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# Prevalence and risk of developing sexual dysfunction in women with multiple sclerosis (MS): a systematic review and meta-analysis

Amid Yazdani<sup>1</sup>, Narges Ebrahimi<sup>2</sup>, Omid Mirmosayyeb<sup>2</sup> and Mahsa Ghajarzadeh<sup>3\*</sup>

## Abstract

**Objective** To estimate the pooled prevalence of sexual dysfunction (SD) in women with multiple sclerosis (MS).

**Methods** We systematically searched PubMed, Scopus, EMBASE, Web of Science, and google scholar and also gray literature up to October 2021.

The search strategy includes:

("Multiple Sclerosis" OR "MS" OR "Disseminated Sclerosis" OR (Disseminated AND Sclerosis) OR (Sclerosis AND Multiple)) AND ("Sexual Dysfunction" OR (Sexual AND Dysfunction) OR (Sexual AND Dysfunctions) OR (Sexual AND Disorders) OR (Sexual AND Disorder) OR "Sexual Dysfunctions" OR "Sexual Disorders" OR "Sexual Disorder" OR "Psychosexual Dysfunctions" OR (Dysfunction AND Psychosexual) OR (Dysfunctions AND Psychosexual) OR "Psychosexual Dysfunction" OR "Psychosexual Disorders" OR (Disorder AND Psychosexual) OR (Disorders AND Psychosexual) OR "Psychosexual Disorder" OR "Hypoactive Sexual Desire Disorder" OR "Sexual Aversion Disorder" OR (Aversion Disorders AND Sexual) OR (Disorders AND Sexual Aversion) OR "Sexual Aversion Disorders" OR "Orgasmic Disorder" OR (Disorders AND Orgasmic) OR "Orgasmic Disorders" OR "Sexual Arousal Disorder" OR (Arousal Disorders AND Sexual) OR (Disorders AND Sexual Arousal) OR "Sexual Arousal Disorders" OR "Frigidity").

**Results** We found 2150 articles by literature search, after deleting duplicates 1760 remained. Fifty-six articles remained for meta-analysis. The pooled prevalence of SD in MS patients estimated as 61% (95%CI:56–67%) ( $I^2$ :95.7%,  $P < 0.001$ ). The pooled prevalence of Anorgasmia in MS patients estimated as 29% (95%CI:20–39%) ( $I^2$ :85.3%,  $P < 0.001$ ). The pooled odds of developing SD in MS women estimated as 3.05(95%CI: 1.74–5.35) ( $I^2$ :78.3%,  $P < 0.001$ ). The pooled prevalence of decreased vaginal lubrication in MS patients estimated as 32%(95%CI:27–37%) ( $I^2 = 94.2%$ ,  $P < 0.001$ ). The pooled prevalence of reduced libido was 48%(95%CI:36–61%) ( $I^2$ :92.6%,  $P < 0.001$ ). The pooled prevalence of arousal problems was 40%(95%CI: 26–54%) ( $I^2$ :97.4%,  $P < 0.001$ ). The pooled prevalence of intercourse satisfaction was 27% (95%CI: 8–46%) ( $I^2$ :99%,  $P < 0.001$ ).

**Conclusion** The result of this systematic review and meta-analysis show that the pooled prevalence of SD in women with MS is 61% and the odds of developing SD in comparison with controls is 3.05.

**Keywords** Sexual dysfunction, Multiple sclerosis, Prevalence

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**Introduction**

Multiple sclerosis (MS) is a degenerative, neurologic disease of the central nervous system (CNS) affecting women more than men [1]. It usually occurs between 20 and 50 years of age, while MS-related complications include both physical and psychological consequences [2]. One of the most common multi-dimensional complications is sexual dysfunction (SD) involving physiological, psychosocial, and interpersonal factors [3]. It is suggested that women with MS have problems regarding finding a partner, building a relationship, and marital issues [3]. SD has negative impacts on health-related quality of life (HRQoL), especially on youth [4, 5]. It can be found at any stages of the disease, and is present at early stage in some cases [6, 7]. The exact etiology of SD in MS is not clear, but physical disability, psychological difficulties, and also side effects of medications could cause SD [8, 9].

Primary SD is the consequence of neurological changes in the body, while secondary SD is due to MS-related complications such as fatigue, pain, spasticity, bladder, and bowel dysfunction [10]. Tertiary SD is related to psychological consequences of MS such as depression, anxiety, and cognitive impairment / and cultural issues regarding sexual consultant in different nations [10].

Loss of orgasm, libido, lubrication, and increased spasticity are common during sexual activity in women with MS [11, 12].

Different factors such as age, disease duration, disability level, bladder dysfunction, cognitive impairment, and disease course influence SD in MS women [13–15].

Up to now, different original studies have been conducted and three previous systematic reviews and meta-analyses estimated the pooled prevalence of SD in women with MS [16–18]. The aim of this system and meta-analysis is to update the prevalence of SD in MS women.

**Methods**

**Eligibility criteria**

*Inclusion criteria were*

Cross-sectional studies, Articles that had been published in the English language.

*Exclusion criteria*

Case-report, RCT studies.

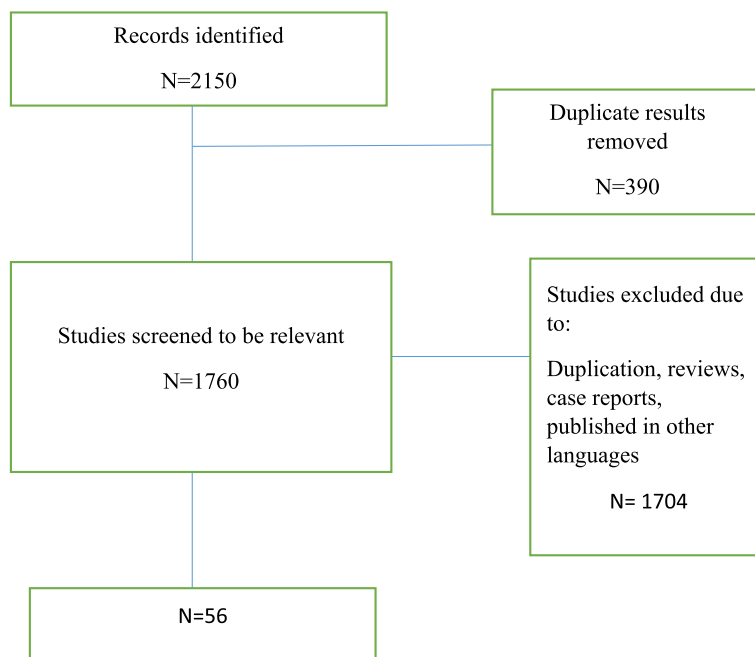
We followed The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) 2020 for reporting this systematic review [19].

**Information sources**

Two independent researchers systematically searched PubMed, Scopus, EMBASE, Web of Science, and google scholar and also gray literature up to October 2021.

**The search strategy includes**

(“Multiple Sclerosis” OR “MS” OR “Disseminated Sclerosis” OR (Disseminated AND Sclerosis) OR (Sclerosis



**Fig. 1** Flow diagram summarizing the selection of eligible studies

**Table 1** Basic characteristics of included studies

| Author                       | Year | Country   | Design          | T. MS All female | MS type RRMS SPMS PPMS CIS | Age         | EDSS        | Disease duration  | Measurements                   | Total sexual dysfunction in PwMS | Anorgasmia |
|------------------------------|------|-----------|-----------------|------------------|----------------------------|-------------|-------------|-------------------|--------------------------------|----------------------------------|------------|
| M Zorzon [12]                | 1999 | Italy     | Case control    | 70               | RR-50<br>PP-16<br>SP-4     | 40.2(10.9)  | 2.6(1.7)    | 10.7(8.5)         | Szasz Sexual Functioning Scale | 44                               | 21         |
| M. Zorzon [20]               | 2001 | Italy     | Cohort          | 64               | NR                         | NR          | NR          | NR                | Szasz Sexual Functioning Scale | 24                               | 24         |
| Kisic-Tepavcevic Darija [21] | 2015 | Serbia    | cohort          | 66               | NR                         | NR          | NR          | NR                | Szasz sexual functioning scale | 45                               | 8          |
| DK Tepavcevic [5]            | 2008 | Serbia    | cross-sectional | 78               | RR-54<br>SP-22<br>PP-2     | 41.7(9.3)   | 4.6(1.6)    | 9.1(6.7)          | Szasz sexual functioning scale | 66                               | 12         |
| Marita P. McCabe [22]        | 1996 | Australia | Cross-sectional | 74               | NR                         | NR          | NR          | NR                | Szasz At least one problem     | 59                               | 17         |
| Iris Zavoreo [23]            | 2016 | Croatia   | Cross sectional | 56               | NR                         | NR          | NR          | NR                | SSS                            | NR                               | NR         |
| Aleksandra Koftuniuk [24]    | 2020 | Poland    | Cross-sectional | 101              | RR-82<br>SP-14<br>PP-5     | 36.7(9.56)  | NR          | 75.1(60.2) months | SSQ                            | 55                               | NR         |
| M. Lew-Starowicz [25]        | 2013 | Poland    | Cross-sectional | 137              | NR                         | 50.7(7)     | NR          | 16.4(8.6)         | SFQ28                          | 113                              | NR         |
| MW Nortvedt [26]             | 2001 | Norway    | Cross-sectional | 118              | NR                         | NR          | NR          | NR                | SF-36                          | 67                               | NR         |
| Sacco E [27]                 | 2011 | Italy     | Cross-sectional | 65               | NR                         | NR          | NR          | NR                | PISQ-12                        | 22                               | 24         |
| R Vazirinejad [28]           | 2008 | Iran      | Cross-sectional | 126              | NR                         | NR          | NR          | NR                | MSQOL-54                       | 115                              | NR         |
| Jing Wu [29]                 | 2020 | Australia | Cross-sectional | 1591             | NR                         | NR          | NR          | NR                | MSQOL-54                       | NR                               | NR         |
| Z. Tulek [30]                | 2011 | Turkey    | cross-sectional | 70               | NR                         | NR          | NR          | NR                | MSQOL-54                       | NR                               | NR         |
| MW Nortvedt [31]             | 2007 | Norway    | Cross-sectional | 40               | NR                         | NR          | NR          | NR                | MSQoL-54                       | NR                               | NR         |
| Claudia H. Marck [32]        | 2016 | Australia | Cross-sectional | 1663             | NR                         | NR          | NR          | NR                | MSQOL-54                       | 925                              | NR         |
| Eftat Merghati-Khoei [33]    | 2013 | Iran      | Cross-sectional | 132              | NR                         | 36.9(8.3)   | NR          | 6.8(5.3)          | MSISQ-19                       | 115                              | NR         |
| Vida Ghasemi [34]            | 2020 | Iran      | Cross-sectional | 260              | RR-212<br>SP-36<br>PP-12   | 37.83(7.34) | 2.02 (1.52) | 6.96(5.06)        | MSISQ-19 44.19(16)             | 198                              | NR         |
| Dilaram Billur Çelik [13]    | 2013 | Turkey    | Cross-sectional | 44               | NR                         | NR          | NR          | NR                | MSISQ-19                       | 32                               | NR         |

**Table 1** (continued)

| Author                       | Year | Country   | Design              | T. MS All female | MS type RRMS SPMS PPMS CIS | Age                             | EDSS                  | Disease duration                    | Measurements                        | Total sexual dysfunction in PwMS | Anorgasmia |
|------------------------------|------|-----------|---------------------|------------------|----------------------------|---------------------------------|-----------------------|-------------------------------------|-------------------------------------|----------------------------------|------------|
| M. Demirkiran [35]           | 2006 | Turkey    | Cross-sectional     | 33               | NR                         | NR                              | NR                    | NR                                  | MSISQ-19                            | 27                               | NR         |
| Sarah Abdo [36]              | 2020 | Egypt     | Cross-sectional ABS | 43               | NR                         | 24.71(3.55)                     | NR                    | NR                                  | MSISQ-19                            | 24                               | NR         |
| Edgar Carnero Contentti [37] | 2019 | Argentina | Cross-sectional     | 137              | RR 112 PP 9 SP 18          | 49.1(10.2)                      | NR                    | 7.5(0.5)                            | MSISQ-19                            | 119                              | NR         |
| Patrick Altmann [38]         | 2021 | Italy     | cross-sectional     | 53               | NR                         | NR                              | NR                    | NR                                  | MSISQ-19                            | 25                               | NA         |
| Fereshteh Ashari [39]        | 2014 | Iran      | cross-sectional     | 271              | NR                         | 36.1(8) n=173<br>33.6(7.9) n=98 | NR                    | 78.4(63.5) n=173<br>60.4(36.8) n=98 | MSISQ-19                            | 173                              | NA         |
| Kowsar Qaderi [40]           | 2014 | Iran      | Cross-sectional     | 132              | NR                         | 36.9(8.3)                       | NR                    | NR                                  | MSISQ-19                            | 110                              | NR         |
| Sabine Salhofer-Polanyi [41] | 2016 | Austria   | Cross-sectional     | 42               | NR                         | 34(7)                           | Median 1.75           | NR                                  | MSISQ-19                            | 15                               | NR         |
| Hanna Pašiu [42]             | 2019 | Croatia   | Cross-sectional     | 75               | NR                         | NR                              | NR                    | NR                                  | MSISQ-15                            | NR                               | NR         |
| Stenager E [43]              | 1996 | Denmark   | cohort              | 27               | NR                         | NR                              | NR                    | NR                                  | MRD                                 | 16                               | NR         |
| Marita P. McCabe [44]        | 2002 | Australia | Case-control        | 237              | NR                         | 44.45                           | NR                    | NR                                  | ISS                                 | 194                              | NR         |
| Marita P. McCabe [45]        | 2003 | Australia | Cohort              | 321              | NR                         | NR                              | NR                    | NR                                  | ISS                                 | 278                              | NR         |
| Cira Fraser [14]             | 2008 | USA       | cross-sectional     | 219              | NR                         | 45.4(9.3)                       | NR                    | NR                                  | Guy's Neurological Disability Scale | 106                              | NR         |
| Simon Dupont [46]            | 1996 | UK        | Cross-sectional     | 65               | NR                         | NR                              | NR                    | NR                                  | GRISS                               | 11                               | 18         |
| Vassilios Tzortzis [7]       | 2008 | Greece    | Cross-sectional     | 63               | RR 58 PP 5                 | 33(6.4)                         | mean 2.5, range 0-3.5 | Mean 2.7 Range 19-51                | FSFI                                | 22                               | NR         |
| Aleksandra Koftuniuk [24]    | 2020 | Poland    | Cross-sectional     | 101              | RR 82 SP 14 PP 5           | 36.7(9.56)                      | NR                    | 75.1(50.2) months                   | FSFI                                | 45                               | NR         |

**Table 1** (continued)

| Author                          | Year | Country     | Design                 | T. MS All female | MS type RRMS SPMS PPMS CIS | Age                  | EDSS                            | Disease duration                                | Measurements         | Total sexual dysfunction in PwMS | Anorgasmia |
|---------------------------------|------|-------------|------------------------|------------------|----------------------------|----------------------|---------------------------------|---|----------------------|----------------------------------|------------|
| Katharina M. Hösli [47]         | 2018 | USA         | Cross-sectional        | 83               | RR 76<br>SP 6<br>PP 1      | Median 36.2          | NR                              | NR  | FSFI                 | 37                               | NR         |
| Fatemeh Nazari [48]             | 2020 | Iran        | Cross-sectional        | 300              | RR 243<br>PMS 39<br>CIS 18 | 36.35(7.33)          | 2.06(1.85)                      | 7.37(5.40)                                      | FSFI                 | 209                              | NR         |
| Pawel Bartnik [49]              | 2017 | Poland      | Cross-sectional        | 86               | RR 86                      | 32.03(7.22)          | 2.03(1.44)                      | 7.87(5.38)                                      | FSFI                 | 21                               | NR         |
| Marcin Popek [50]               | 2018 | Poland      | case-control           | 55               | NR                         | NR                   | NR                              | NR  | FSFI<br>26.24(7.22)  | 22                               | NR         |
| Fatih Firdolas [51]             | 2012 | Turkey      | Cross sectional        | 23               | RR 17<br>SP 6              | NR                   | 2(0.22) N= 17<br>5.91(0.53) N=6 | NR  | FSFI                 | 12                               | NR         |
| Giulia Gava [52]                | 2019 | Italy       | Case-control           | 153              | NR                         | 47.3(10.5)           | 3.1(2.2)                        | 13.5(8.7)                                       | FSFI<br>17.9(12.7)   | 64                               | NR         |
| Ilan Gruenwald [53]             | 2007 | Israel      | cross-sectional        | 41               | RR 38<br>SP 3              | NR                   | Median 2.5                      | Median 10                                       | FSFI                 | 25                               | NR         |
| Charalampos Konstantinidis [54] | 2018 | Greece      | cross-sectional        | 248              | NR                         | 45.84(8.448)         | NR                              | 12.78(2.18)                                     | FSFI                 | 160                              | NR         |
| Giuseppe Lombari [55]           | 2011 | Italy       | Cross-sectional        | 54               | NR                         | Mean:34.7<br>(26-44) | Mean:2.9<br>(1.5-6)             | Mean 8.6<br>(2-18)                              | FSFI                 | 31                               | NR         |
| Fariba Askari [2]               | 2016 | Iran        | Cross-sectional        | 86               | RR 81<br>SP 5              | 33.4(6.5)            | NR                              | NR  | FSFI                 | 58                               | NR         |
| Khadjeh Mohammadi [56]          | 2013 | Iran        | cross-sectional        | 226              | RR 169<br>PP 4<br>SP 53    | 35.7(8.07)           | NR                              | 1.8(0.79)                                       | FSFI                 | 125                              | NR         |
| Alireza Ale-hashemi [57]        | 2019 | Iran        | case-control           | 64               | RR 60<br>SP 4              | 35.25(8.07)          | Mean 2<br>Range 0-6             | Mean<br>52.5 months<br>(ranging from 6 to 84.5) | FSFI<br>22.86 (5.36) | 53                               | NR         |
| Ramezani, M.A [58]              | 2018 | Iran        | Cross-sectional        | 70               | NR                         | NR                   | NR                              | NR  | FSFI                 | 44                               | NR         |
| Jeroen R. Scheepe [59]          | 2015 | Netherlands | Cross-sectional        | 50               | NR                         | NR                   | NR                              | NR  | FSFI                 | 16                               | NR         |
| Tzitzika, M [54]                | 2018 | Greece      | Cross-sectional<br>ABS | 267              | NR                         | NR                   | NR                              | NR  | FSFI                 | 172                              | NR         |
| Julia Koehn [60]                | 2014 | Germany     | Cross-sectional        | 82               | NR                         | 36.7(9.5)            | NR                              | 69(75.1) Months                                 | FSFI<br>3.31(1.2)    | 37                               | NR         |



**Table 1** (continued)

| Author                       | Hyporgasmia | Decrease vaginal lubrication | Change in vaginal sensation | Reduce libido | Painful intercourse | Lack of sexual desire | Partner satisfaction problems | satisfaction | Arousal Problems | T control                  | Total sexual dysfunction in control |
|------------------------------|-------------|------------------------------|-----------------------------|---------------|---------------------|-----------------------|-------------------------------|--------------|------------------|----------------------------|-------------------------------------|
| Sacco E [27]                 | NR          | NR                           | NR                          | NR            | 20                  | 21                    | NR                            | 29           | NR               | NA                         | NA                                  |
| R.Vazirinejad [28]           | NR          | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | NA                         | NA                                  |
| Jing Wu [29]                 | 929         | 808                          | NR                          | NR            | NR                  | 1017                  | 549                           | NR           | NR               | NA                         | NA                                  |
| Z. Tulek [30]                | 35          | 28                           | NR                          | NR            | NR                  | 37                    | 23                            | NR           | NR               | NA                         | NA                                  |
| MW Nortvedt [31]             | 28          | 20                           | NR                          | NR            | NR                  | 25                    | 18                            | NR           | NR               | NA                         | NA                                  |
| Claudia H. Marck [32]        | 599         | 514                          | NR                          | NR            | NR                  | 695                   | 238                           | NR           | NR               | NA                         | NA                                  |
| Effat Merghati-Khoei [33]    | 100         | 80                           | 46                          | 77            | NR                  | NR                    | NR                            | NR           | NR               | NA                         | NA                                  |
| Vida Ghasemi [34]            | 156         | 82                           | 31                          | NA            | NR                  | 966                   | NR                            | NR           | NR               | NA                         | NA                                  |
| Dilaram Billur Çelik [13]    | 10          | 10                           | NR                          | NR            | NR                  | 9                     | NR                            | NR           | NR               | NA                         | NA                                  |
| M. Demirkiran [35]           | 22          | 17                           | 19                          | 21            | NR                  | NR                    | NR                            | NR           | 20               | NA                         | NA                                  |
| Sarah Abdo [36]              | NR          | 3                            | NA                          | 11            | NR                  | NR                    | NR                            | NR           | NR               | NA                         | NA                                  |
| Edgar Carnero Contentti [37] | 55          | 44                           | 27                          | NR            | NR                  | 53                    | NR                            | NA           | NA               | NA                         | NA                                  |
| Patrick Alt-mann [38]        | NA          | NA                           | NA                          | NA            | NA                  | NA                    | NA                            | NA           | NA               | NA                         | NA                                  |
| Fereshteh Ashtari [39]       | 112         | 70                           | 48                          | NR            | NR                  | 92                    | NR                            | NR           | NR               | NA                         | NA                                  |
| Kowsar Qaderi [40]           | 83          | 67                           | 38                          | 64            | NR                  | NR                    | NR                            | NR           | NR               | NA                         | NA                                  |
| Sabine Salhofer-Polanyi [41] | 17          | 12                           | 6                           | 20            | NR                  | NR                    | NR                            | NR           | 11               | NA                         | NA                                  |
| Hanna Pašiu [42]             | 19          | 16                           | 13                          | NR            | NR                  | 19                    | 11                            | NR           | NR               | NA                         | NA                                  |
| Stenager E [43]              | 3           | 4                            | 6                           | 15            | NR                  | NR                    | NR                            | NR           | NR               | NA                         | NA                                  |
| Marita P. McCabe [44]        | 101         | 78                           | 81                          | NR            | 40                  | 96                    | NR                            | NR           | 73               | 190 mean age = 44.35 years | 146                                 |
| Marita P. Mccabe [45]        | 101         | 78                           | 81                          | NR            | 40                  | 96                    | NR                            | NR           | 73               | 239                        | 191                                 |

**Table 1** (continued)

| Author                          | Hypogasmia | Decrease vaginal lubrication | Change in vaginal sensation | Reduce libido | Painful intercourse | Lack of sexual desire | Partner satisfaction problems | satisfaction | Arousal Problems | T control                               | Total sexual dysfunction in control |
|---------------------------------|------------|------------------------------|-----------------------------|---------------|---------------------|-----------------------|-------------------------------|--------------|------------------|---|-------------------------------------|
| Cira Fraser [14]                | NR         | NR                           | 5                           | NR            | NR                  | 15                    |                               | 2            |                  | NA                                      | NA                                  |
| Simon Dupont [46]               | NR         | NR                           | NR                          | NR            | 26                  | NR                    | NR                            | 7            | NR               | NA                                      | NA                                  |
| Vassilios Tzortzis [7]          | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | 61                                      | 13                                  |
| Aleksandra Koftuniuk [24]       | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | NA                                      | NA                                  |
| Katharina M. Hösl [47]          | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | 21                                      | 1                                   |
| Fateme Nazari [48]              | 111        | 71                           | NR                          | NR            | 51                  | 116                   | NR                            | 70           | 116              | NA                                      | NA                                  |
| Pawel Bartnik [49]              | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | NA                                      | NA                                  |
| Marcin Popek [50]               | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | 55<br>29,91<br>(3.79)                   | 12                                  |
| Fatih Firdolas [51]             | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | NA                                      | NA                                  |
| Giulia Gava [52]                | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | 153<br>Age:48.5(9.6)<br>FSFI:21.1(11.2) | 24                                  |
| Ilan Gruenwald [53]             | 22         | NR                           | NR                          | NR            | 3                   | 25                    | NR                            | NR           | 13               | NA                                      | NA                                  |
| Charalampos Konstantinidis [54] | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | NA                                      | NA                                  |
| Giuseppe Lombardi [55]          | NR         | NR                           | NR                          | NR            | NR                  | 12                    | NR                            | NR           | NR               | NA                                      | NA                                  |
| Fariba Askari [2]               | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | NA                                      | NA                                  |
| Khadijeh Mohammadi [56]         | 81         | 41                           |                             |               | 29                  | 77                    |                               | 54           | 100              | NA                                      | NA                                  |
| Alireza Alehashemi [57]         | NR         | NR                           | NR                          | NR            | NR                  | NR                    | NR                            | NR           | NR               | <b>64</b><br><b>24.39 (4.75)</b>        | NR                                  |
| Ramezani, M.A [58]              | NR         | NR                           | NR                          | NR            | 36                  | 21                    | NR                            | NR           | NR               | NA                                      | NA                                  |





AND Multiple)) AND (“Sexual Dysfunction” OR (Sexual AND Dysfunction) OR (Sexual AND Dysfunctions) OR (Sexual AND Disorders) OR (Sexual AND Disorder) OR “Sexual Dysfunctions” OR “Sexual Disorders” OR “Sexual Disorder” OR “Psychosexual Dysfunctions” OR (Dysfunction AND Psychosexual) OR (Dysfunctions AND Psychosexual) OR “Psychosexual Dysfunction” OR “Psychosexual Disorders” OR (Disorder AND

Psychosexual) OR (Disorders AND Psychosexual) OR “Psychosexual Disorder” OR “Hypoactive Sexual Desire Disorder” OR “Sexual Aversion Disorder” OR (Aversion Disorders AND Sexual) OR (Disorders AND Sexual Aversion) OR “Sexual Aversion Disorders” OR “Orgasmic Disorder” OR (Disorders AND Orgasmic) OR “Orgasmic Disorders” OR “Sexual Arousal Disorder” OR (Arousal Disorders AND Sexual) OR (Disorders

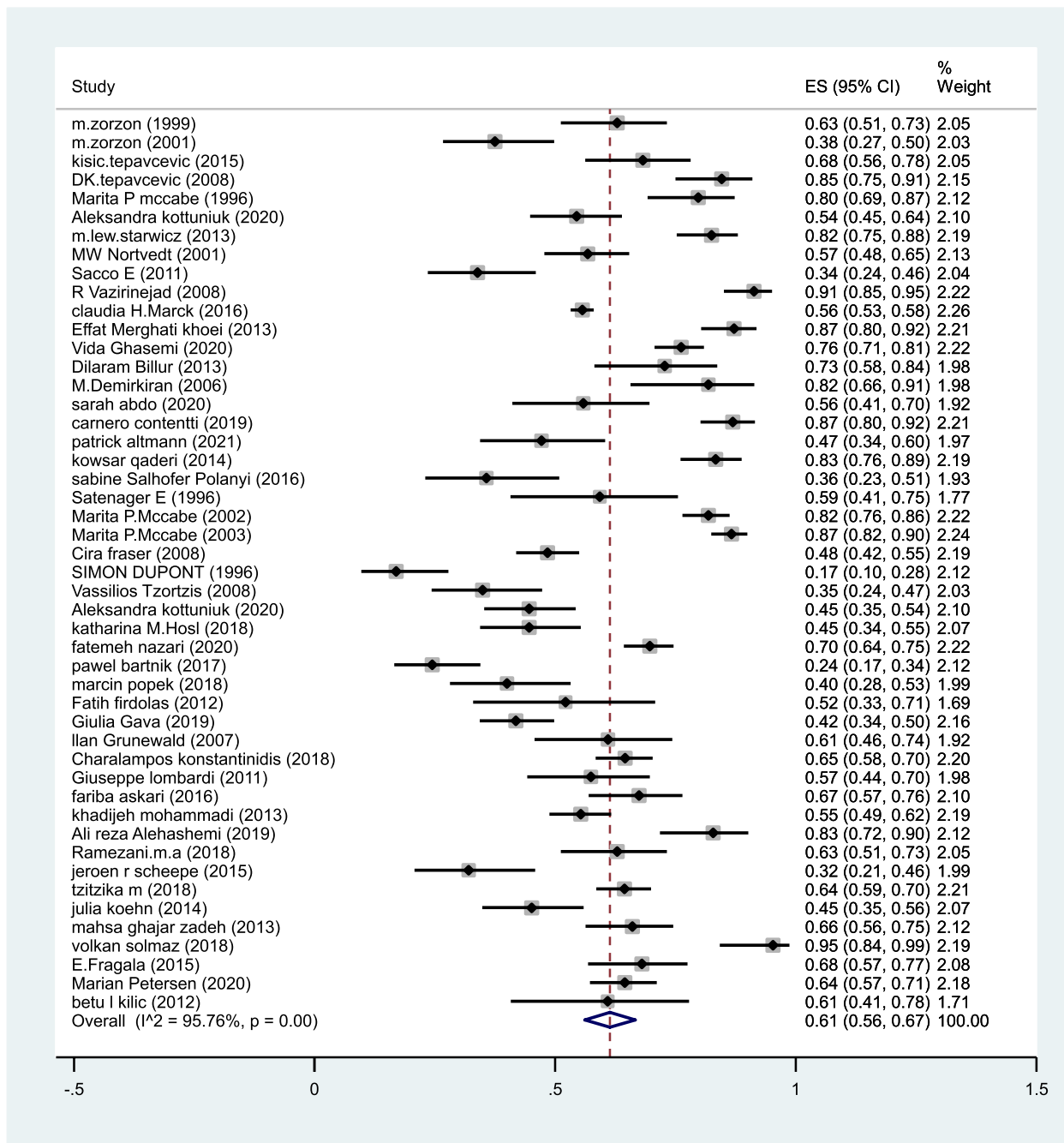


Fig. 2 The pooled prevalence of SD in MS patients

AND Sexual Arousal) OR “Sexual Arousal Disorders” OR “Frigidity”).

**Selection process**

After obtaining the results, and importing them to Endnote, they omitted duplicates. Then titles, and abstracts were screening, and potential full texts were obtained. The researchers extracted data from each study, entered in Excel, and in the case of discrepancies, the third researcher solved the problem.

**Data items**

Data regarding first author, country of origin, number of enrolled patients, number of cases with SD, mean age, mean EDSS, mean duration of the disease, were collected.

**Statistical analysis**

All statistical analyses were performed using STATA (Version 14.0; Stata Corp LP, College Station, TX, USA). To determine heterogeneity, Inconsistency ( $I^2$ ) was calculated.

We used random effects model.

**Effect measures**

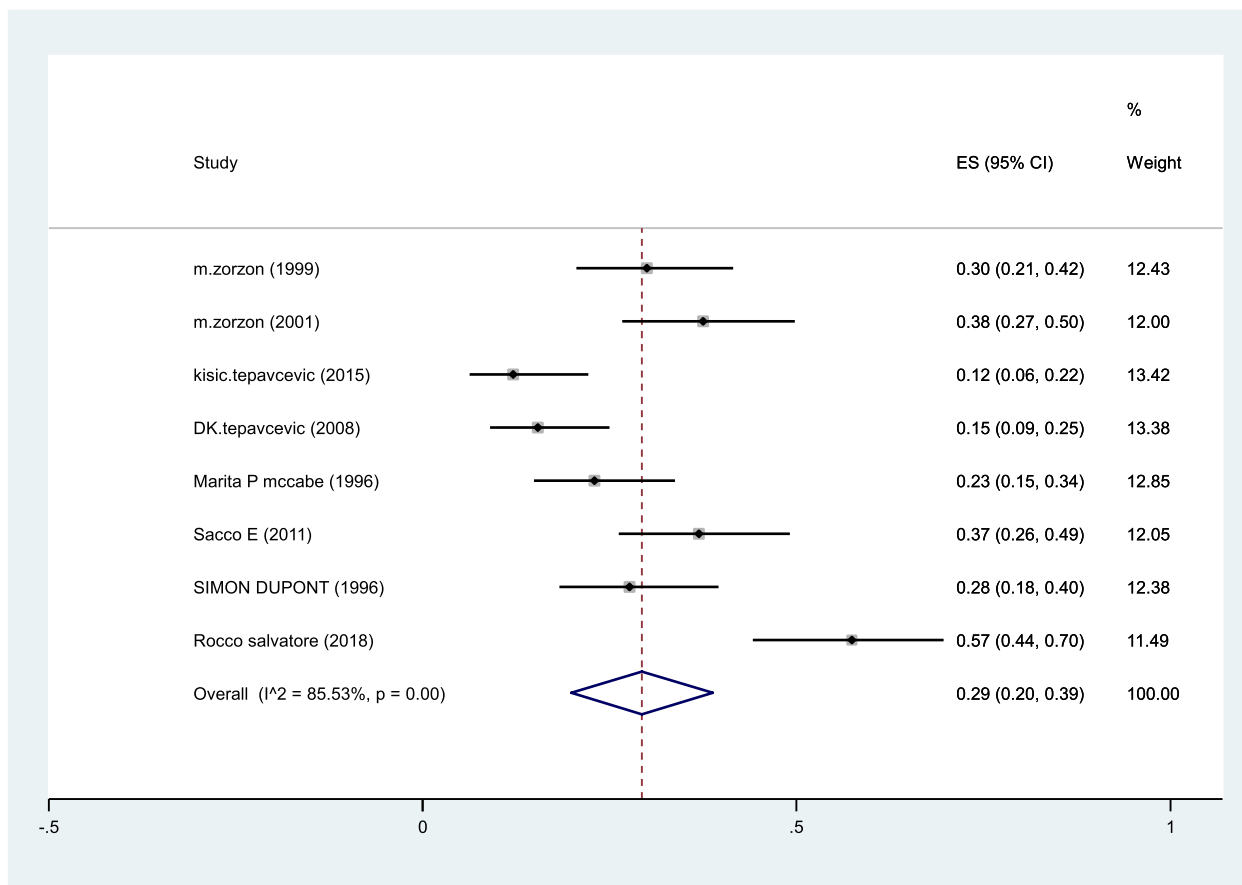
The pooled prevalence of domains of sexual function were estimated. The pooled odds ratio(OR) of developing sexual dysfunction in women with MS comparing to healthy controls were calculated.

**Results**

We found 2150 articles by literature search, after deleting duplicates 1760 remained. Fifty-six articles remained for meta-analysis (Fig. 1).

Included studies were published between 1996, and 2021. Most included studies were from Iran, followed by Italy, and Turkey. The mean age of participants ranged between 24.7, and 50.7 years, and EDSS ranged between 1.7 and 5. The most frequent applied questionnaire was FSFI (Table 1).

Totally 8980 patients were evaluated and the total number of patients with SD was 4245.



**Fig. 3** The pooled prevalence of anorgasmia in MS patients

The pooled prevalence of SD in MS patients estimated as 61% (95%CI:56–67%) ( $I^2$ :95.7%,  $P < 0.001$ ) (Fig. 2).

The pooled prevalence of Anorgasmia in MS patients estimated as 29% (95%CI:20–39%) ( $I^2$ :85.3%,  $P < 0.001$ ) (Fig. 3).

The pooled prevalence of decreased vaginal lubrication in MS patients estimated as 32%(95%CI:27–37%) ( $I^2 = 94.2%$ ,  $P < 0.001$ ) (Fig. 4).

The pooled prevalence of reduced libido was 48%(95%CI:36–61%) ( $I^2$ :92.6%,  $P < 0.001$ ) (Fig. 5).

The pooled prevalence of intercourse satisfaction was 27% (95%CI: 8–46%) ( $I^2$ :99%,  $P < 0.001$ ) (Fig. 6).

The pooled prevalence of arousal problems was 40%(95%CI: 26–54%) ( $I^2$ :97.4%,  $P < 0.001$ ) (Fig. 7).

The pooled odds of developing SD in MS women estimated as 3.05(95%CI: 1.74–5.35) ( $I^2$ :78.3%,  $P < 0.001$ ) (Fig. 8).

### Discussion

MS is a neurological disease characterized by a wide range of physical, and psychological complications. The prevalence of SD in MS is near five times higher than general population [12, 66], although it is considered poorly in this population.

To our knowledge, this is the first comprehensive systematic review and meta-analysis including all related studies evaluating SD in women with MS. We included all studies which used different questionnaires. The

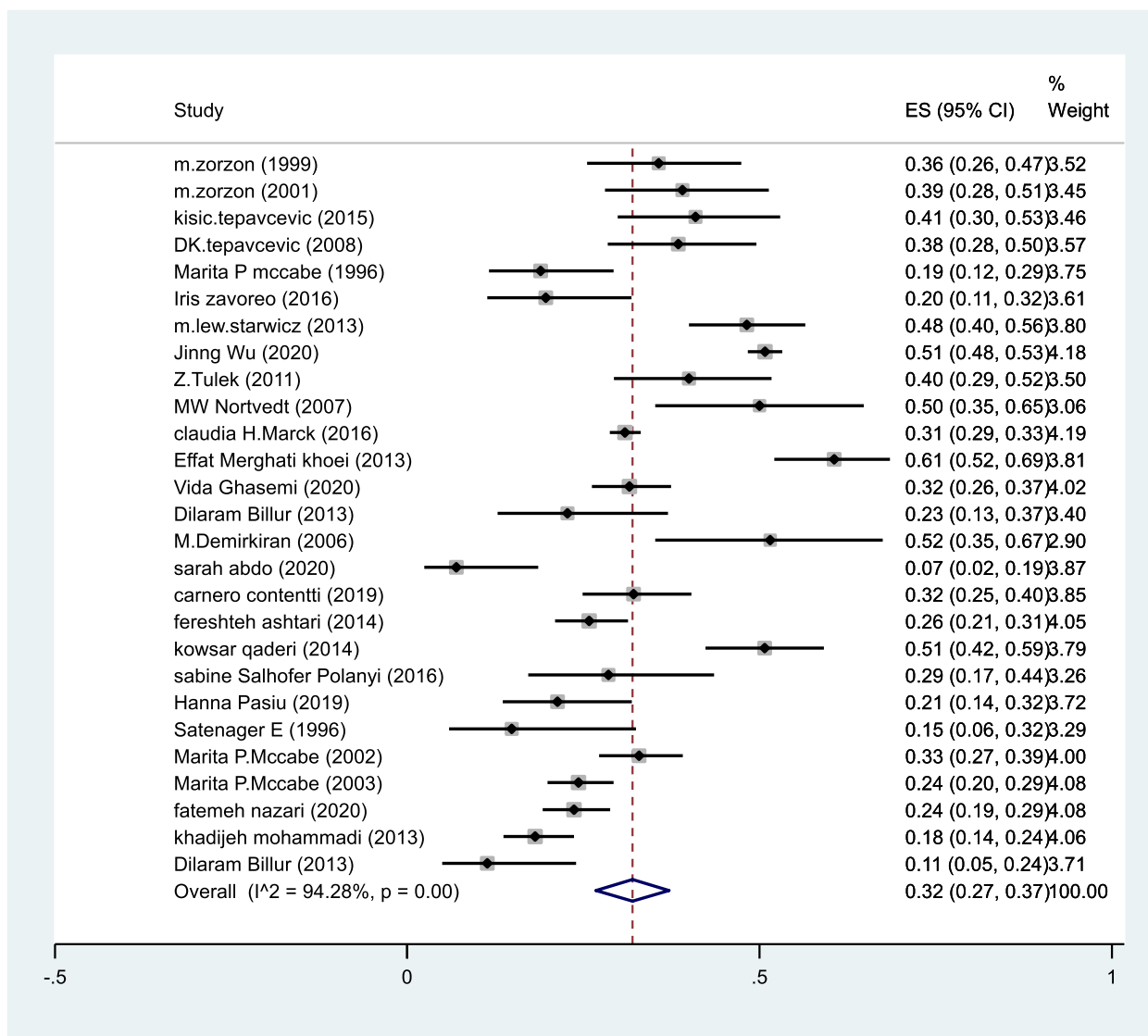
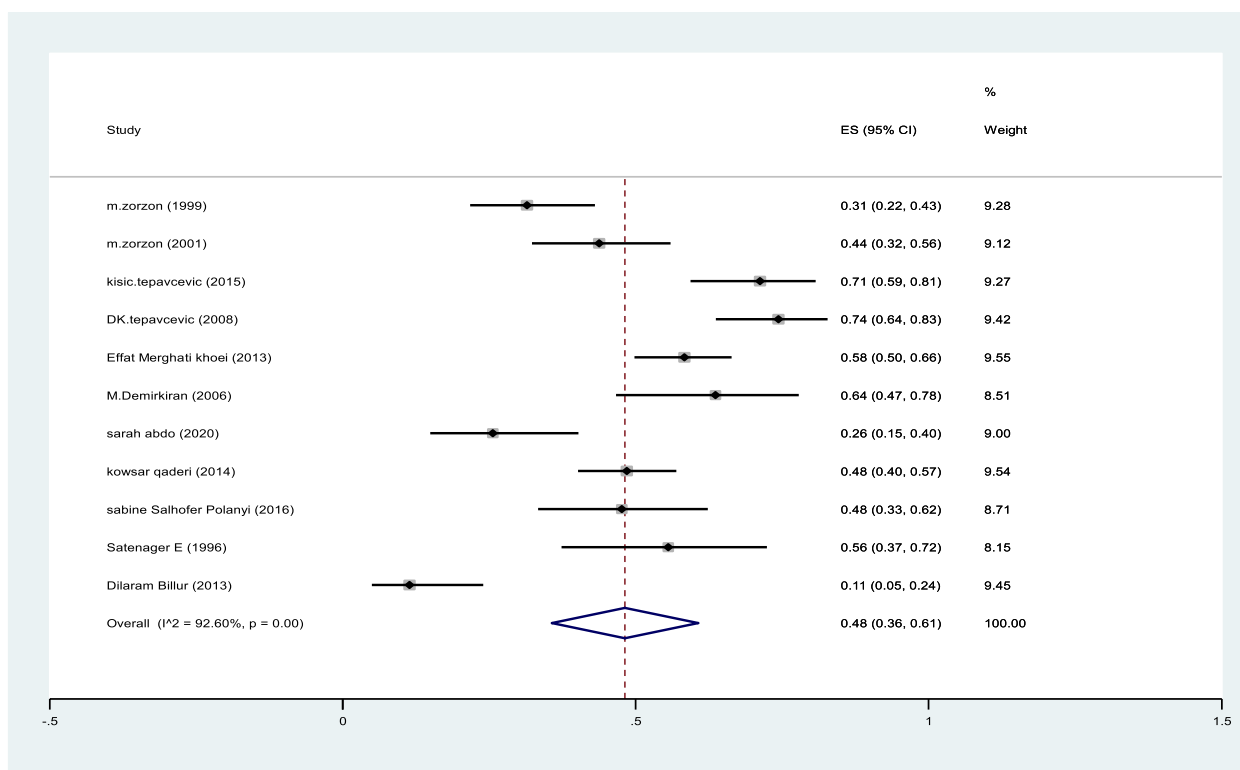


Fig. 4 The pooled prevalence of decreased vaginal lubrication in MS patients



**Fig. 5** The pooled prevalence of reduced libido in MS patients

pooled prevalence of SD was estimated as 61%, and the most common SD complaint was reduced libido (the pooled prevalence was estimated as 48%), we also found that the pooled prevalence of intercourse satisfaction was 27%.

We included all studies which applied different diagnostic tools, so our estimate would be higher than previous ones.

In a previous systematic review and meta-analysis which was conducted by Zhao et al., the relative risk (RR) of developing SD in MS women was 1.87 which shows that women with MS have 87% increased risk of developing SD [16]. They also reported lower pooled scores of desires, arousal, orgasm, satisfaction, pain, and lubrication in MS group.

In our previous systematic review, which we included only studies that applied FSFI questionnaire for evaluating SD in MS, the pooled prevalence of SD estimated as 55% [18].

In 2008, Tzorts et al. evaluated 63 women with MS using FSFI questionnaire, and reported SD in 22 and reported no depression in affected cases [7].

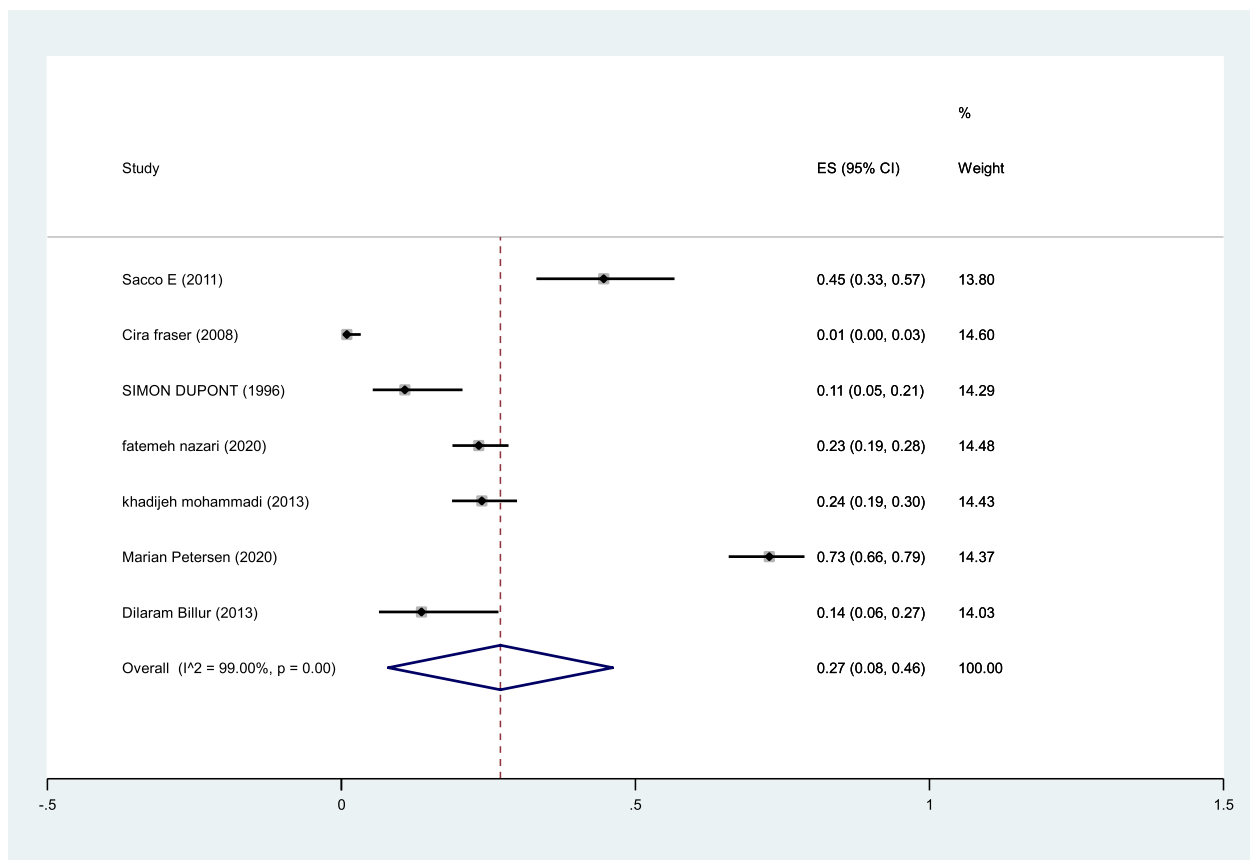
Zorzon et al. used Szasz Sexual Functioning Scale for SD assessment and reported SD in 44 out of 70 cases. Anorgasmia or hyporgasmia followed by decreased vaginal lubrication were the most affected subscales [12].

The variation about the prevalence of SD in included studies is due to unclear definition of SD, diverse inclusion, and exclusion criteria, various diagnostic methods, no standardized tools, and cultural issues.

SD is an important issue in marital life which is ignored by most physicians and patients. It is a multi-dimensional issue which affects quality of life as well as psychological well-being. Different factors such as disease duration, disability level, psychological disorders such as depression, anxiety, and stress are considered to play a role in SD development in MS while there are controversies between studies [11].

Most physicians do not pay attention to this part of their patient's lives, and patients hesitate to talk about intimate issues.

Depression is negatively correlated with FSFI score and its subscales in a previous original study [11]. On the



**Fig. 6** The pooled prevalence of reduced libido in MS patients

other hand, it is shown that depression is related with both libido reduction and arousal problems [67, 68].

In another study, higher age was associated with increased SD prevalence in MS [69] while Çelik et al. reported that SD should be evaluated in MS women at earlier stages and disease duration or disability level are not prognostic factors for developing SD [13]. Zhao et al. in their meta-analysis showed that disease duration longer than ten years, increases the risk of SD 2.5fold in MS cases [16].

Another influencing factor is bladder dysfunction in MS cases which negatively affects their sexual activity [70]. Fragala et al. investigated SD in 91% of MS women with detrusor over-activity and 66% without detrusor over-activity [62].

The association refers to S2, S3 and S4 innervation of bladder, which control sexual response [10]. On the other hand, detrusor dysfunction as a MS-related complication may reflect severe neurological disability and SD [71].

Zivadinov et al. investigated that physical disorders, depression, age at MS onset, and also

neurological impairment while they reported no correlation between SD and duration of the disease [15].

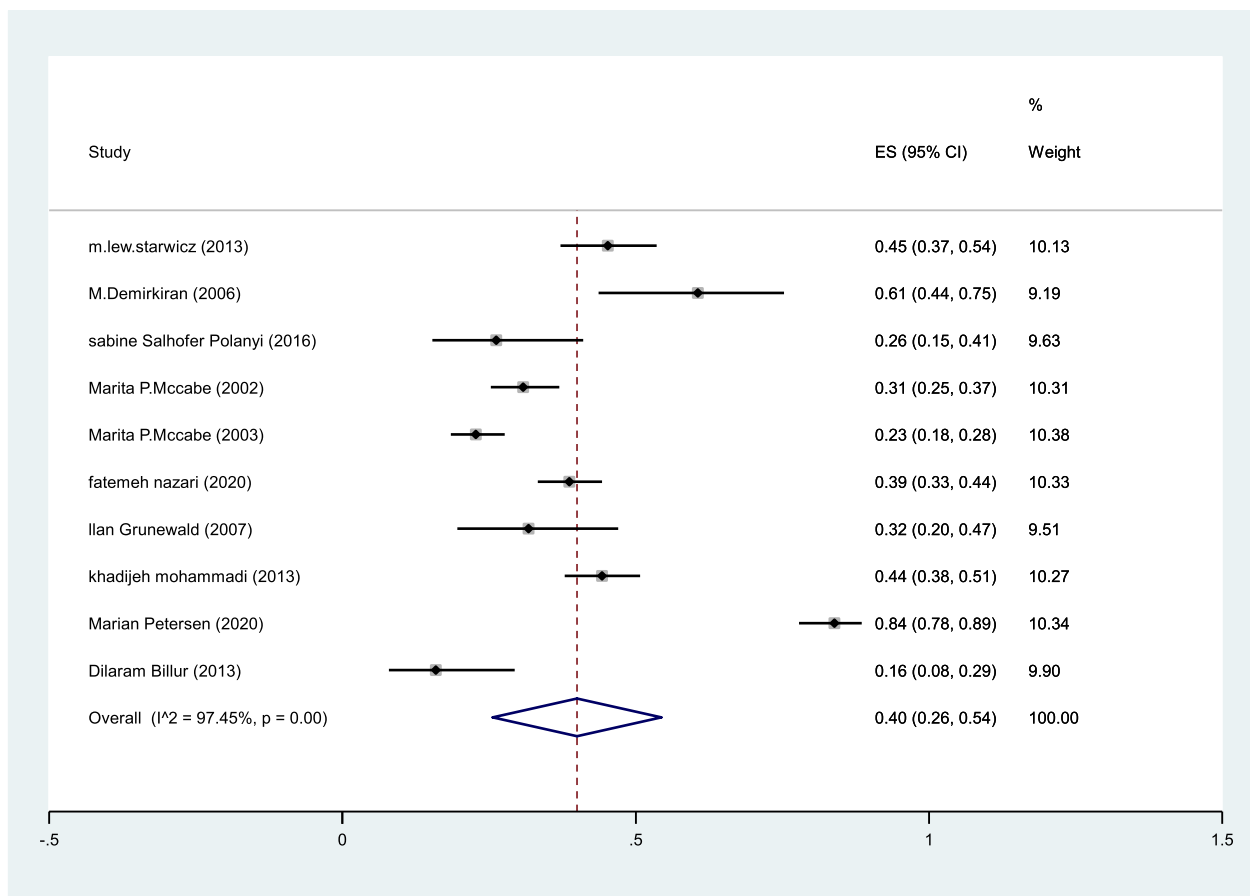
Higher disability level, depression and anxiety were related with SD presence in Demirkian et al. study [72].

This systematic review has some strength. First, we included all studies which evaluated SD. Second, the number of included studies is high. Third, we analyzed all subscales of SD.

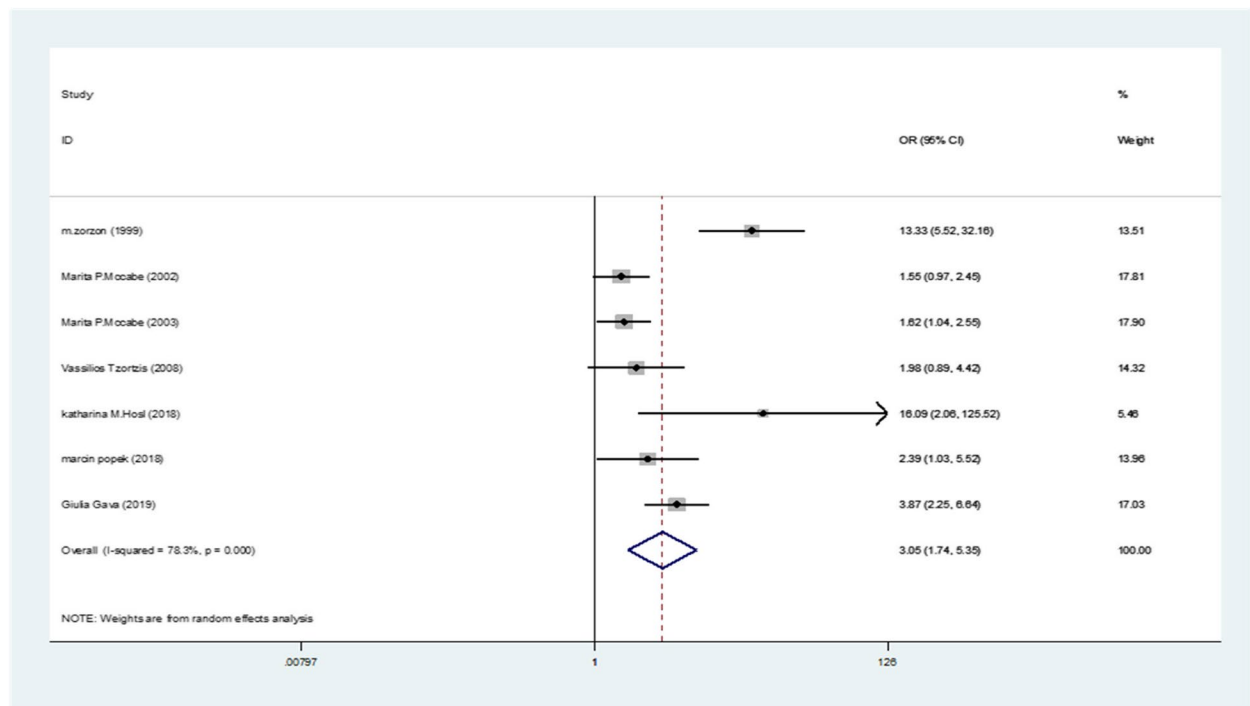
We also had some limitations. First, all included studies used various diagnostic tools. Second, there was no clear definition of SD. Third, inclusion criteria of participants differed between studies.

**Conclusion**

The result of this systematic review and meta-analysis show that the pooled prevalence of SD in women with MS is 61% and the odds of developing SD in comparison with controls is 3.05.



**Fig. 7** The pooled prevalence of arousal problems in MS patients



**Fig. 8** The pooled odds of developing SD in women with compared to healthy controls

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**Authors' contributions**

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