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The Prevalence of Sexual Dysfunction in the Different Menopausal Stages: A Systematic Review and Meta-Analysis

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ABSTRACT

Objectives: Despite the noticeable advances in sexual dysfunction (SD) research in the menopausal period, scientific literature showed different reports on the prevalence of SD in the menopausal stages. The primary objective of this study was to systematically review and meta-analysis the prevalence of SD in the different menopausal stages and then meta-analysis the included studies in domains of SD separately. *Methods:* In this systematic review and meta-analysis, keywords were retrieved through MeSH strategy and databases such as PubMed/MEDLINE, PsycINFO, Web of Science (ISI), Scopus, ScienceDirect, SID (Scientific Information Database), Magiran, and Google scholar were searched. Manual review of retrieved citations identified additional citations. The quality of the included studies was assessed using The Newcastle-Ottawa Scale. The main outcome measure in this study was the prevalence of SD in three stages of menopause such as pre, peri, and postmenopause.

Results: Of 54 included studies 81,227 menopausal aged women from different menopause stages participated and the sample sizes varied from 49 to 31,581 individuals. The articles from 17 countries worldwide were included in this study. The prevalence of SD in premenopausal aged women was ranged between 22.7% and 72.2%, in perimenopausal aged women, was 37.3–78.2% and also in postmenopausal aged women was extremely reported a wide variety of prevalence ranges and was estimated between 8.7% and 89.01%. The premenopausal women had a lower prevalence of SD compared to other stages of the menopausal period. *Conclusion:* The results indicated that the prevalence of SD and also domains of SD in different studies were reported much widely. This study can be used as a good resource for obstetricians to understand the high possibility of recurrence of SD and assess the sexual activity of menopausal aged women in the menopause clinic. However, based on the systematic review, more standard and high-quality studies are needed to perform regarding the prevalence of SD in menopausal periods.

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1. Introduction

Menopause is the natural phenomenon defined as a permanent menstrual cessation for 12 months due to the loss of ovarian follicular activity and the reduction of ovarian steroid hormone production (Roberts & Hickey, 2016; Thomas & Thurston, 2016). Based on the literature, menopause divided into three stages such as pre- menopausal, perimenopausal and postmenopausal stages. The pre-menopausal period consists of the reproductive age or the time between the first period and when she gets to the final period. In this stage, women may experience the fluctuation of hormones level (Phipps et al., 2010). Perimenopausal stages start with the first onset of menstrual irregularity symptoms and ends after

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one year of amenorrhea. On the other hand, perimenopausal is defined as the final years of a female's reproductive period (Santoro, 2016). The postmenopausal stage is considered as stopping the menstrual period for more than 12 months due to the natural causes (Dalal & Agarwal, 2015). Menopause is accompanied by anatomical, physiological, and psychological changes that often affect women's sexual functions (Dąbrowska-Galas et al., 2019; Naeij et al., 2019).

In most western countries, although the sexual health is an important and considerable issue however, the individual's knowledge regarding the relation between the sexual health, quality of life, and aging is limited, and scientific research in this regard is still scarce (Træen et al., 2017). Menopausal period is associated with number of adjustments appeared by the endocrine system which reduce the level of estrogen in the body and lead to physiological and psychological changes which influence women's sexuality (Nazarpour et al., 2018). Changes in women's sexual function (SD) and desire are one of the most common symptoms in this period (Thompson et al., 2011). SD cycle is influenced by neurological (central and peripheral nervous system neurotransmitters), hormonal (sex hormones), vascular (genital blood flow) and anatomical (components of pelvic floor muscles) systems which all are contributed in maintaining normal sexual function cycle in women (Elyasi et al., 2015; Latif & Diamond, 2013). American Psychiatric Association (APA) classified women's SD as sexual interest/arousal disorder, genito-pelvic pain/penetration disorder, substance/medication-induced SD and other specified or unspecified SDs (APA, 2013).

Evidence suggests that there is a significant relationship between experiencing sexual symptoms and menopausal status (Islam et al., 2018). A decline in sexual activity and vaginal dryness followed by estrogen level reduction, may develop the sexual problems in the menopausal period (Dąbrowska-Galas et al., 2019; Zhang et al., 2017). The prevalence of SD varies among women from different ethnic and cultural groups (Asadi et al., 2012; Ghanbarzadeh et al., 2013; Heidari et al., 2019). According to the results of studies, the prevalence of SD including sexual desire, arousal, satisfaction, orgasm, and pain disorders among postmenopausal women has been shown to be between 26.0% and 85.2% (Masliza et al., 2014; Nazarpour et al., 2018). Sexual well-being during menopause will be an important issue and may be an unattainable goal for many women (Simon et al., 2018). Based on the results of studies, spousal relationship issues and other psychosocial factors such as health of the partner, conflicts in the family and history of psychiatric disorders can strongly impact women's overall sexual experience and well-being after menopause (Avis et al., 2004; Blumel et al., 2009). Also in other words, SD may significantly lead to lowered self-esteem, impaired quality of life and social activities (Mernone et al., 2019; Nappi et al., 2016; Nazarpour et al., 2016), emotional distress (Tehrani et al., 2014), and difficulty in marital communications (Kalra et al., 2014).

A comprehensive literature search showed that despite of performing various studies on the prevalence of SD in menopausal women all over the world (Cumming et al., 2010; Dąbrowska-Galas et al., 2019; Heidari et al., 2019; McCool et al., 2016), but there is no systematic review and meta-analysis regarding the prevalence of SD in different stages of menopause. Only there was some systematic review and meta-analysis which assessed the prevalence of female SD (McCool et al., 2016) and affecting factors of menopause (Heidari et al., 2019; Nazarpour et al., 2016). Given the importance of SD issue in the menopausal aged women, this study aimed to systematically review Persian and English languages published studies as far available regarding the prevalence of SD in the different menopausal stages.

2. Materials and methods

This present study is a systematic review and meta-analysis of the current research literature on the prevalence of SD in menopausal stages women all over the world. This study was performed following by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009; Shamseer et al., 2015). The protocol of this study

was accepted in PROSPERO, Available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42018116278. Also, the ethical code for this study was IR.MAZUMS.REC.1397.3288.

2.1. Literature search and search strategy

A comprehensive literature search was conducted in the electronic databases including PubMed/MEDLINE, PsycINFO, Web of Science (ISI), Scopus, ScienceDirect, SID (Scientific Information Database), Magiran, and Google scholar. No limitations were considered for publication date and also Persian and English languages articles were included. The latest search was performed between "August 2020 to September 2020". The search was conducted separately by two researchers in this period of time and then checked by them. The search process was mainly based on systematic searches using Persian and English keywords as follows: ["cross-sectional studies" OR "descriptive studies" OR "cohort studies" OR "prospective studies" OR "longitudinal"] AND ["menopause" OR "climacteric" OR "menopausal stages" OR "premenopause" OR "perimenopause" OR "postmenopause" OR "middle-aged women" OR "midlife women"] AND ["sexual dysfunction" OR "sexual disorders" OR "sexual problem" OR "hypoactive sexual desire disorder" OR "arousal disorder" OR "orgasmic dysfunction disorder" OR "lubrication problems" OR "dyspareunia" OR "vaginal dryness" OR "Genito-pelvic pain/penetration disorder" OR female sexual distress disorder"]. In order to identify more relevant citations, reference lists of included studies were also searched manually.

2.2. Inclusion and exclusion criteria

Two researchers (S.Kh and M.A) independently conducted the screening of titles and abstracts and if a study was relevant, the manuscript obtained and reviewed in full-text versions for further assessment according to the inclusion and exclusion criteria. We included cross-sectional or cohort studies reported the prevalence of SD in different stages of menopause, performed on healthy menopausal aged women and also studies in Persian and English languages, with no year of publication limitation. In contrast, cross-sectional or cohort studies reported SD with no definition or determination of menopausal stages in the methodology section, conducted in menopausal aged women with chronic or specific diseases or women received hormone therapy, or with premature or surgical menopause, studies which reported the mean ± standard deviation of SD even in menopausal stages, gray literature and study designs such as randomized clinical trials, case report, narrative review, editorial, case reports and etc., were excluded in the abstract screening stage. It should be noted that final included studies were selected based on these criteria.

The Stages of Reproductive Aging Workshop (Harlow et al.) are recognized the changes in menstrual cycle characteristics as the important early markers of the menopausal transition (Gracia et al., 2005). A woman was classified as premenopausal if she had regular menstrual cycles with no change in cycle length. Perimenopause was defined as having menstrual irregularity and having nine or fewer menstrual cycles during the 12 months period. Postmenopause was characterized as having at least 12 consecutive months of amenorrhea associated with no other medical causes (Gracia et al., 2005; Sowers et al., 2008).

2.3. Type of outcome measure

The primary outcome measured in this study was systematically assessment the prevalence of SD in different stages of menopause according to published relevant articles and the secondary outcome was to perform a meta-analysis of SD in various domains of SD in different menopausal stages in included studies.

2.4. Methodological quality assessment

The Newcastle–Ottawa Scale (NOS) is one of the most known scales for assessing the quality and the risk of bias in the observational studies (Margulis et al., 2014; Stang, 2010). The NOS can

be used for cross-sectional, case-control, and cohort studies (Wells et al., 2016). The NOS evaluates three quality parameters (selection, comparability, and outcome) divided across eight specific items, which slightly differ when scoring cross-sectional, case–control, and cohort studies. Each item on the scale is scored from one point, except for the comparability parameter, which scores up to two points. Thus, the maximum for each study is 9 and studies with a score of fewer than 5 points have been identified as high risk of bias (Luchini et al., 2017; Wells et al., 2016).

2.5. Data collection and extraction

The full texts of the selected articles were read carefully and the required information was extracted into descriptive tables and was cross-checked by S. Kh. To avoid the possibility of bias, the search process, the selection of studies, the quality assessment, and data extraction were conducted by two researchers independently and in the case of disagreement, results were assessed by a third researcher. We extracted data such as first author, publication year, country, sampling method, setting, sample size, participant's age groups, type and distribution of menopausal status, instruments, the prevalence of female SD based on their menopausal status.

2.6. Statistical analysis

The STATA software version 11 was used to analyze data. The heterogeneity index between the studies was determined using I^2 tests. The Random Effect Model (REM) was used to estimate the standardized difference of the prevalence of SD in different menopausal stages. Standardized difference spot of the SD prevalence was estimated with a 95% confidence interval (CI) in the forest plots, in which the square plot represented the weight of each study and the lines on both sides indicated a 95% CI and the significance level of less than 0.05 was used as the judgment criterion.

3. Results

The search resulted in 3108 articles. After excluding duplicate results ($n = 631$), 2477 articles remained. The titles and abstracts screening led to the exclusion of 1944 articles. During a full-text appraisal, articles that were assessed SD in reproductive-aged women with no refer to pre-menopausal aged ($n = 15$), clinical trials ($n = 143$), case reports ($n = 3$), narratives review, editorial studies ($n = 121$), cross-sectional studies which not assessed the prevalence of SD ($n = 197$) were excluded from the study. Finally, 54 articles remained for this systematic review and meta-analysis process (Figure 1).

3.1. Characteristics of studies included studies

The results of the included studies are shown in Table 1. Of the 54 included studies, 15 studies were conducted in Iran (Alizadeh et al., 2015; Arman et al., 2005; Beigi & Fahami, 2008; Beigi et al., 2008; Eftekhar et al., 2016; Ghazanfarpour et al., 2015; Hashemi et al., 2013; Jamali et al., 2016; Merghati-Khoei et al., 2014; Moghassemi et al., 2011; Nazarpour, Simbar, Tehrani, et al., 2016; Nazarpour et al., 2018; Safaei & Rajabzadeh, 2017; Safarinejad, 2006; Yazdanpanahi et al., 2018), 11 studies were in the United States (Biddle et al., 2009; Blümel et al., 2009; Jonusiene et al., 2013; Leiblum et al., 2006; Levine et al., 2008; Rosen et al., 2012, 2012; Santoro & Komi, 2009; Shifren et al., 2008; West et al., 2008), four studies in Brazil (Cabral et al., 2012; Dombek et al., 2016; Valadares et al., 2008, 2016), three studies were in Italy (Berra et al., 2010; Cagnacci et al., 2020; Pace et al., 2009), two studies in Australia (Gartoulla et al., 2015; Zeleke et al., 2017), two studies in Thailand (Indhavivadhana et al., 2010; Peeyananjarassri et al., 2008), one study was in Hong Kong (Lo & Kok, 2013), three studies in Turkey (Alarslan et al., 2011; Verit et al., 2009; Yağmur & Orhan, 2019), three studies in Korea (Chang et al., 2019; Park et al., 2015; Park et al., 2003), two studies in India (Mishra et al., 2016; Santpure et al., 2016), two studies in China (Kong et al., 2019; Tong et al., 2019), one study in Egypt (Hassanin et al., 2010), one study in Malaysia (Ishak et al., 2010),

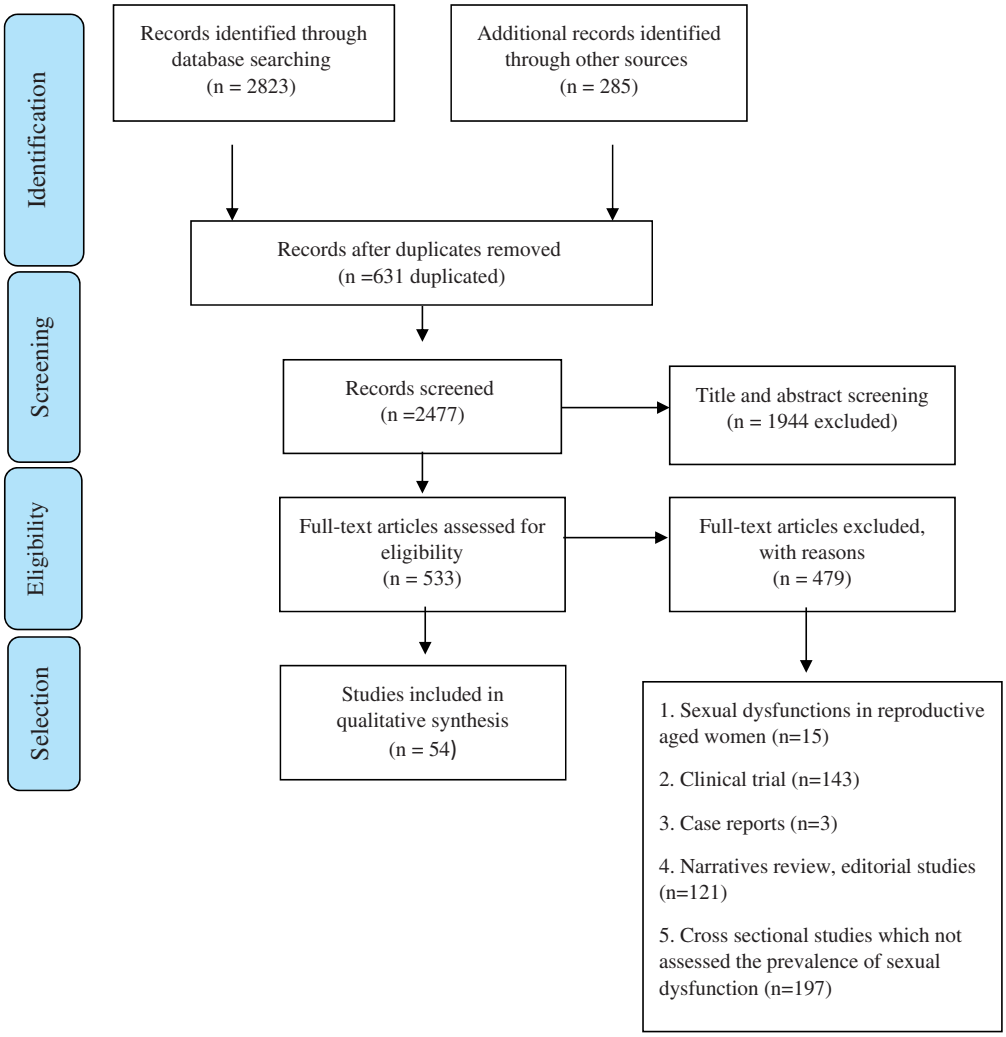

Figure 1. PRISMA flow diagram.

one study in Chile (Castelo-Branco et al., 2003), one study in Spain (Yanez et al., 2006), one study in Poland (Dąbrowska-Galas, 2019), and one study was carried out in four countries such as France, Germany, Italy, and United Kingdom (Dennerstein et al., 2006). The included studies were published between 2003 and 2019. Of 54 studies included, 81,227 menopausal aged women from different menopausal stages participated and the sample sizes varied from 49 to 31,581 individuals. Of the 54 included studies, 49 studies were cross-sectional design, and five studies were prospective cohort studies. Random sampling method was used in 20 articles (Arman et al., 2005; Avis et al., 2009; Beigi & Fahami, 2008; Beigi et al., 2008; Biddle et al., 2009; Blümel et al., 2009; Cabral et al., 2012; Dąbrowska-Galas, 2019; Dennerstein et al., 2006; Gartoulla et al., 2015; Ghazanfarpour et al., 2015; Kong et al., 2019; Nazarpour et al., 2016; Park et al., 2003; Safarinejad, 2006; Santoro & Komi, 2009; Valadares et al., 2008, 2016; Yağmur & Orhan, 2019; Zeleke et al., 2017). In 24 studies, convenience method was used for data collection, in eight studies, random cluster sampling, multistage cluster sampling, stratified, cluster sampling were used. Only two studies census method was applied to data sampling. In 26 studies, Female Sexual Function Index (FSFI) was used to assess the prevalence of SD in menopausal aged women. Other questionnaires such as the Profile of Female Sexual Function (PFSF) was used in five studies. To assess sexual distress in menopausal aged women, two questionnaires were used in the included studies. Female Sexual Distress Scale (FSDS) was used in three studies to assess the prevalence of sexual distress. The Personal Distress Scale (PDS) is also used in four studies.

Table 1. Characteristics of included studies in systematic review and meta-analysis ($n = 54$).

First author, Country	Year of study	Age groups (Nakib G)	Sampling method	Type of study	Sample size	Instruments	Source of sampling selection
C. CASTELO-BRANCO, Chile	2003	40–64	Convenience	Cohort	534	Interview through DSM-IV	Clinic
Park, Korea	2003	41–65	Disproportional stratified random sampling	Cross-sectional	2196	A semi-structured questionnaire	Community
Leiblum, USA	2005	20–70	Census	cross-sectional	952	PFSF, PDS	Community
Arman, Iran	2005	40–76	Random cluster sampling	cross sectional	174	structured questionnaire	Clinic
D. Yánez, Spain	2006	40–65	Convenience	Cohort	385	DSM-IV	Clinic
Dennerstein, France, Germany, Italy,UK	2006	20–70	Random	Cross-sectional	2467	PFSF, PDS	Community
Safarinejad, Iran	2006	20–60	Random	cross-sectional	2626	FSDS, FSFI	Community
Beigi, Iran	2007	–	Random	Cross-sectional	174	Self-made questionnaire	clinic
Shifren, USA	2008	18–>65	Census	Cross-sectional	31581	FSDS, CSFQ-14	Community
Beigi, Iran	2008	–	Random	Cross-sectional	174	self-made questionnaire	clinic
West, USA	2008	30–70	dual-frame approach and a list-assisted random-digit dialing	Cross-sectional	2207	PFSF, PDS	Community
Valadares, Brazil	2008	40–65	Random	Cross-sectional	315	PEQ	Community
Levine, USA	2008	40–65	random digit dialing and probability	Cross-sectional	1480	ASEX	community
Peeyananjarassri, Thailand	2008	45–55	Convenience	Cross-sectional	219	FSFI	clinic
Verit, Turkey	2009	19–60	Convenience	Cross-sectional	180	FSFI	Clinic
Biddle, USA	2009	30–70	Random	Cross-sectional	1189	PFSF,PDS, SF-12 health survey	Community
Santoro, USA	2009	45≤	Random	Cross-sectional	3471	self-reported	Community
Blü mel, Latin America	2009	40–59	Random	Cross-sectional	7243	MRS, FSFI	Clinic
Pace, Italy	2009	48–69	Convenience	Prospective cohort	158	FSFI, UDI-6	Clinic
Avis, USA	2009	42–52	Random	Cohort	3302	Interview	Community
Berra, Italy	2010	21–72	Convenience	cross-sectional	100	FSFI, FSDS	clinic
Indhavivadhana, Thailand	2010	55< >	Convenience	Cross-sectional	97	structured questionnaire	Clinic
Hassanin, Egypt	2010	>40	Convenience	Cross-sectional	601	DSM-IV	Clinic
Ishak, Malaysia	2010	18–65	Convenience	Cross-sectional	163	FSFI	Clinic
Moghasemi, Iran	2011	43–64	Convenience	Cross-sectional	149	FSFI	Clinic
Alarslan, Turkey	2011		Convenience	Cross-sectional	83	FSFI	Clinic
Rosen, USA	2012	18≤	A stratified, cluster sampling	Cross-sectional	701	Validated structured diagnostic interview based on DSM-IV	Clinic
Cabral, Brazil	2012	40–65	Random	cross-sectional	370	FSFI	Clinic
Rosen, USA	2012	≥18	Convenience	cross-sectional	1574	FSFI	Clinic
Tsing Lo, Hong Kong	2013	40–60	Convenience	cross-sectional	371	DSM-IV, self-administered questionnaire	Clinic
Hashemi, Iran	2013	45–65	multistage probability cluster sampling	Cross-sectional	225	self- made sexual attitudes and the sexual function questionnaires	Community
Jonusiene, USA	2013	45–65	Convenience	cross-sectional	246	FSFI, GCS	Clinic
Merghati-Khoei, Iran	2014	40–65	multistage cluster sampling	Cross-sectional	200	PFSF	Clinic

(*continued*)

Table 1. Continued.

First author, Country	Year of study	Age groups (Nakib G)	Sampling method	Type of study	Sample size	Instruments	Source of sampling selection
Alizadeh, Iran	2014	40–60	Convenience	cross-sectional	300	MENQOL	Clinic
Park, South Korea	2015	50–74	multistage stratified cluster	Cross-sectional	3828	the Korean version of the Composite International Diagnostic Interview (CIDI)	Community
Nazarpour, Iran	2015	40–65	A multistage, random sampling	Cross-sectional	405	FSFI, MRS	community
Gartoulla, Australia	−2015	40–65	Random cluster	Cross-sectional	2020	MENQOL	Community
Ghazanfarpour, Iran	2015	38–78	Random	Cross-sectional	349	MENQOL	Clinic
Valadares, Brazil	2015	45–60	Simple random sampling	cross-sectional	736	PEQ, MRS	Community
Yazdanpanahi, Iran	2015	40–>65	Convenience	cross-sectional	310	FSFI	Clinic
Mishra, India	2016	>40	Convenience	Cross-sectional	49	FSFI	Clinic
Santpure, India	2016	46–65	Convenience	Cross-sectional	520	Semi-structured questionnaire	Hospital
Dombek, Brazil	2016	45–65	Convenience	Cross-sectional	111	MRS, FSFI	Clinic
Zeleke, Australia	2016	65–79	Random	Cross-sectional	1548	FSFI, FSDS, MENQOL	Community
Eftekhar, Iran	2016	40–60	Convenience	cross-sectional	151	FSFI	Clinic
Jamali, Iran	2016	50–89	Convenience	cross-sectional	746	FSFI	Clinic
Safaei, Iran	2017	45–85	Convenience	Cross-sectional	200	FSFI	Clinic
Nazarpour, Iran	2017	40–65	multistage probability cluster sampling	cross-sectional	405	FSFI	Community
Tong, China	2018	45–64	multistage, stratified, cluster sampling	cross-sectional	1440	FSFI	Community
Dąbrowska-Galas, Poland	2019	40–65	Random	cross-sectional	320	FSFI	Clinic
Kong, China	2019	45–60	Random	cross-sectional	120	MRS	Clinic
Yağmur, Turkey	2019	35–64	Random	cross-sectional	310	FSFI	Clinic
Chang, Korea	2019	40–65	Convenience	Cohort	841	FSFI	Clinic
Cagnacci, Italy	2019	40–55	Convenience	cross-sectional	518	FSFI	Clinic

DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, 4th Edition; PFSF: Patient Specific Functional Scale; PDS: Posttraumatic Diagnostic Scale; FSDS: The Female Sexual Distress Scale; FSFI: The Female Sexual Function Index; CSFQ: The Changes in Sexual Functioning Questionnaire; PEQ: the Short Personal Experiences Questionnaire; ASEX: Arizona Sexual Experiences Scale; SF-12: Short Form-12 health survey; MRS: Menopause Rating Scale; UDI-6: Urinary Distress Inventory, Short Form-6; GCS: Greene Climacteric Scale; MENQOL: Menopause Quality of Life questionnaire,.

Interview based on Diagnostic and Statistical Manual of Mental disorder (DSM-IV) was used in seven studies to assess the possibility of sexual disorders in samples. In eight studies. no validated questionnaire and self-made (semi-structured) or self-made structured instruments were used for assessing the SDs. Menopause Rating Scale (MRS), Green Climacteric Scale (GCS), and Menopause specific Quality of Life (MENQOL) questionnaire were used in five, one, and four studies respectively. Of 54 included studies, 34 studies were conducted in the clinic environment, 19 studies sampling were conducted in the community, and only in 1 study sampling was in the hospital.

3.2. The prevalence of sexual disorders based on the included studies

The prevalence of sexual disorders was shown in Tables 2–4. In this study, each of the sexual disorders was reported based on the menopausal stages separately. The prevalence of SD in premenopausal aged women was ranged between 22.7% and 72.2%, in perimenopausal aged women, was 37.3–78.2% and also in postmenopausal aged women was extremely wide range and was estimated between 8.7% and 89.01%. The prevalence of sexual desire disorder (SDD) was 16.0–57.6% in premenopause, 36.0–93.7% in perimenopausal aged women, and 4.2–93.0% in postmenopausal aged women. The prevalence of sexual arousal disorder based on included studies was 22.2–52.9% in premenopausal aged women, 27.8–100% in perimenopausal women and 7.7–91.8% in postmenopausal women. The prevalence of orgasmic disorder was 14.2–54.1% in premenopause, 41.6–75.0% in perimenopausal period, and 7.0–86.9% in postmenopausal aged women. The prevalence of lubrication problems in premenopausal based on included articles was estimated 6.2−50.0% in premenopausal aged women, 40.0–52.6% in perimenopausal aged women, and 10.7–93% in postmenopausal women. The prevalence of sexual pain disorder was estimated 2.7–65.6% in premenopausal aged women, 30.4–75.0% in perimenopausal aged women and 2.4–90.4% in postmenopausal aged women. The prevalence of unsatisfaction

Table 2. Prevalence of sexual dysfunction premenopausal aged women based on the results of the included studies (%).

Author	Prevalence of FSD	Prevalence of low sexual desire	Prevalence of arousal disorder	Prevalence of orgasm disorder	Prevalence of lubrication problems	Prevalence of pain disorder	Prevalence of unsatisfaction	Prevalence of HSDD	Prevalenceof sexual distress
Alizadeh	–	31.9	–	–	28.1	–	–	–	–
Berra	25.0	29.2	52.9	52.6	50.0	65.6	64.5		64.5
Leiblum	–	24.0	–	–	–	–	–	–	59.0
Tsing Lo	72.2	32.5	33.3	35.9	29.1	25.7	–		–
West		26.7	–	–	–	–	–	6.6	
Verit	47.7	–	–	–	–	–	–		–
Valadares	24.2	–	–	–	–	–	–		–
Rosen	–	–	–	–	–	–	–	50.0	–
Dennerstein	–	16.0	–	–	–	–	–	7.0	–
Gartoulla	43.5		–	–					
Shifren	–	57.6	49.7	54.1	–	–	–	–	–
Rosen	35.6			–			21.7	57.8	–
Avis	–	34.5	22.2	–	–	60.7	–	–	–
Valadares	22.7	–	–	–	–	–	–	–	–
Tong	42.8	37.1	33.2	36.7	27.1	16.6	55.6	–	–
Chang	55.0	40.8	26.6	14.2	6.2	2.7	6.2	–	–

Table 3. Prevalence of sexual dysfunction perimenopausal aged women based on the results of the included studies (%).

Author	Prevalence of FSD	Prevalence of low sexual desire	Prevalence of arousal disorder	Prevalence of orgasm disorder	Prevalence of lubrication problems	Prevalence of pain disorder	Prevalence of unsatisfaction	Prevalence of HSDD	Prevalence of sexual distress
Alizadeh	–	48.0	–	–	40.0	–	–	–	–
Tsing Lo	78.2	36.0	38.4	41.6	44.0	30.4	–	–	–
Mishra	41.0	93.7	100.0	75.0	52.6	75.0	–	–	–
Valadares	37.3	–	–	–	–	–	–	–	–
Avis	–	38.0	27.8	–	–	53.6	–	–	–

(unsatisfactory sexual intercourse) was 6.2–64.5% in premenopause, 14.0–79.7% in postmenopause women. The prevalence of hypoactive sexual desire disorder (HSDD) in premenopausal aged women was 6.6–57.8% and also in postmenopausal aged women was considered 6.6–54.5%. The prevalence of sexual distress was estimated between 59–64.5% in the premenopausal stage and based on three included studies the prevalence of sexual distress among postmenopause women was 15.5–36.2%. There was no study among included studies to assess the prevalence of unsatisfaction, HSDD and sexual distress in the perimenopausal stage.

3.3. Meta-analysis results

3.3.1. The prevalence of SD in menopausal stages

The highest prevalence of SD in premenopausal women was in the study of TSING Lo et, al in Hong Kong with a sample size of 371, which reported as 72.20% (67.64–76.76) (Lo & Kok, 2013) and the lowest prevalence was in the Valadares study in Brazil with a sample size of 736 which had been reported 22.70% (Valadares et al., 2016) (Figure 2). By combining the results of nine studies, the overall prevalence of SD in premenopausal women with a CI95% and based on the REM was estimated at 41.05% (32.40–49.69). The prevalence of SD in perimenopausal aged women was assessed only in three included studies. Based on the meta-analysis result, the highest prevalence of SD was seen in TSING Lo et, al in Hong Kong which reported 78.20% (74.00–82.40) and the lowest prevalence of SD in perimenopausal women was 37.30% (31.96–42.64) which reported in Valadares study in Brazil (Valadares et al., 2008). The overall prevalence of SD among perimenopausal aged women according to combining of the results of three studies, with a $CI_{95\%}$ confidence interval and based on the REM was estimated at 52.41% (21.08–83.74) (Figure 3). The highest prevalence of SD in postmenopausal women was in Hassanin et al study in Egypt with a sample size of 601 which reported as 89.01% (86.51–91.51) (Hassanin et al., 2010) and the lowest prevalence was in the Park study in South Korea with a sample size of 3828 which the prevalence of SD

Table 4. Prevalence of sexual dysfunction postmenopausal aged women based on the results of the included studies (%).

Author	Prevalence of FSD	Prevalence of low sexual desire	Prevalence of arousal disorder	Prevalence of orgasm disorder	Prevalence of lubrication problems	Prevalence of pain disorder	Prevalence of unsatisfaction	Prevalence of HSDD	Prevalence of sexual distress
Moghasemi	86.6	69.8	61.7	40.3	49.7	45.0	36.9	–	–
Beigi	72.4	62.6	75.3	56.3	–	34.9	–	–	–
Safaei	72.5	91.5	90.0	80.0	93.0	–	72.5	–	–
Hashemi	–	46.3		27.0	25.0	17.8	21.3	–	–
Nazarpour	61.0	–	–	–	–	–	–	–	–
Ghazanfarpour	–	58.6	–	–	22.0	–	–		
Alizadeh		70.8		–	50.0	–		–	–
Safarinejad	30.0	–	–	–		–	–	–	–
Arman	72.4	62.6	75.3	56.3	–	34.9	–	–	–
Berra	20.0	34.9	39.2	35.9	41.5	39.6	48.9	–	36.2
Leiblum	–	29.0	–	–	–	–	14.0	9.0	33.0
Tsing Lo	79.3	37.8	43.2	45.0	55.0	38.7	–	–	–
Park	8.7	4.2	7.7	–	–	2.4	–	–	–
Mishra	58.9	95.6	91.3	82.6	91.3	82.6	–	–	–
West	–	52.4	–	–	–	–	–	7.7	–
Verit	85.9	–	–	–	–	–	–	–	–
Valadares	45.3	–	–	–	–	–	–	–	–
Santpure	–	55.6	–	–	10.7	10.7	–	–	–
Rosen	–	–	–	–	–	–	–	44.2	–
Dombek	70.3	–	–	–	–	–	–		–
Levine	55.0	32.0	43.0	26.0	57.0	–	–	–	–
Merghati-Khoei	–	94.5	–	–	–	–	–	–	–
Dennerstein	–	42.0	–	–	–	–	–	9.0	–
Biddle	–	–	–	–	–	–	–	6.6	–
Zeleke		88.0						13.6	15.5
Indhavivadhana	76.2	71.6	70.3	–	–	47.3	–	–	–
Santoro	–	–	–	–	–	58.0	–	–	–
Park	–	64.5	–	–	–	–	–	–	–
Peeyananjarassri	82.2	93.0	82.9	63.6	52.7	27.1	51.9	–	–
Ibrahim M.A. Hassanin	89.01	–	–	–	–	–	–	–	–
Alarslan	44.6	–	–	–	–	–	–	–	–
Blü mel	49.7	–	–	–	–	–	–	–	–
C. CASTELO-BRANCO	57.7	–	–	–	–	–	–	–	–
Gartoulla	68.0	–	–	–	–	–	–	–	–
Ishak	50.0	–	–	–	–	–	–	–	–
Shifren	–	29.4	32.9	29.3	–	–	–	–	–
Jonusiene	67.9	–	–	–	–	–	–	–	–
Pace	61.0	–	21.0	7.0	–	40.0		32.0	
Cabral	81.0	–	–	–	–	–	–	–	–
Rosen	49.4	–	–	–	–	–	20.4	54.5	–
Valadares	49.6								
D. Yánez	83.9	–	–	–	–	–	–	–	–
Avis	–	41.0	36.3	–	–	47.7	–	–	–
Jamali	81.5	86.7	91.8	86.9	88.6	90.4	79.7		
Nazarpour	61.0	–	–	–	–	–	–	–	–
Tong	47.9	42.5	40.8	40.8	29.3	14.0	58.8	–	–
Yağmur	59.7	–	–	–	–	–	–	–	–
Yazdanpanahi	88.7	62.6	59.7	32.6	65.2	25.8	40.0	–	–
Chang	86.4	67.5	61.5	38.5	43.2	21.3	28.4	–	–

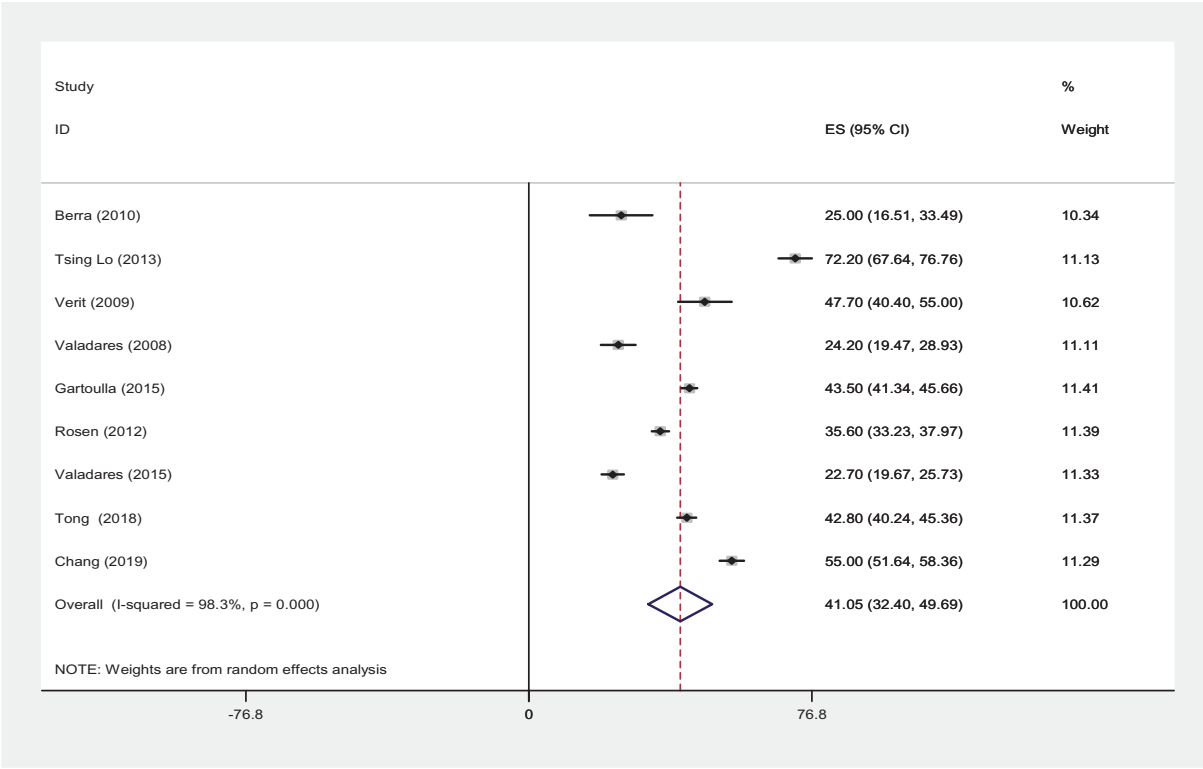

Figure 2. The prevalence of premenopausal SD with CI95%. Heterogeneity chi-squared = 479.12 (df. = 8) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 98.3%.

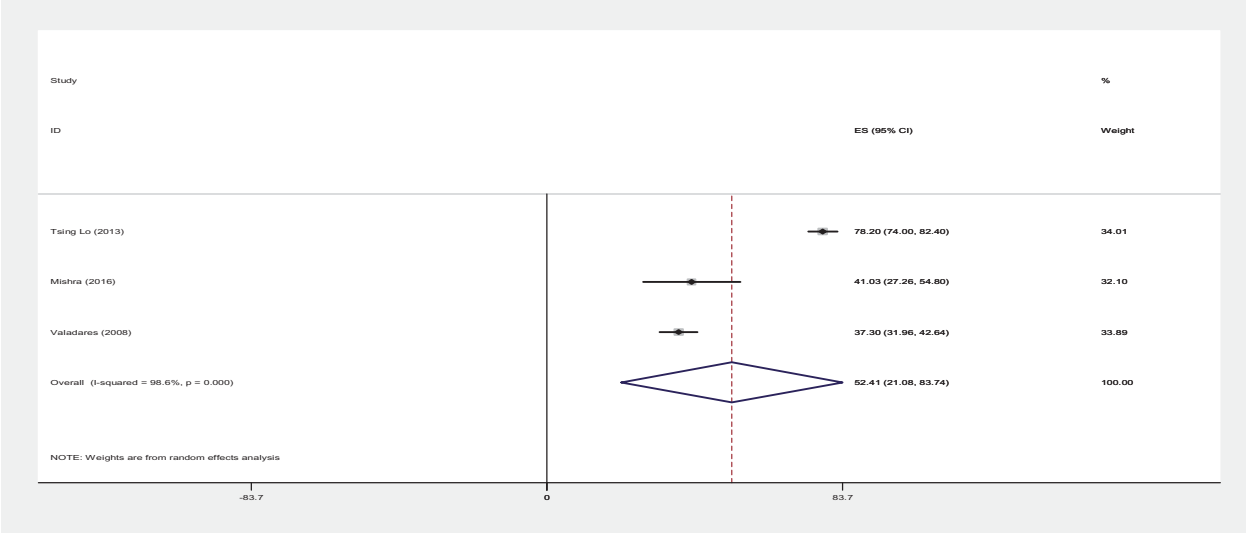

Figure 3. The prevalence of perimenopausal SD with CI95%. Heterogeneity chi-squared = 148.06 (*df.* = 2), $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 98.6%.

had been reported 8.70% (7.81–9.59) (Park et al., 2015). Based on the combining of the results of 35 studies, the total prevalence of SD in postmenopausal women with a CI95% and based on the REM was estimated to be 63.62% (53.66–73.57) (Figure 4).

3.3.2. The prevalence of sexual desire disorder (SDD) in menopausal stages

The highest prevalence of premenopausal SDD was in Shifren study, in the USA with 31581 sample size, which reported 57.60% (57.05–58.15) (Shifren et al., 2008) and the lowest prevalence of

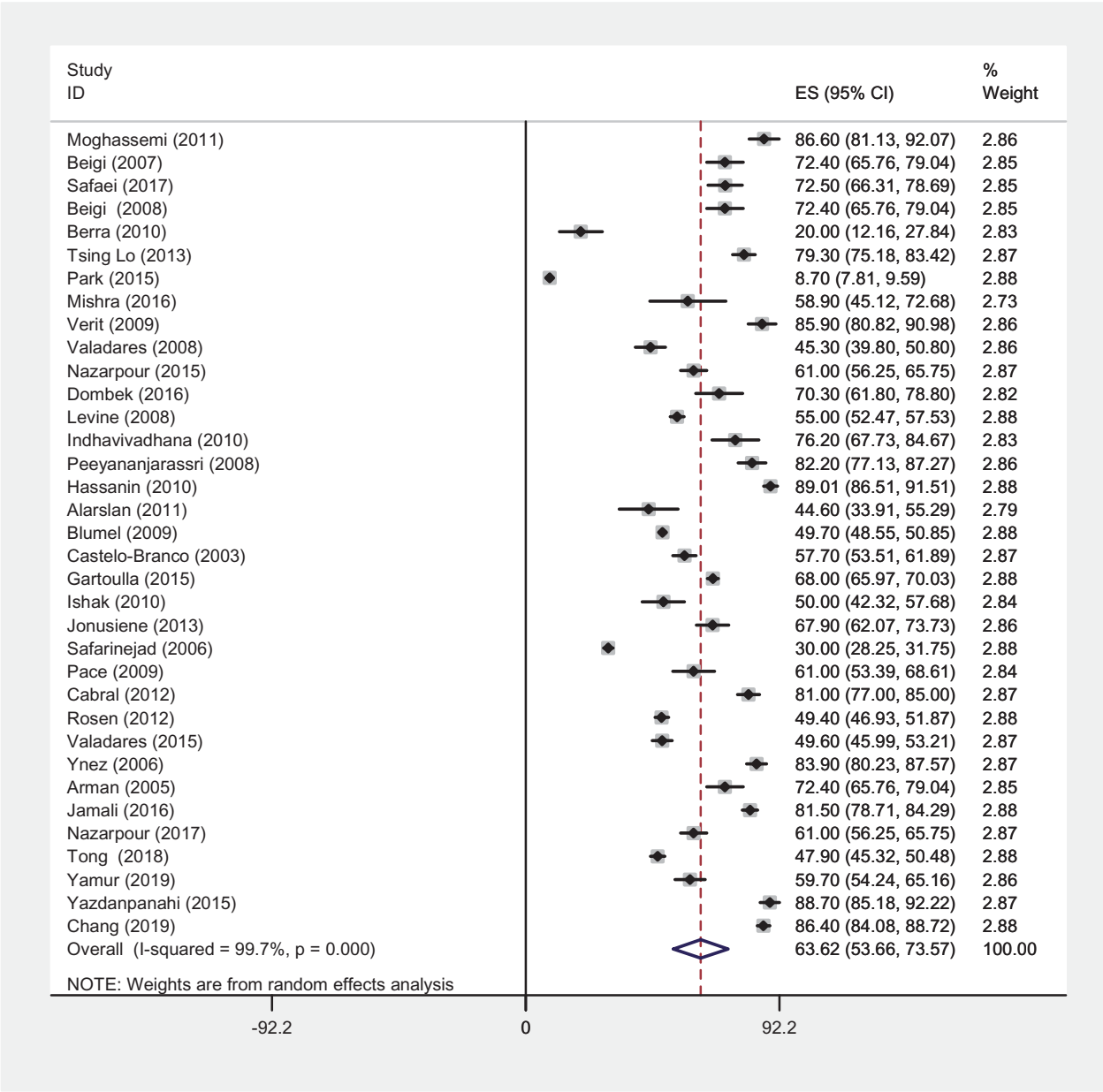

Figure 4. The prevalence of postmenopausal SD with CI95%. Heterogeneity chi-squared = 13,244.35 (*df.* = 34) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.7%.

SDD observed in the Dennerstein study performed in four countries France, Germany, Italy and the United Kingdom with a sample size of 2467, which was estimated 16.00% (14.55–17.45) (Dennerstein et al., 2006). By combining the results of 10 studies, the overall prevalence of premenopausal SDD with a $CI_{95\%}$ and based on the REM was estimated 33.05% (20.19–45.92) (Figure 5). The highest prevalence of perimenopausal SDD was in Mishra et al study in India with a sample size of 49 which was reported 93.70% (86.90–100.50) (Mishra et al., 2016) and the lowest prevalence observed in the TSING Lo et al. study with a sample size of 371 which was estimated 36.00% (31.12–40.88) (Lo & Kok, 2013). Combining the results of 4 studies, the total prevalence of SDD in perimenopausal women with a CI95% and based on the REM was estimated to be 53.71% (34.72–72.71) (Figure 6). The highest prevalence of SDD in postmenopausal women was in the study of Mishra in India, which was reported 95.60% (89.86−101.34) (Mishra et al., 2016) and the lowest prevalence was in the Park study in South

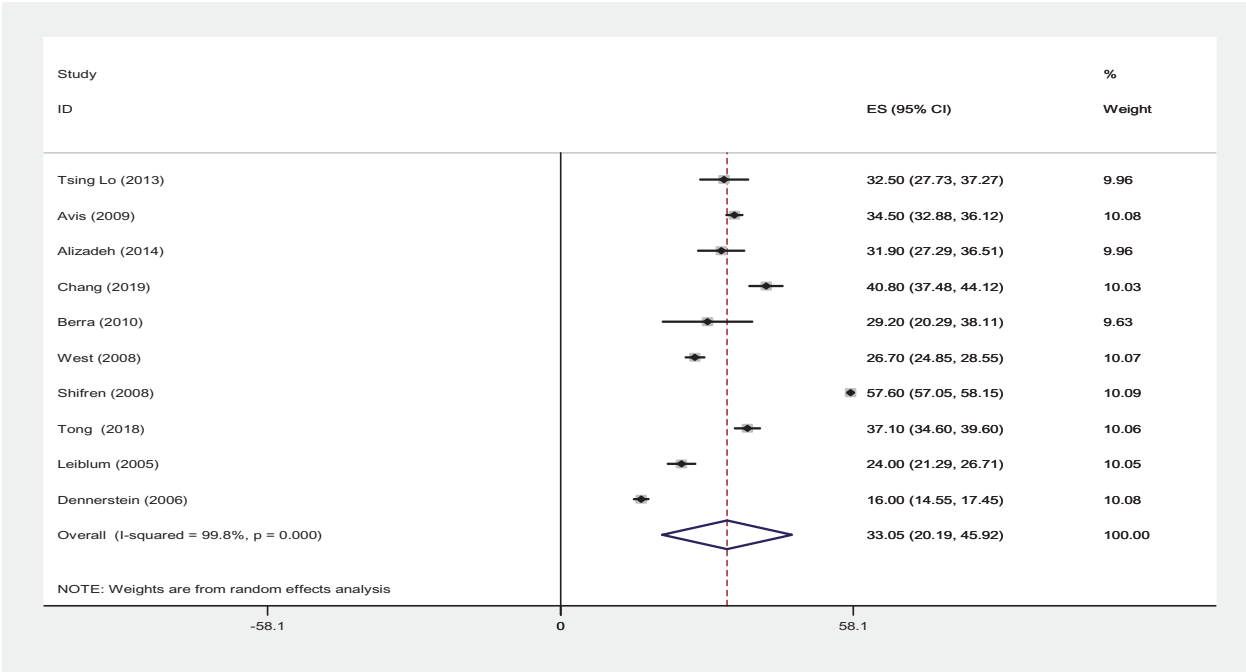

Figure 5. The prevalence of premenopausal sexual desire disorder (SDD) with CI95%. Heterogeneity chi-squared = 4343.67 (*df.* = 9) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity)= 99.8%.

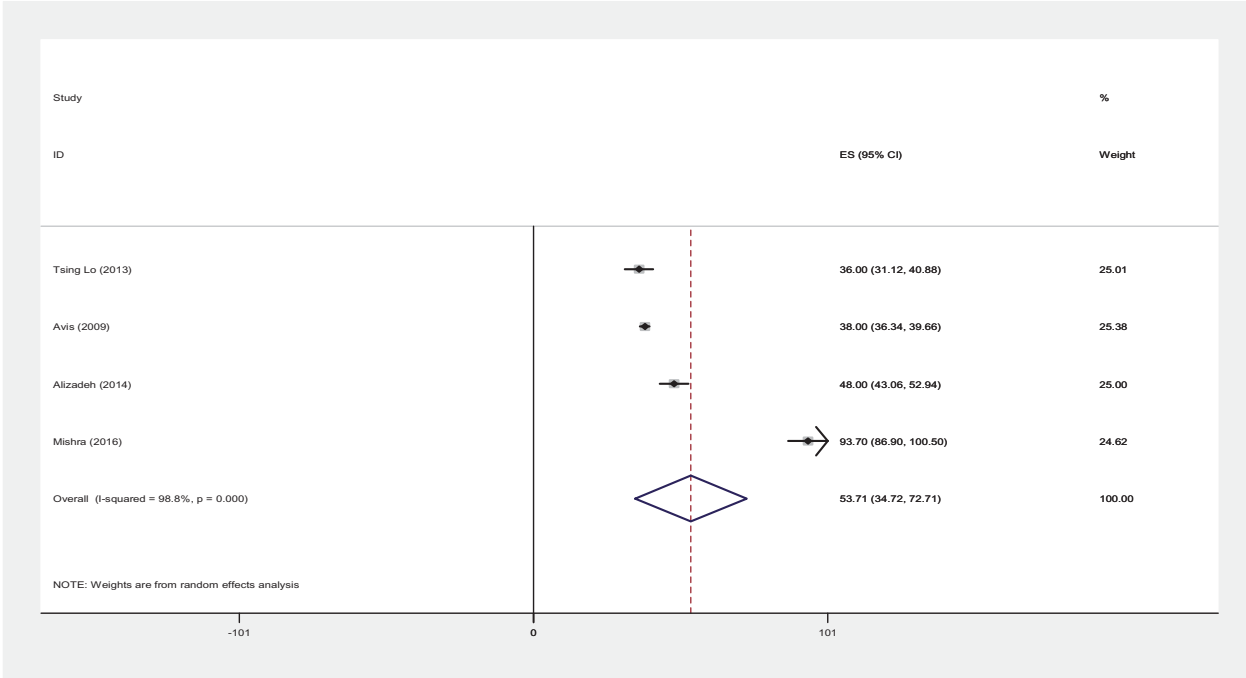

Figure 6. The prevalence of perimenopausal SDD with CI95%. Heterogeneity chi-squared = 254.77 (*df.* = 3) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity)= 98.8%.

Korea with a sample size of 3828 which had been reported 4.20% (3.56–4.84) (Park et al., 2015). According to combining the results of 28 studies, the overall prevalence of SDD in postmenopausal women with a CI95% and based on the REM was estimated 58.90% (48.32–69.48) (Figure 7).

3.3.3. The prevalence of sexual arousal disorder (SAD) in menopausal stages

The highest prevalence of premenopausal SAD was in Berra study, in the Italy with 100 sample size, which reported 52.90% (43.12%–62.68%) (Berra et al., 2010) and the lowest prevalence was

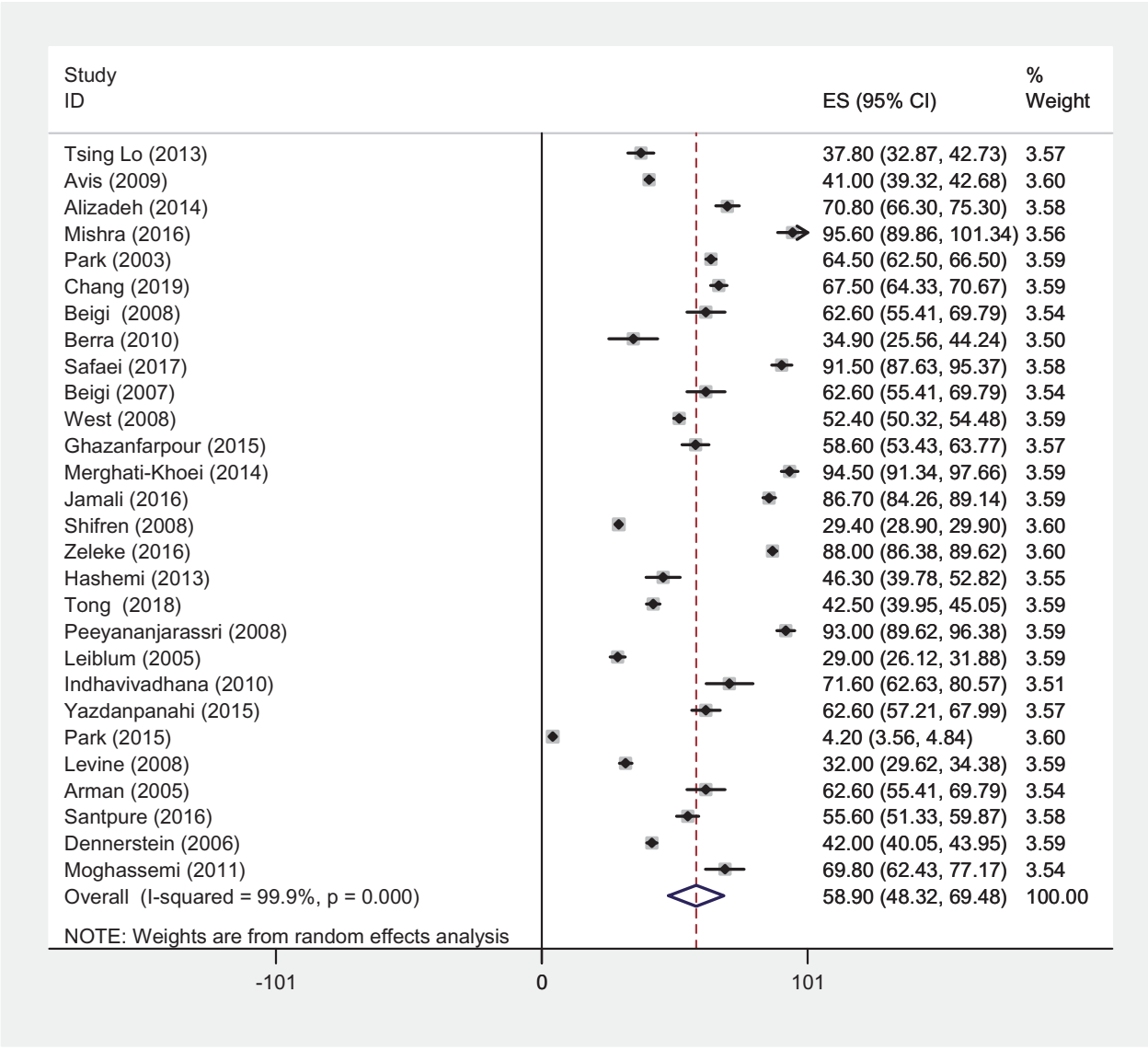

Figure 7. The prevalence of postmenopausal SDD with CI 95%. Heterogeneity chi-squared = 21,307.57 (*df.* = 27) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.9%.

in the Avis study in USA with a sample size of 3302 and reported 22.20% (20.78–23.62) (Avis et al., 2009). By combining the results of six studies, the overall prevalence of premenopause SAD with a $CI_{95\%}$ and based on the REM was estimated 36.12% (22.62–49.62) (Figure 8). The highest prevalence of SAD in postmenopausal women was in the study of Jamali in Iran with a sample size of 746, which determined 91.80% (89.83–93.77) (Jamali et al., 2016) and the lowest prevalence was in the Park study in South Korea with a sample size of 3828 which reported 7.70% (6.86–8.54) (Park et al., 2015) (Figure 6). Based on combining the results of 19 studies, the overall prevalence of SAD in postmenopausal women with a $CI_{95\%}$ and based on the REM was estimated 57.78% (46.64–68.92) (Figure 9). There was no enough study to meta-analysis the prevalence of SAD among perimenopausal aged women.

3.3.4. The prevalence of orgasmic disorder in menopausal stages

The highest prevalence of premenopausal orgasmic disorder was in Shifren study in the USA which reported 54.10% (44.33–63.87) (Shifren et al., 2008) and the lowest prevalence was reported in the Chang study in Korea, 14.20% (7.36%–21.04%) (Chang et al., 2019). Based on combining the results of five studies, the overall

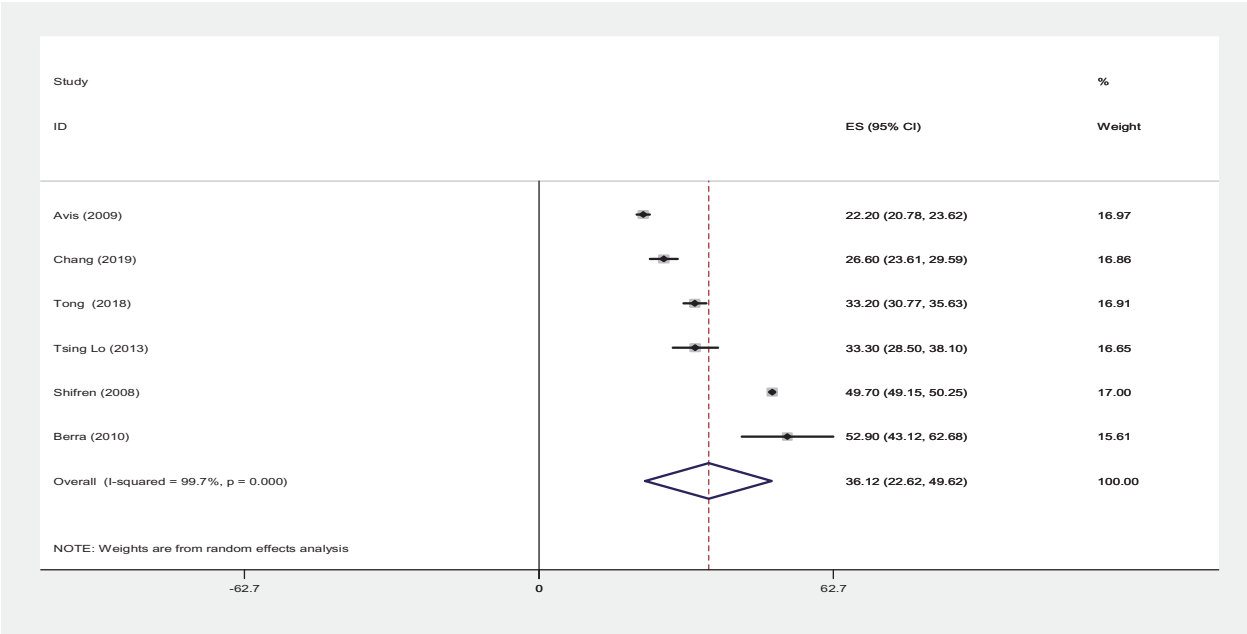

Figure 8. The prevalence of premenopausal sexual arousal disorder (SAD) with CI95%. Heterogeneity chi-squared = 1534.38 (*df.*= 5) $p = 0 < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.7%.

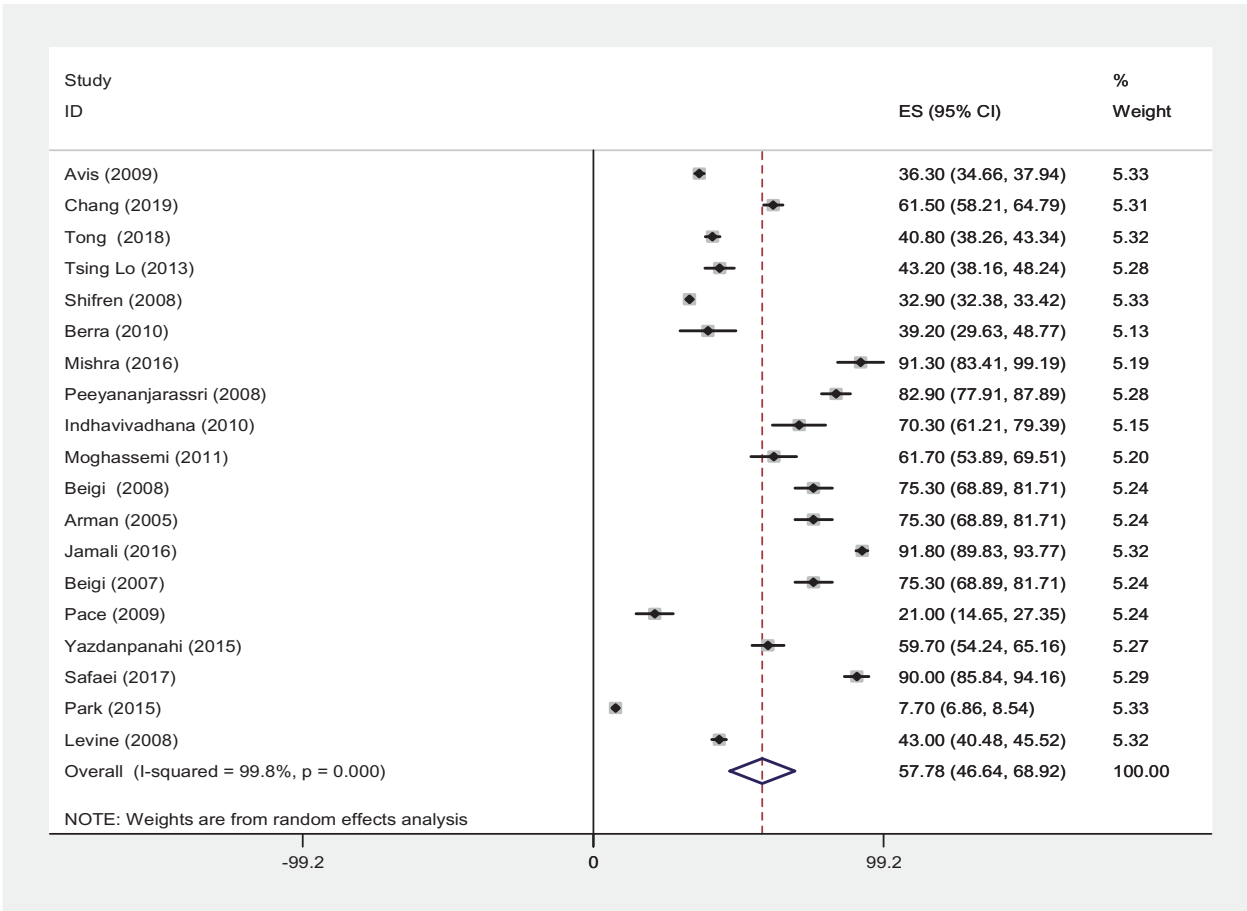

Figure 9. The prevalence of postmenopausal SAD with CI95%. Heterogeneity chi-squared = 9326.53 ($df = 18$) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.8%.

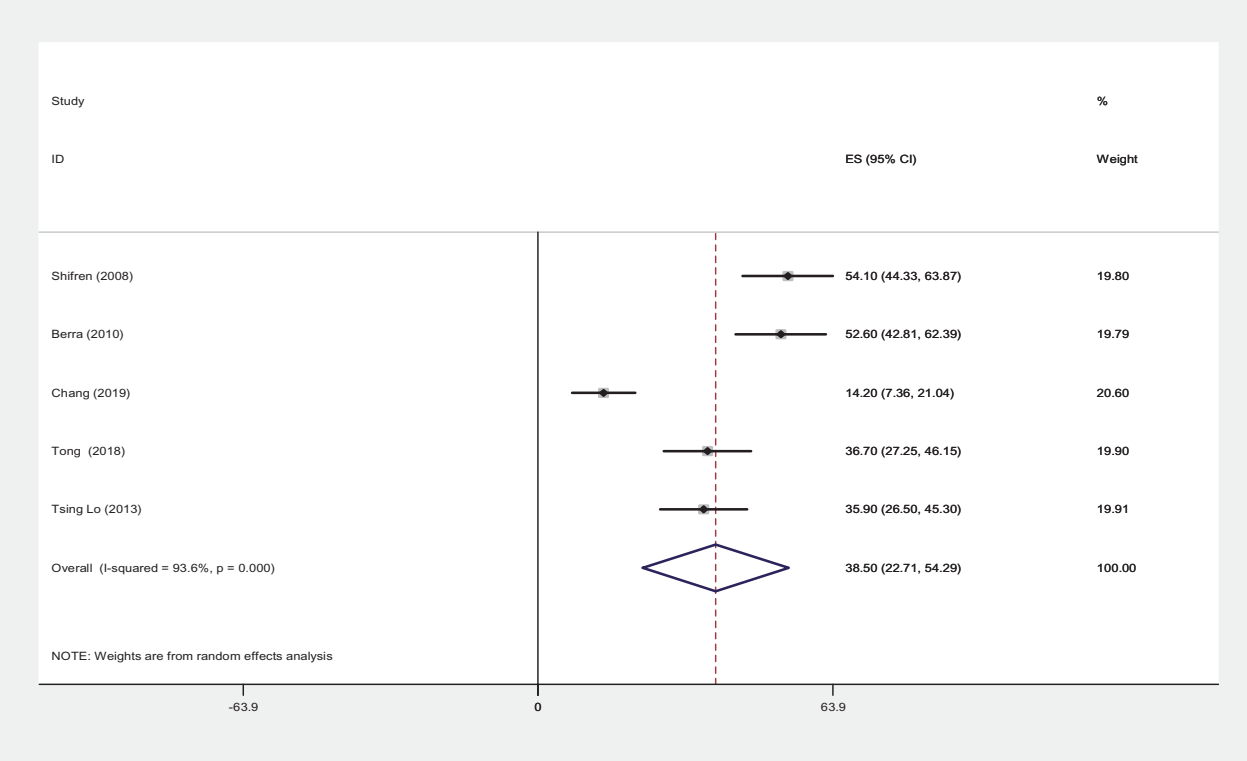

Figure 10. The prevalence of premenopausal orgasmic disorder with CI95%. Heterogeneity chi-squared = 62.73 (*df.* = 4) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 93.6%.

prevalence of premenopausal orgasmic disorder in postmenopausal women with a CI95% and based on the REM was estimated 38.50% (22.71–54.29) (Figure 10). The highest prevalence of orgasmic disorder in postmenopausal women was in the Jamali et, al study in Iran, which was reported 86.90% (80.29–93.51) (Jamali et al., 2016) and the lowest prevalence was in the Pace study in Italy with a sample size of 158 which had been reported 7.00% (2.00–12.00) (Pace et al., 2009). According to combining the results of 17 studies, the overall prevalence of orgasmic disorder in postmenopausal women with a $CI_{95\%}$ and based on the REM was estimated 47.33% (34.43–60.22) (Figure 11). There was no enough study to perform meta-analysis regarding the prevalence of orgasmic disorder among perimenopausal aged women.

3.3.5. The prevalence of lubrication problems in menopausal stages

The highest prevalence of premenopause lubrication problem was in Berra study in the Italy which reported 50.00% (40.20–59.80) (Berra et al., 2010) and the lowest prevalence was reported in the Chang study in Korea nearly 6.20% (4.57–7.83) (Chang et al., 2019). By combining the results of five studies, the total prevalence of lubrication problems in premenopausal women with a CI95% and based on the REM was estimated to be 27.64% (14.62–40.65) (Figure 12). The highest prevalence of perimenopausal lubrication problem was in Mishra et al study in India reported 56.20% (42.31%–70.09%) (Mishra et al., 2016) and the lowest prevalence of lubrication problem in perimenopausal women was in the Alizadeh et al. study in Iran, estimated 40.00% (35.16%−44.84%) (Alizadeh et al., 2015). Combining the results of three studies showed that the overall prevalence of lubrication problem in perimenopausal women with a $CI_{95\%}$ and based on the REM was estimated 44.06% (37.93–50.20) (Figure 13). The highest prevalence of lubrication problems in postmenopausal women was in Safaei et, al in Iran with a sample size of 200, which reported 93.00% (89.46–96.54) (Safaei & Rajabzadeh, 2017) and the lowest prevalence was in the Santpure study in India with a sample size of 520 which estimated 10.70% (8.04–13.36) (Santpure et al., 2016). By

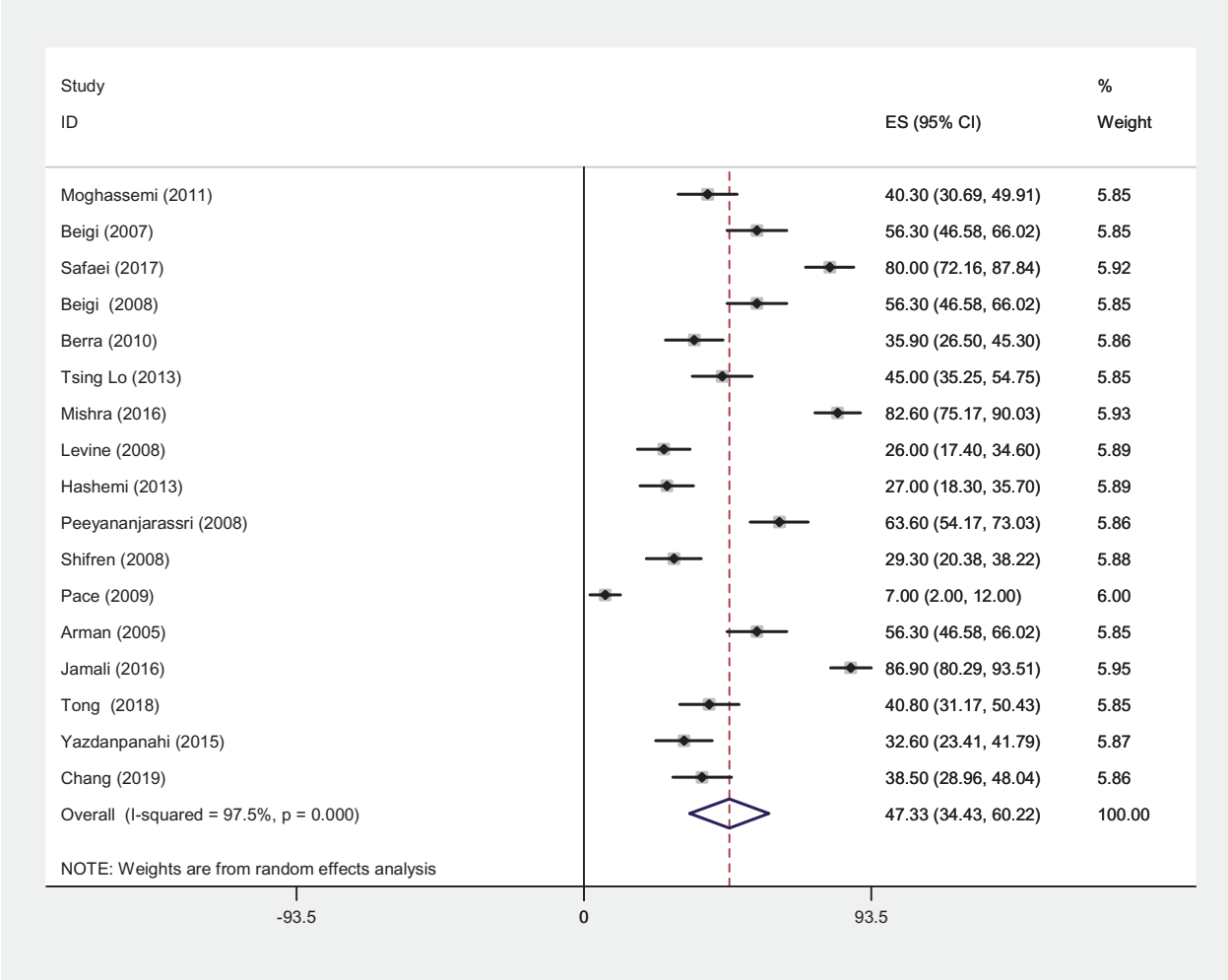

Figure 11. The prevalence of postmenopausal orgasmic disorder with CI95%. Heterogeneity chi-squared = 642.26 (*df.* = 16) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 97.5%.

combining the results of 15 studies, the overall prevalence of lubrication problems in postmenopausal women with a $CI_{95\%}$ and based on the REM was estimated 51.60% (36.76–66.44%) (Figure 14).

3.3.6. The prevalence of sexual pain disorder (SPD) in the menopausal stages

The highest prevalence of premenopausal SPD in Berra study in the Italy which was reported 65.60% (56.29–74.91) (Berra et al., 2010) and the lowest prevalence, 2.70% (1.60–3.80%), was reported in the Chang study in Korea (Chang et al., 2019). By combining the results of 5 studies, the total prevalence of SPD in premenopausal women with a $CI_{95\%}$ and based on the REM was estimated to be 34.12% (7.27–60.98) (Figure 15). The highest prevalence of perimenopausal SPD was in Mishra et al study in India, reported 75.00% (62.88–87.12) (Mishra et al., 2016) and the lowest prevalence of SPD in perimenopausal women was in the study of TSING Lo et, al which was reported as 30.40% (25.72–35.08) (Lo & Kok, 2013). As combining the results of three studies, the overall prevalence of perimenopausal SPD with a $CI_{95\%}$ and based on the REM was estimated 52.21% (33.12–71.30) (Figure 16). The highest prevalence of SPD in postmenopausal women was in the study of Mishra in India which reported as 82.60% (71.99–93.21) (Mishra et al., 2016), and the lowest prevalence was in the Park study in South Korea which the prevalence of SPD had been reported 2.40% (1.92–2.88) (Park et al., 2015). By combining the results of 18 studies, the overall prevalence of SPD in postmenopausal women with a CI95% and based on the REM was estimated 34.45% (22.35–46.55) (Figure 17).

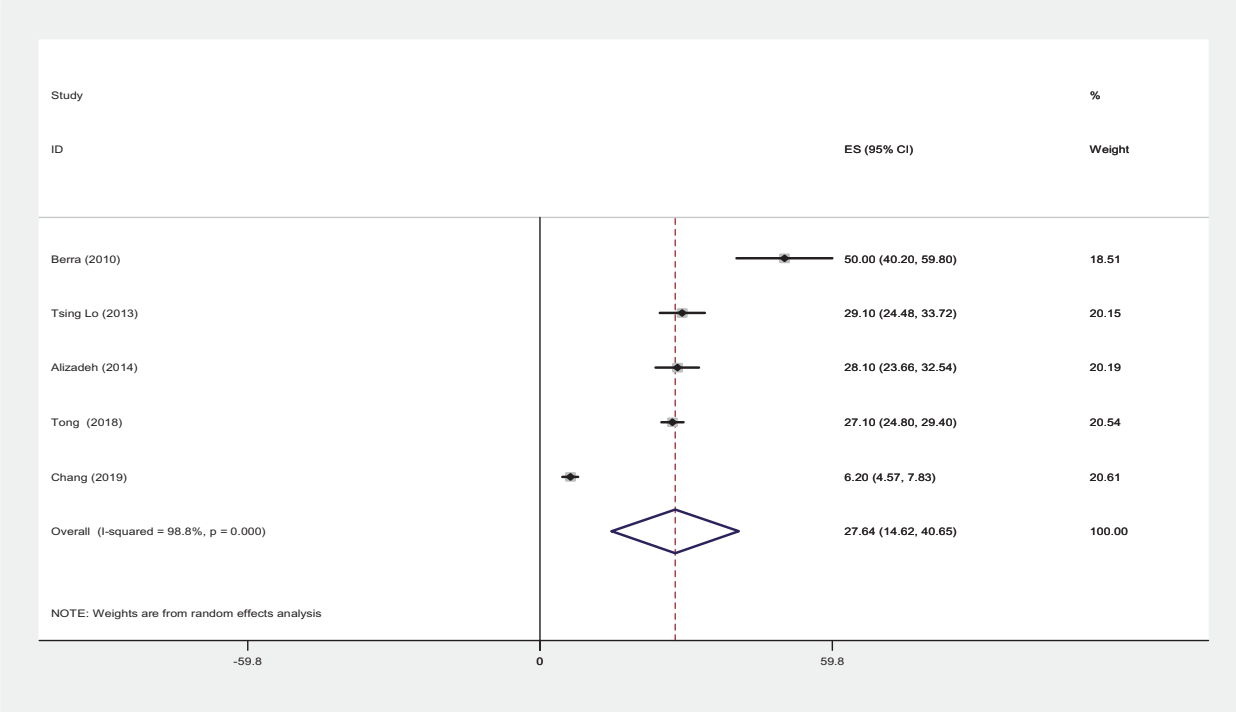

Figure 12. The prevalence of premenopausal lubrication problems with CI95%. Heterogeneity chi-squared = 334.27 (*df.* = 4) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 98.8%.

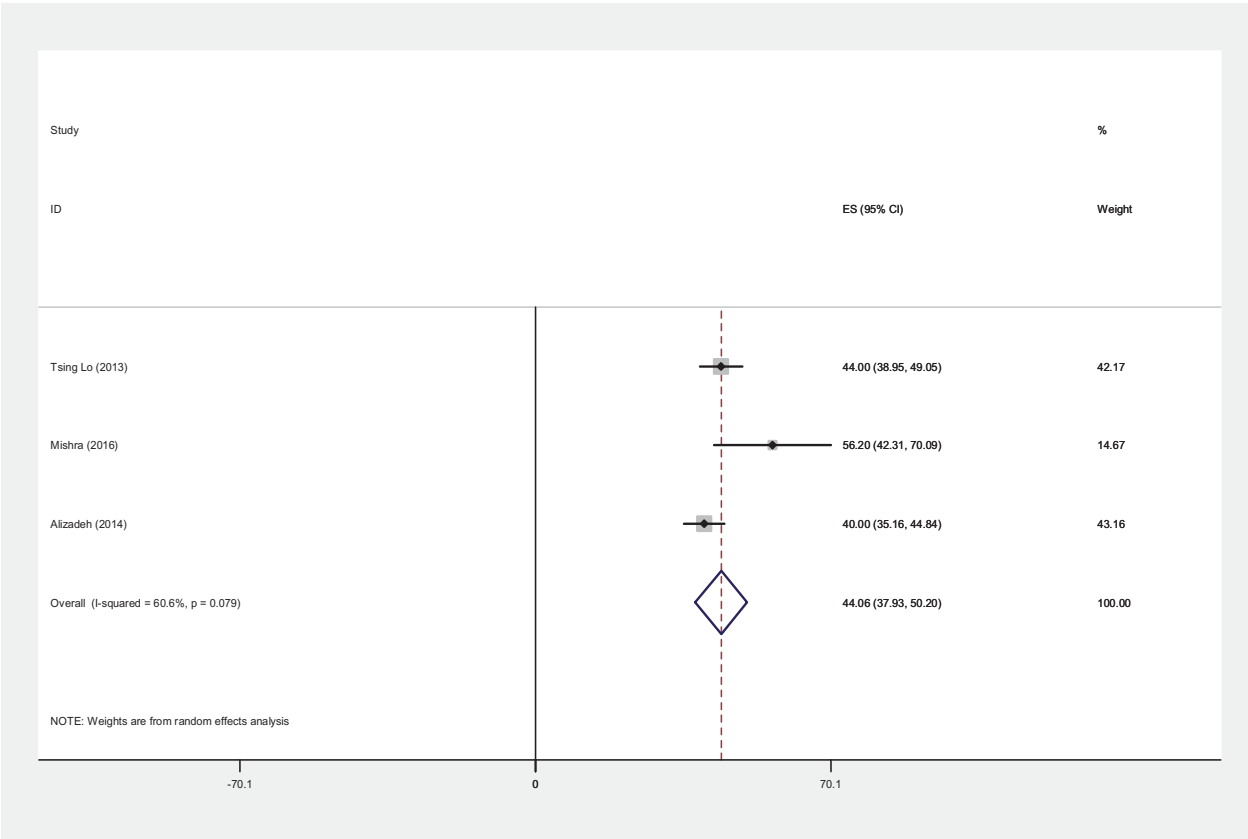

Figure 13. The prevalence of perimenopausal lubrication problems with CI95%. Heterogeneity chi-squared = 5.07 (*df.* = 2) $p = 0.079$. I-squared (variation in ES attributable to heterogeneity) = 60.6%

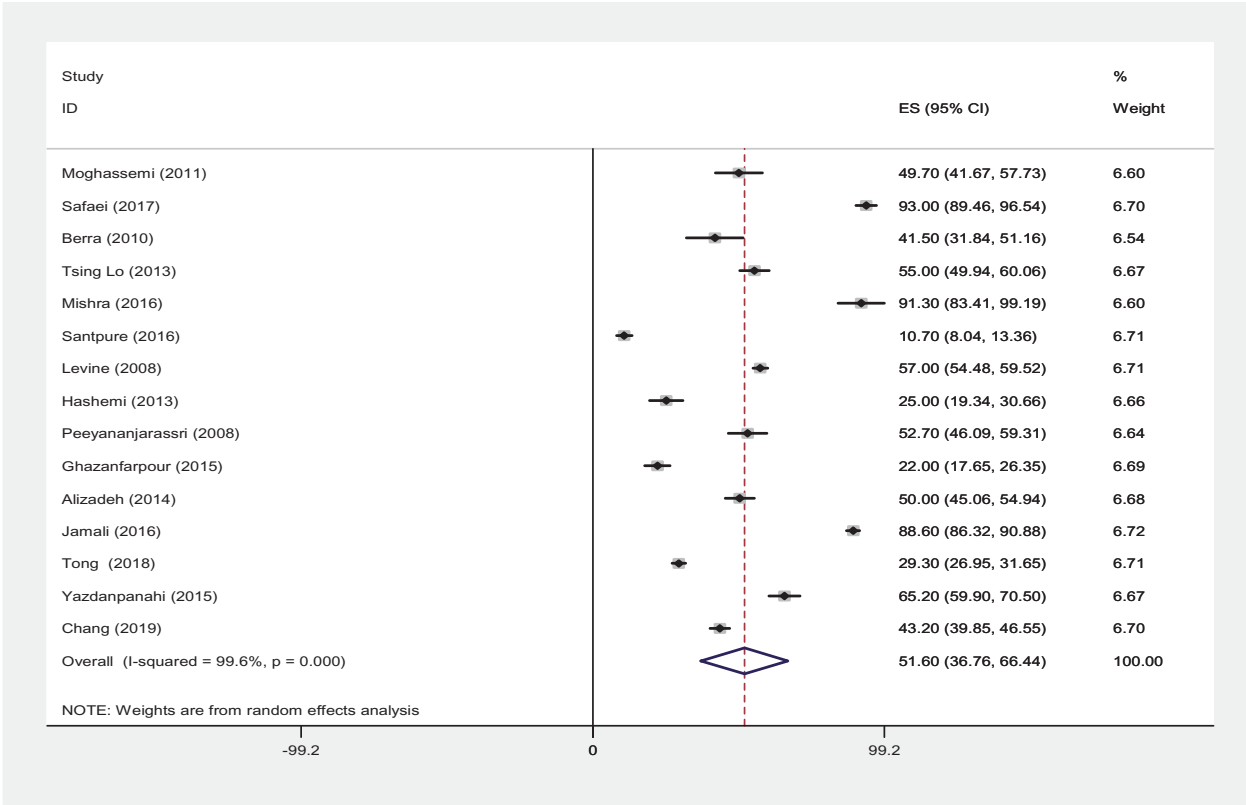

Figure 14. The prevalence of postmenopausal lubrication problems with CI95%. Heterogeneity chi-squared = 3226.42 (*df.* = 14) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.6%.

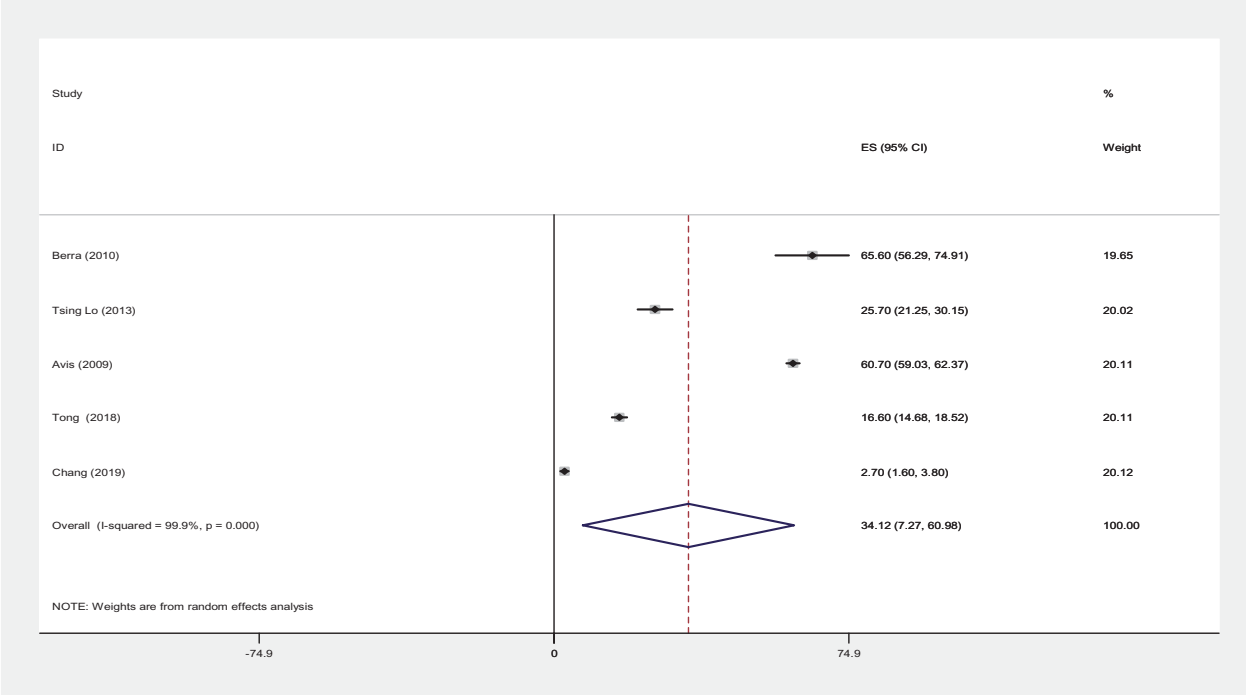

Figure 15. The prevalence of premenopausal sexual pain disorder (SPD) with CI95%. Heterogeneity chi-squared = 336.43 (*df.* = 4) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.9%.

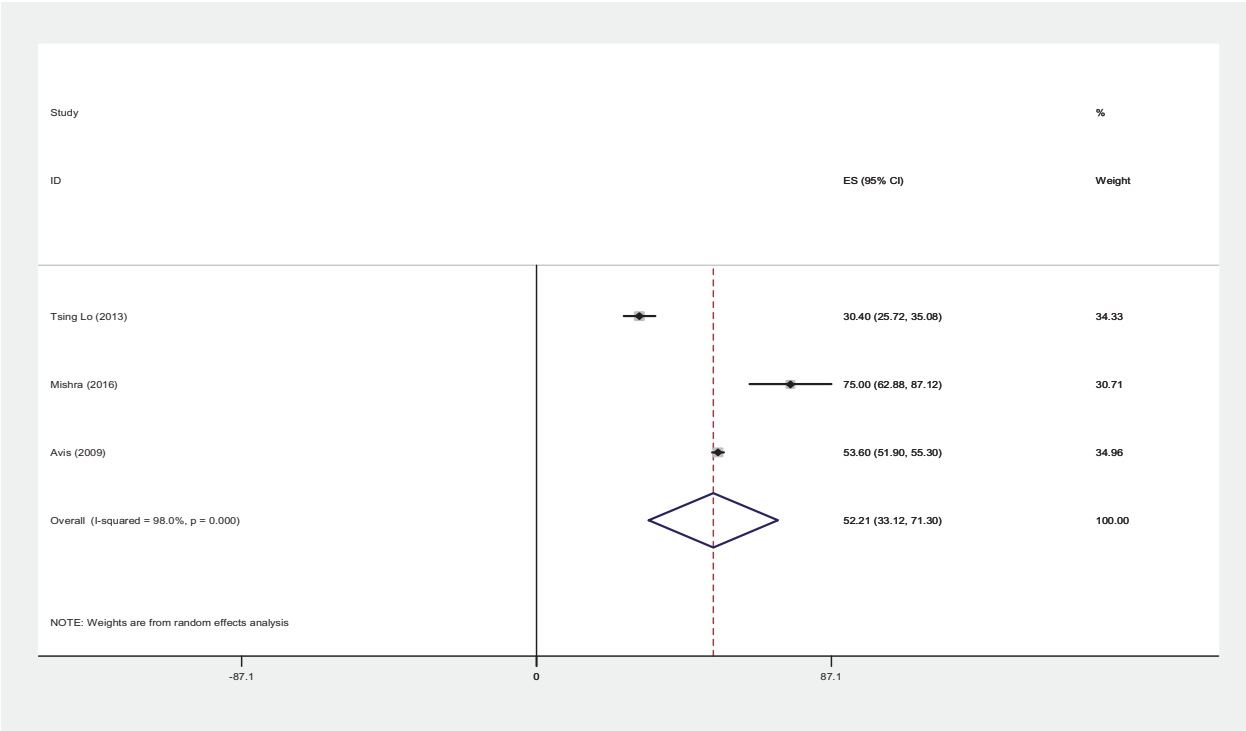

Figure 16. The prevalence of perimenopausal SPD with CI95%. Heterogeneity chi-squared = 98.29 (*df.* = 2) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 98.0%.

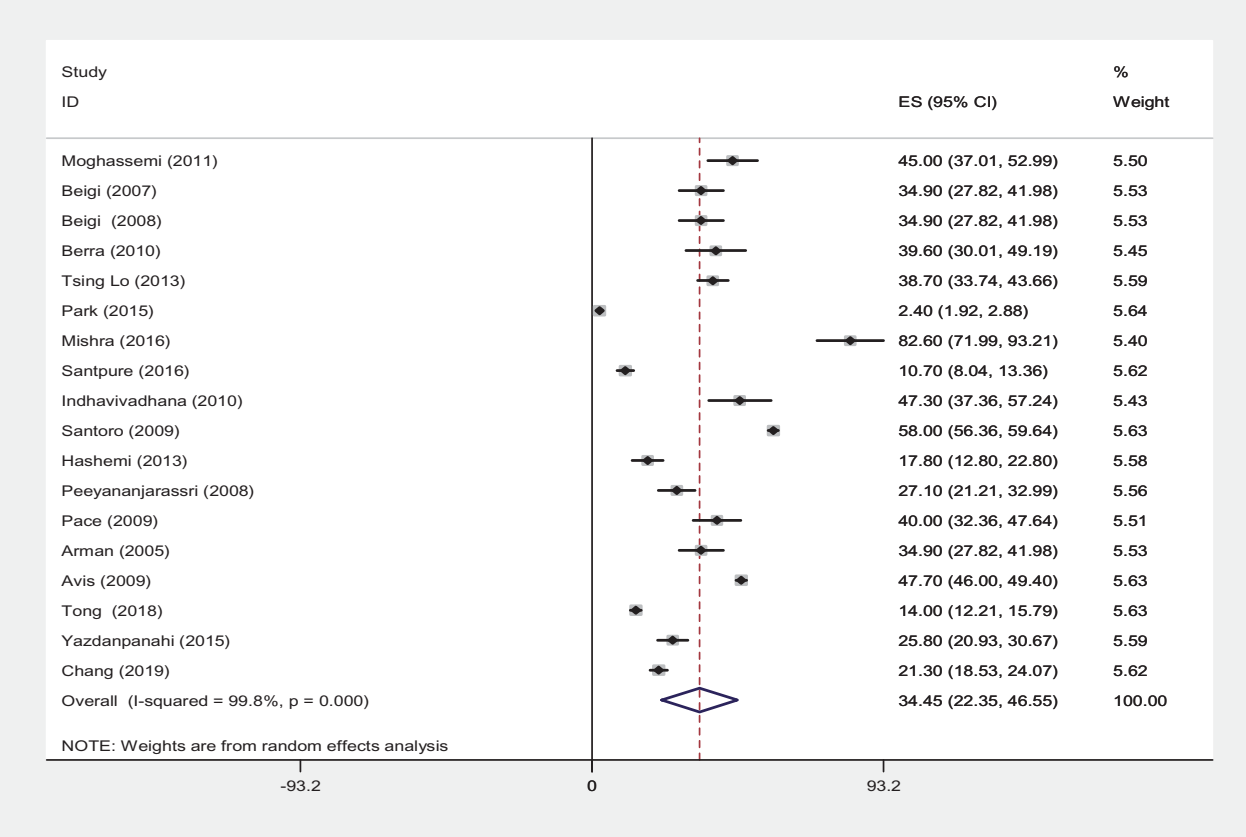

Figure 17. The prevalence of postmenopausal SPD with CI95%. Heterogeneity chi-squared = 6908.15 (*df.* = 17) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.8%.

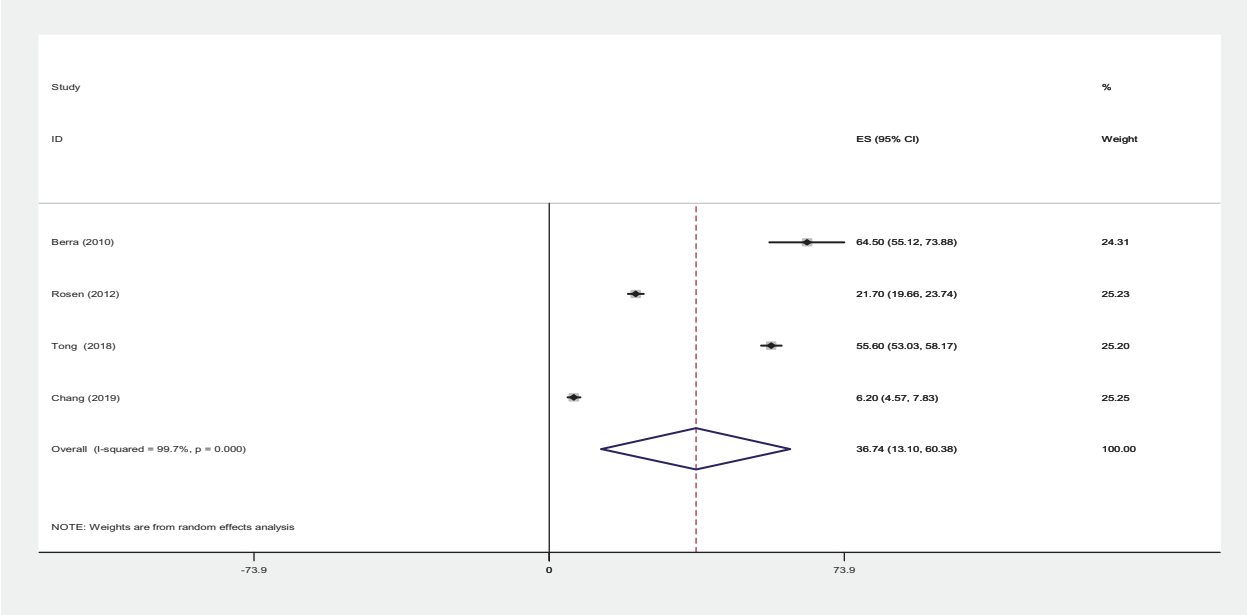

Figure 18. The prevalence of premenopausal unsatisfaction with CI95%. Heterogeneity chi-squared = 1079.59 (*df.* = 3) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.7%.

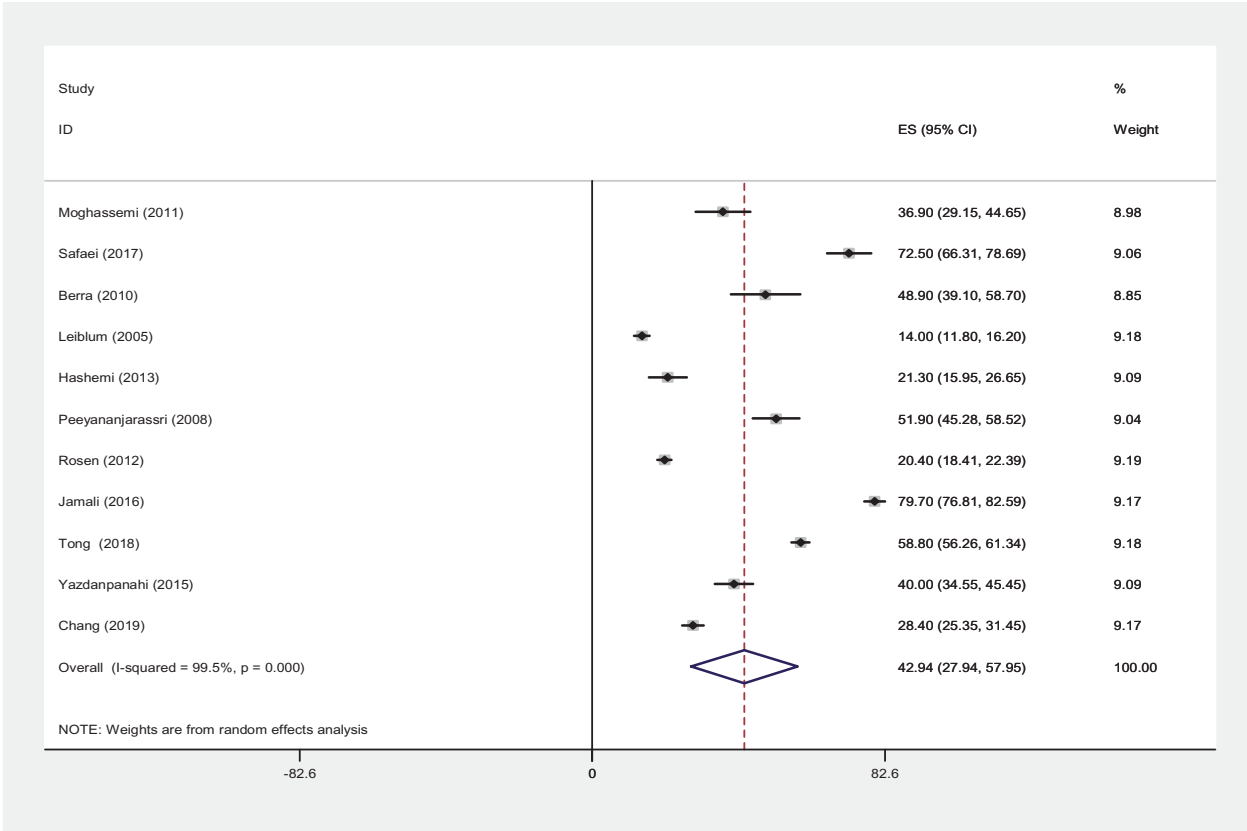

Figure 19. The prevalence of postmenopausal unsatisfaction with CI95%. Heterogeneity chi-squared = 2024.32 (*df.* = 10) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.5%

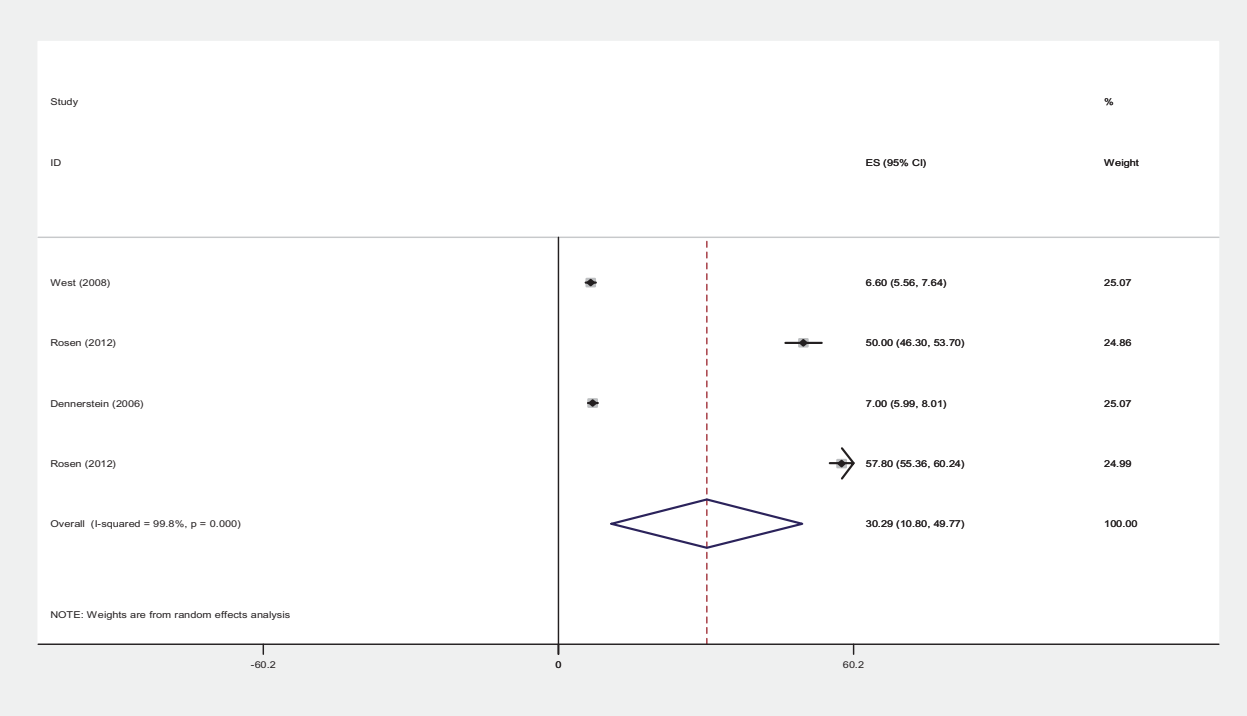

Figure 20. The prevalence of premenopausal HSDD with CI95%. Heterogeneity chi-squared = 1957.20 (*df.* = 3) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.8%.

3.3.7. The prevalence of unsatisfaction in the menopausal stages

The highest prevalence of premenopausal unsatisfaction problem was in Berra study in the Italy which reported 64.50% (55.12–73.88) (Berra et al., 2010) and the lowest prevalence reported in the Chang study in Korea as 6.20% (4.57–7.83) (Chang et al., 2019). By combining the results of four studies, the overall prevalence of unsatisfaction in premenopausal women with a CI95% and based on the REM was estimated 36.74% (13.10–60.38) (Figure 18). The highest prevalence of unsatisfaction in postmenopausal aged women was in the study of Jamali in Iran which was reported as 79.70% (Jamali et al., 2016) and the lowest prevalence in the study of Leiblum in USA, was reported 14.00% (11.80–16.20) (Leiblum et al., 2006). Combining the results of the 11 studies showed the overall prevalence of unsatisfaction in postmenopausal women with a CI95% and based on the REM was estimated 42.94% (27.94–57.95%) (Figure 19). There was no enough study to perform meta-analysis regarding the prevalence of unsatisfaction among perimenopausal aged women.

3.3.8. The prevalence of HSDD in the menopausal stages

The highest prevalence of premenopause HSDD was in Rosen study in the USA which reported 57.80% (55.36–60.24) (Rosen et al., 2012) and the lowest prevalence was in the West study in USA with a sample size of 2207 that reported 6.60% (5.56–7.64) (West et al., 2008). By combining the results of four studies, the overall prevalence of perimenopausal HSDD with a CI95% and based on the REM was estimated 30.29% (10.80–49.77) (Figure 20). The highest prevalence of postmenopausal HSDD was in Rosen study in the USA which reported 54.50% (52.04–56.96) (Rosen et al., 2012) and the lowest prevalence was in the West study in USA that reported 7.70% (6.59–8.81) (West et al., 2008). Through combining the results of 7 studies, the overall prevalence of postmenopausal HSDD with a CI95% and based on the REM was estimated 23.80% (13.22–34.38) (Figure 21). There was no enough study to perform meta-analysis regarding the prevalence of HSDD among perimenopausal aged women.

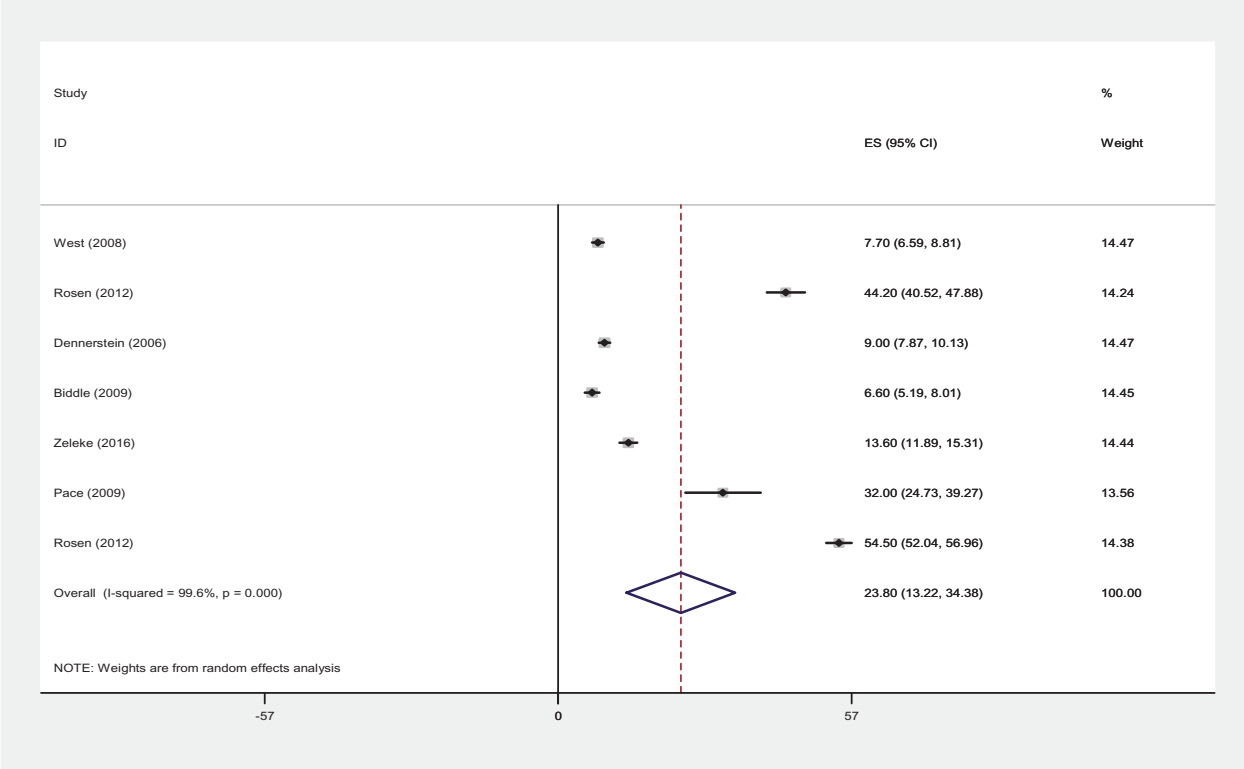

Figure 21. The prevalence of postmenopausal HSDD with CI95%. Heterogeneity chi-squared = 1609.81 (*df.* = 6) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 99.6%.

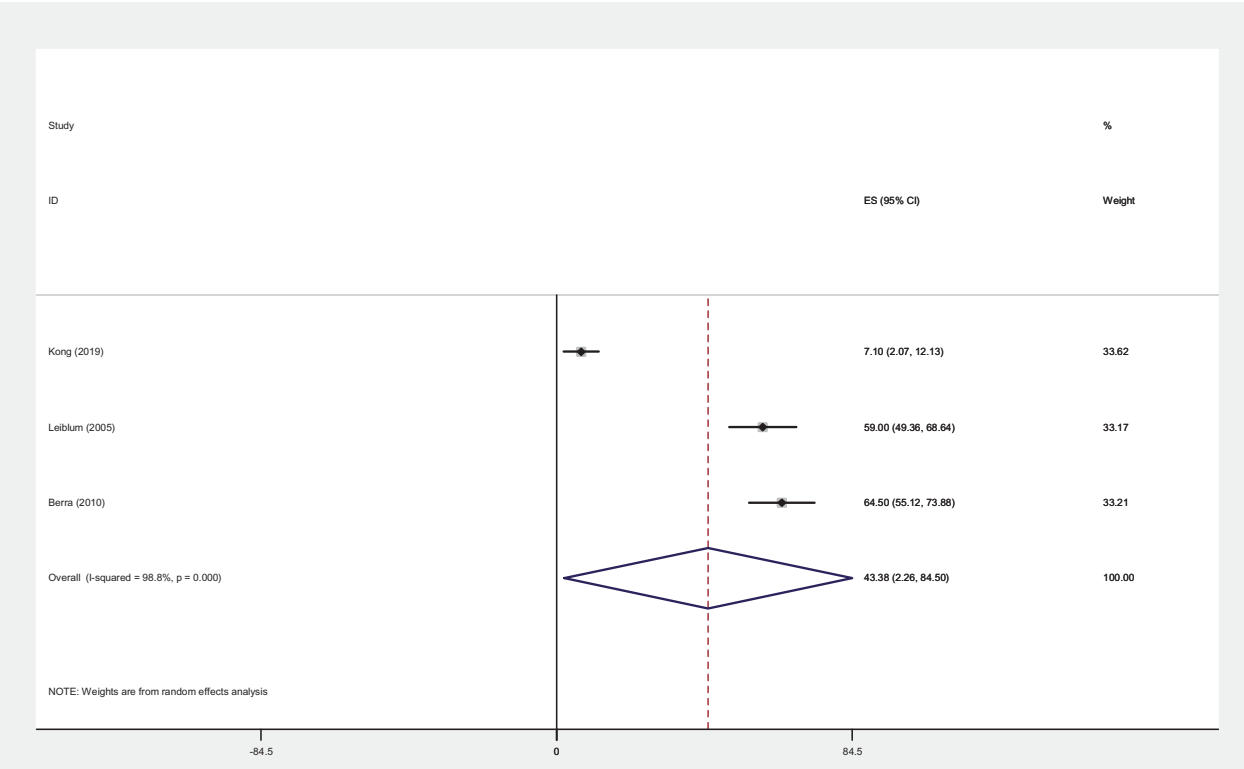

Figure 22. The prevalence of premenopausal distress disorder (DD) with CI95%. Heterogeneity chi-squared = 163.77 (*df.* = 2) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 98.8%.

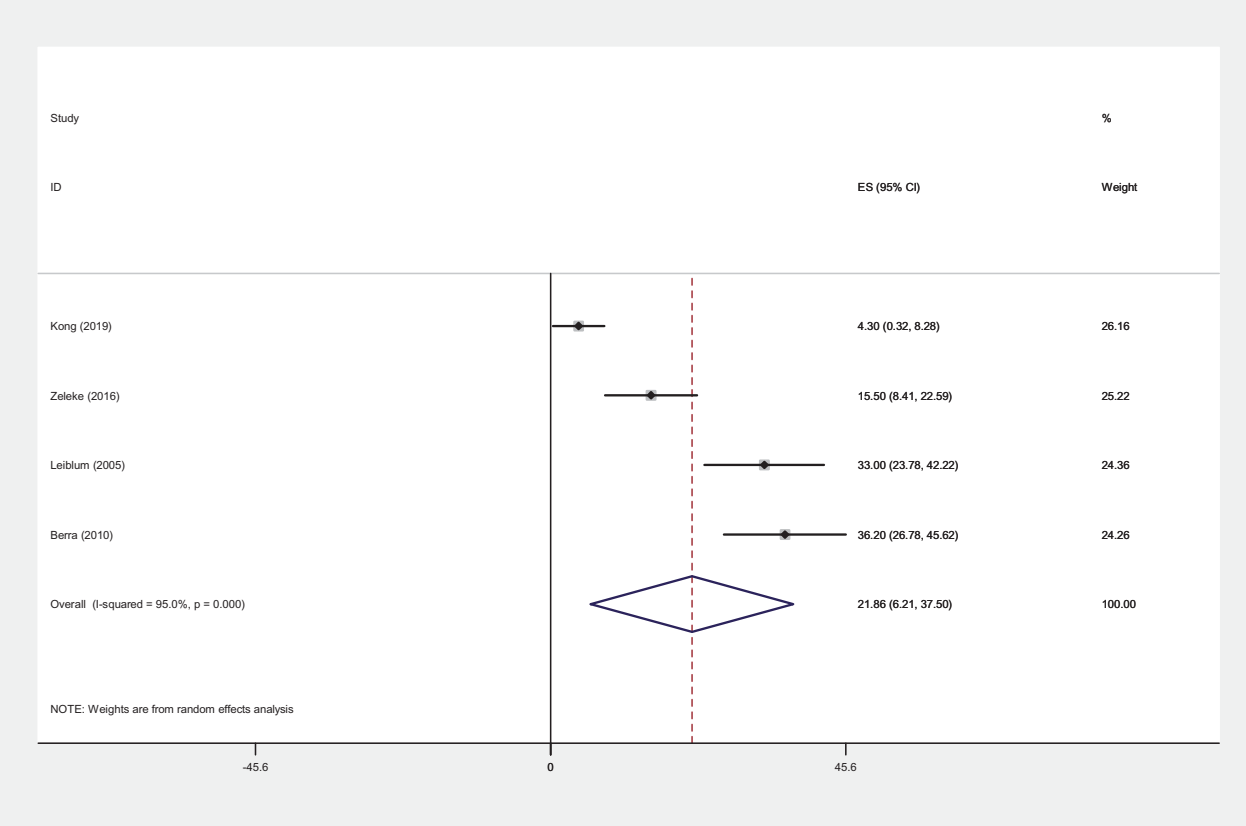

Figure 23. The prevalence of postmenopausal DD with CI95%. Heterogeneity chi-squared = 60.27 (*df.* = 3) $p < 0.001$. I-squared (variation in ES attributable to heterogeneity) = 95.0%.

3.3.9. The prevalence of female distress disorder (DD) in the menopausal stages

The highest prevalence of premenopausal DD was in Berra study in the Italy which reported 64.50% (55.12–73.88) (Berra et al., 2010) and the lowest prevalence was in Kong study in China with a sample size of 120 which reported 7.10% (2.07–12.13) (Kong et al., 2019). By combining the results of three studies, the overall prevalence of premenopausal DD with a CI95% and based on the REM was estimated 43.38% (2.26–84.50) (Figure 22). The highest prevalence of postmenopausal DD was in Berra study in the Italy that estimated 36.20% (26.78–45.62) (Berra et al., 2010) and the lowest prevalence was in the Kong study in China which reported 4.30% (0.32–8.28) (Kong et al., 2019). By combining the results of four studies, the overall prevalence of postmenopausal DD with a CI95% and based on the REM was estimated 21.86% (6.21–37.50) (Figure 23). There was no enough study to perform meta-analysis regarding the prevalence of DD among perimenopausal aged women.

3.4. Quality assessment of included studies

The quality of included studies was assess based on the Newcastle–Ottawa Scale. The total score of this scale was considered 0–10. The score of included studies was ranged from 5 to 8. Higher score from this scale showed higher quality. The details of this scale and scoring was showed in Table 5.

4. Discussion

In this study, the prevalence of SD in the different menopausal stages was assessed systematically. Also the domains of sexual dysfunction such as SDD, SAD, orgasmic disorder, lubrication problems, SPD, unsatisfaction, HSDD and DD were assessed separately in the different stages of menopause and showed through forest plot.

The total prevalence of SD in premenopausal aged women based on the results of 9 studies was determined 41.05%. In Lo et al. that had the

Table 5. NEWCASTLE–OTTAWA QUALITY ASSESSMENT SCALE (For Cross-Sectional Studies).

		Selection				Comparability	Outcome		Score
Row	First author/year	Representativeness of the sample	Sample size	Non-respondent	Ascertainment of the exposure	The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled	Assessment of the outcome	Statistical test	0–10 stars
1	Moghasemi 2011	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
2	Beigi, 2008	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
3	Safaei, 2017	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
4	Beigi, 2008	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
5	Berra, 2010	b (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
6	Leiblum, 2006	b (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
7	Tsing Lo, 2013	b (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
8	Park, 2015	b (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
9	Mishra, 2016	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
10	West, 2008	a (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
11	Verit, 2009	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
12	Valadares, 2008	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
13	Santpure, 2016	b (*)	b	c	b (*)	a (*)	c (*)	a (*)	5
14	Rosen, 2012	a (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
15	Nazarpour	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
16	Dombek	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
17	Levine	a (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
18	Merghati-khoei	a (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
19	Dennerstein	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
20	Biddle	a (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
21	Zeleke	a (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
22	Indhavivadhana	b (*)	a (*)	c	b (*)	a (*)	c (*)	a (*)	6
23	Santoro	a (*)	b	a (*)	b (*)	a (*)	c (*)	a (*)	6
24	Park, 2003	a (*)	b	a (*)	b (*)	a (*)	c (*)	a (*)	6
25	Hashemi, 2013	a (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
26	Peeyananjarassri, 2008	b (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
27	Hassanin, 2010	b (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
28	Alarslan, 2011	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
29	Blumel, 2009	a (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
30	CASTELO-BRANCO, 2003	b (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
31	Gartoulla, 2015	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
32	Ghazanfarpour, 2015	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
33	Ishak, 2010	b (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
34	Shifren, 2008	a (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
35	Jonusiene, 2013	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
36	Alizadeh, 2015	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
37	Safarinejad, 2006	a (*)	a (*)	a (*)	a (**)	a (*)	c (*)	a (*)	8
38	Pace, 2009	b (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
39	Carbal, 2012	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
40	Rosen, 2012	a (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
41	Valadares, 2016	a (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
42	Yanes, 2006	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
43	Arman, 2005	a (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
44	Avis, 2009	a (*)	b	c	b (*)	a (*)	c (*)	a (*)	5

(*continued*)

Table 5. Continued.

		Selection				Comparability	Outcome		Score
Row	First author/year	Representativeness of the sample	Sample size	Non-respondent	Ascertainment of the exposure	The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled	Assessment of the outcome	Statistical test	0–10 stars
45	Dąbrowska-Galas, 2019	a (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
46	Eftekhar, 2016	b (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
47	Jamali, 2016	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
48	Nazarpour, 2018	a (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
49	Kong, 2019	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
50	Tong, 2019	a (*)	b	a (*)	a (**)	a (*)	c (*)	a (*)	7
51	Yağmur, 2019	b (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
52	Yazdanpanahi, 2018	b (*)	a (*)	c	a (**)	a (*)	c (*)	a (*)	7
53	Chang, 2019	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6
54	Cagnacci, 2020	b (*)	b	c	a (**)	a (*)	c (*)	a (*)	6

NEWCASTLE–OTTAWA QUALITY ASSESSMENT SCALE.
Selection: (Maximum 5 stars).
1) Representativeness of the sample:.
a) Truly representative of the average in the target population.* (all subjects or random sampling)
b) Somewhat representative of the average in the target population. *(non-random sampling)
c) Selected group of users
d) No description of the sampling strategy
2) Sample size:
a) Justified and satisfactory.*
b) Not justified
3) Non-respondents:
a) Comparability between respondents and non-respondents characteristics is established, and the response rate is satisfactory. *
b) The response rate is unsatisfactory, or the comparability between respondents and non-respondents is unsatisfactory
c) No description of the response rate or the characteristics of the responders and the non-responders
4) Ascertainment of the exposure (Addis et al.):
a) Validated measurement tool.**
b) Non-validated measurement tool, but the tool is available or described.*
c) No description of the measurement tool
Comparability: (Maximum 2 stars)
1) The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled
a) The study controls for the most important factor (select one).*
b) The study control for any additional factor.*
Outcome: (Maximum 3 stars)
1) Assessment of the outcome:
a) Independent blind assessment.**
b) Record linkage.**
c) Self report.*
d) No description
2) Statistical test:
a) The statistical test used to analyze the data is clearly described and appropriate, and the measurement of the association is presented, including confidence intervals and the probability level (p value).*
b) The statistical test is not appropriate, not described or incomplete.

highest prevalence of SD, 371 samples were selected through convenience sampling method from clinic and self-administered tool was used for measuring the SD among samples that was completely different from Valadares et, al study that had the lowest prevalence of SD among included studies based on SPEQ and also have larger sample size that were selected from community. It is possible that these factors had considerable effect on the estimated prevalence in these studies.

According to results of this meta-analysis study, the total prevalence of SD in perimenopausal aged women was 52.41% based on the meta-analysis of three studies. In Valadares et al. study, samples were selected from community randomly and validated PEQ scale was used in the determination of the SD while in Lo et al. study self-administered tool was used in measuring the SD among participants that selected convenience from clinic so different results in these two studies may be contributed to the different tools, sample size and sampling methods.

Based on results of this meta-analysis, the total prevalence of postmenopausal SD was estimated approximately 64%. Among 35 studies assessed in this domain, in Egyptian study, with the highest prevalence, samples were selected through convenience sampling method from clinic. DSM-IV was used to assess the prevalence of SD in participants while in Park et al. study samples were selected through multistage stratified cluster sampling from community. In this study the Korean version of the Composite International Diagnostic Interview were used for data collection from participants (Park et al., 2015). Difference in the estimated prevalence among studies may be attributed to methodological approaches and implementation of the study.

The total prevalence of SDD in premenopausal women was investigated in 10 included studies and was estimated 33%. Shifren et al in a population-based study assessed the prevalence of sexual problems among 31,581 samples 18–65 years through census and validated tools was used to assess the SD among participants. In this study, the prevalence of premenopausal SDD and DD was reported 57.60% and 12.0% respectively (Shifren et al., 2008). In Dennerstein study among Western European women, the prevalence of SDD was estimated 16%. In this study, participants of 20–70 years were randomly included and PFSF scale was used to assess the sexual function among participants (Dennerstein et al., 2006). Although both of these two studies performed in community-based settings, however different sampling methods and tools for measuring SDD, may effect on different obtained results.

Regarding the prevalence of SDD among perimenopausal aged women, only four studies had included in meta-analysis process. The results showed that the total prevalence of SDD was approximately 54%. In TSING Lo et al., 371 samples were enrolled in the study through convenience sampling method from clinic and self-administered questionnaire was used for measurement of SD and in this study participants compared to three other studies participants, had higher SDD disorder (Lo & Kok, 2013).

The total prevalence of SDD among postmenopausal women were determined 59% based on analysis of 28 studies. Among analyzed studies, Mishra et al study in India had the highest prevalence of SDD. In this cross-sectional study, 49 postmenopausal women were chosen through convenience sampling method. Although the FSFI with standard scoring was used in this study, however, the small sample size in this study can have significantly effect on the higher estimated prevalence.

The total prevalence of premenopausal SAD was estimated 36% according to meta-analysis of 6 studies. In Berra study, 100 women were assessed with the aim of comparing the impairment of sexual function such as sexual distress in pre and postmenopausal stages. In this study samples who referred to clinic participated in the study and validated tools such as FSFI and FSDS were implemented to measure the sexual function and level of sexual distress among participants (Berra et al., 2010). In Avis et al study, the prevalence of SAD was estimated 22%. In this study, 3302 menopausal aged women were randomly participated in the interview (Avis et al., 2009). In these two studies, different tools were used and also various methodological approaches were implemented in these two studies.

The results of meta-analysis also showed that the total prevalence of postmenopausal SAD was estimated nearly 58%. In Jamali et al study, the sample were selected through convenience sampling method among individuals referred to health care system. In this study validated FSFI with standard scoring was used. The women with age group between 50 and 89 years were included in this study and as aging is an important factor associated with higher SD so it may have effect on higher prevalence of SAD among participants (Jamali et al., 2016) while in Park et al study a community based study was performed among the large sample size and a validated diagnostic tool was used for screening participants regarding sexual issues (Park et al., 2015).

Also in this meta-analysis study, the prevalence of orgasmic disorder were assessed in menopausal stages. In premenopausal women, results showed that the overall prevalence of orgasmic disorder was estimated 38.5%. Only five studies were assessed this domain of SD among premenopausal women and among them, in Chang et al, participants had lower orgasmic disorder. In this study, samples were chosen from clinic and FSFI was used for determining the prevalence of SD domains (Chang et al., 2019) while in Shifren study, wide age group of women through census method were participated in the study and more than 50% of participants have orgasmic disorder (Shifren et al., 2008). The results of these studies due to different methodological design were significantly different.

In postmenopausal women, results of analysis 17 studies showed that, the prevalence of orgasmic dysfunction disorder was estimated 47%. Among these studies in Pace et al cohort studies, perimenopausal and postmenopausal women were assessed in a 3 year follow up and the prevalence of orgasmic dysfunction disorder were estimated 7.0% (Pace et al., 2009), while in Jamali et al due to most of women were elderly and sexual dysfunction complaints such as orgasm disorder was obviously higher compared to other assessed studies (Jamali et al., 2016).

The prevalence of total lubrication problem, SPD and unsatisfaction in premenopausal stage based on the result of meta-analysis were estimated 28.0%, 34.0% and 37.0%, respectively. In these three domains of SD, limited studies had the criteria for including in this study and results showed, Berra et al. study in Italy had the higher prevalence of these three domains. In this study women aged 18–72 years were participated and more than half of them had these complaints in their sexual life however the small sample size of this study may have effect on estimated prevalence and certainly decreased the representative of the results to this age group population (Berra et al., 2010). In Chang et al, the lower prevalence of lubrication problem, SPD and unsatisfaction were reported compared to other included studies in this regard. Although both two studies used the FSFI for measuring these problems among their population, however the results affected by study's methodological characteristics such sample size and demographic characteristics of participants (Chang et al., 2019). The prevalence of total lubrication problem in postmenopausal period based on meta-analysis of 15 studies were estimated 52.0%. In Safaei study, despite the valid tool for assessing the SD among participants, the convenience sampling method and the wide range of age group 45–85 years maybe the causes of higher SD among samples (Safaei & Rajabzadeh, 2017) compared study by Santpure et al in India which conducted on 520 women aged 46–65 years (Santpure et al., 2016). Although in both studies, samples were chosen from clinic through convenience sampling method, different results may attributed to different number of sample size, cultural differences among participants of these two studies and also different measuring tools.

The prevalence of SPD among postmenopausal women were 35% based on the results of meta-analysis of 18 studies. Although the different results among studies maybe affected by cultural issues among countries which in some countries these problems generally underestimated, however different measurement tools and age groups of study samples, certainly have important influences on the results.

Other SD such as HSDD and DD were assessed in limited included studies. In Rosen et al. study, the prevalence of HSDD were assessed among 1574 menopausal aged women and its results showed the higher prevalence of HSDD

rather than other studies in this regard. In this study, FSFI with standard scoring were used for assessment of HSDD among 40–60 years participants (Rosen et al., 2012) while in West et al study results was significantly different due to different sample size and method of sampling (West et al., 2008).

Although the prevalence of sexual difficulties or dysfunctions increased in the menopausal period, however, it is difficult or embarrassing for women to initiate discussions about sexual health with their healthcare providers (Hinchliff & Gott, 2011). Based on the results of a study, healthcare providers should provide the appropriate consulting regarding the importance of sexual health on different aspects of personal marital life and increase the women's knowledge regarding their personal rights regarding sexual function in the menopause and facilitate their reporting and negotiating regarding the sexual problems with their physicians (Schaller et al., 2020).

Overall the results of this systematic review and meta-analysis showed that the prevalence of SD and its domain were significantly reported a wide variety of ranges among included studies and this differences mostly attributed to the methodological design and samples selection process. In other words, in some studies, the valid tools were not applied to measure the SD and the results in these studies might be not precise findings. Also the study samples characteristics such as ages and status of menopause of samples in the included studies were not completely similar so, we can consider the wide ranges of SD domains in included studies attributed to mentioned causes.

4.1. Strengths and limitations

This systematic review and meta-analytic was conducted by a robust search strategy and we attempt to publication bias not occurred as possible. The main limitation of this study was heterogeneity between studies regarding the reported prevalence of SD. Also only Persian and English language articles were included in this study and other languages studies with related topics were not included in the study due to non-dominance of authors.

5. Conclusion

In this study, based on the inclusion criteria studies regarding SD and it's domains in menopausal period were assessed systematically. The results indicated that the prevalence of SD and also domains of SD in different studies were reported much widely prevalence range and in postmenopausal were higher than compare to other stages of menopause. This study can be used as a good resources for obstetricians to understand the high possibility of recurrence of SD and assess the sexual activity of menopausal aged women in the menopause clinic. Also this study results can be a good resource for researchers to designing more standard and high quality studies regarding the prevalence of SD in menopausal periods.

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The project was found to be in accordance to the ethical principles and the national norms and standards for conducting Medical Research in Iran. Ethical code for this study was IR.MAZUMS.REC.1397.3288

Declaration of interest statement

No potential conflict of interest was reported by the authors.

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