https://doi.org/10.1016/j.msard.2012.10.005
42. Ghajarzadeh M, Jalilian R, Mohammadifar M, Sahraian MA, Azimi A (2014) Sexual function in women with multiple sclerosis. Acta Med Iran 52(4):315–318
43. Barak Y, Achiron A, Elizur A, Gabbay U, Noy S, Sarova-Pinhas I (1996) Sexual dysfunction in relapsing-remitting multiple sclerosis: magnetic resonance imaging, clinical, and psychological correlates. J Psychiatry Neurosci: JPN 21:255–258
44. Winder K, Linker RA, Seifert F, Deutsch M, Engelhorn T, Dörfler A et al (2016) Neuroanatomic correlates of female sexual dysfunction in multiple sclerosis. Ann Neurol 80(4):490–498. https://doi.org/10.1002/ana.24746
45. Winder K, Seifert F, Koehn J, Deutsch M, Engelhorn T, Dörfler A et al (2015) Site and size of multiple sclerosis lesions predict enhanced or decreased female orgasmic function. J Neurol 262(12):2731–2738. https://doi.org/10.1007/s00415-015-7907-0
46. Solmaz V, Ozlece HK, Him A, Güneş A, Cordano C, Aksoy D et al (2018) Evaluation of the association between sexual dysfunction and demyelinating plaque location and number in female multiple sclerosis patients. Neurol Res 40(8):683–688. https://doi.org/10.1080/01616412.2018.1462752