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Original Paper

Prevalence of Female Sexual Dysfunction in Different Pregnancy Trimesters: A Systematic Review and Meta-analysis

Mina Malary[1], Mahmood Moosazadeh[2], Malihe Amerian[3], Shadi Sabetghadam[4], Afsaneh Keramat[5*]

1. PhD Candidate in Reproductive Health, Student Research Committee, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran
2. Associate Professor, Gastrointestinal Cancer Research Center, Non-communicable Diseases Institute, Mazandaran University of Medical Sciences, Sari, Iran
3. Midwifery (MSc), School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran
4. PhD Candidate in Reproductive health, Department of Reproductive Health, School of Nursing and Midwifery, Guilan University of Medical Sciences, Rasht, Iran
5. Professor, Department of Reproductive Health, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran

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ABSTRACT

Introduction: Pregnancy is one of the most sensitive periods in a woman's life. Physical and psychological changes during pregnancy can significantly affect the couples' sexual relations. Healthy sexual desire during pregnancy is essential for the development of couples as parents.

Objective: This meta-analysis study estimates the prevalence of sexual dysfunction overall and in different trimesters of pregnancy.

Materials and Methods: This research is a systematic review and meta-analysis. A search was conducted in PubMed, Scopus, Science Direct, and Google Scholar databases to find cross-sectional and prospective cohort studies investigating the prevalence of sexual dysfunction in different trimesters using the Female Sexual Function Index (FSFI) published from 2000 to 2019. The methodological quality of each study was assessed using the modified from the STROBE (The Strengthening the Reporting of Observational Studies in Epidemiology) checklist to determine the risk of bias. The standard error of prevalence in each study was calculated based on the binomial distribution formula. Based on heterogeneity results, a random effect model was used to estimate the prevalence.

Results: Fifteen articles met the inclusion criteria, with a total number of 3569 participants, of which 2538 were in cross-sectional studies and 1031 in prospective cohort studies. In the meta-analysis of both prospective cohort and cross-sectional studies, the prevalence rates of sexual dysfunction in the first, second, and third trimesters, and overall were estimated at 51.33% (95%CI; 37.41-65.25), 51.13% (95%CI; 38.93-63.33), 72.80% (95%CI; 65.78-79.81%), and 58.65% (95%CI; 51.50-65.80), respectively.

Conclusion: The trimester of pregnancy has a predictive role in the prevalence of sexual dysfunction during pregnancy. The prevalence of sexual dysfunction is higher in the third trimester.

*** Corresponding Author:**
Afsaneh Keramat, Professor.
Address: *Department of Reproductive Health, School of Nursing and Midwifery, Shahroud University of Medical Sciences, Shahroud, Iran.*
Tel: *+98 (23) 32393962*
E-mail: *afsanehkeramat@yahoo.com*

Highlights

- The trimester of pregnancy is an essential factor influencing the prevalence of sexual dysfunction.
- Depending on the type of study (cross-sectional or cohort), the prevalence of sexual dysfunction varies in different trimesters of pregnancy.
- The highest prevalence of sexual dysfunction was observed in the third trimester.

Plain Language Summary

Women's sexual function fluctuates throughout their lives, and the transition to pregnancy as a crucial period with physiological and anatomical changes has a significant effect on their sexual function. During pregnancy, many factors can significantly impact women's sexual function, one of which is the trimester of pregnancy. Different trimesters of pregnancy can be very important because of the different changes they make to a pregnant woman's body, physically and hormonally. Numerous preliminary studies have evaluated sexual function, especially in pregnant women as a vulnerable group. Still, no study has been performed that combines the results of these preliminary studies and reports a single outcome. Therefore, the present meta-analysis evaluated the prevalence of sexual dysfunction overall and in different trimesters of pregnancy. The present study's findings showed various patterns of sexual dysfunction prevalence in different trimesters and overall based on the study design (cross-sectional, cohort, and combined). However, higher levels of sexual dysfunction in the third trimester were common among all studies. It is essential to consider the trimester of pregnancy in sexual counseling during pregnancy, and it should not be neglected.

Introduction

Pregnancy is one of the most critical periods with significant changes in women's physical, mental, and sexual status [1]. Pregnancy has been reported as a risk factor for lower scores of sexual function in women [2]. About 50% of women of any age suffer from sexual disorders during their lifetime [3]. A study in the Middle East showed decreased levels of sexual desire and activity and frequency of orgasms in women and decreased levels of sexual activity in their husbands during pregnancy compared to the pre-pregnancy period [4]. In a cross-sectional study in Canada and the United States, 31-58% of pregnant women reported sexual problems, including decreased desire, arousal, lubrication, orgasm, and increased genito-pelvic pain [5]. In the latest study conducted in Iran, the prevalence of sexual dysfunction in pregnant women in Jahrom City was 68% [6].

Factors such as giving up sexual activity, feeling guilty about having sex during pregnancy, changing body image, and reduced feeling of being attractive for the husband, fear of harming the fetus, or miscarriage and premature birth can affect a woman's sexual response. Ultimately, this condition leads to anxiety and lack of self-confidence, and mental disorders in couples [7]. However, due to social taboos, this issue is often neglected and is less explored. Thus, many women who experience sexual dysfunction continue to suffer, even though it negatively affects their quality of life [8]. A study conducted in Iran showed that the scores of physical, mental, environmental, and social health components of the quality of life of pregnant women with sexual dysfunction are lower than women without sexual dysfunction. More than half of women with sexual dysfunction showed a significant reduction in all aspects of quality of life than women with normal sexual function [6].

The sexual desire and function of pregnant women during pregnancy are unpredictable; sexual desire may decrease in the first trimester of pregnancy due to hormonal fluctuations, fatigue, or nausea. It may increase during the second trimester due to increased blood flow to the genitals and breasts and decrease again in the third trimester due to weight gain, back pain, and other symptoms [9]. A meta-analysis of 59 studies in 1999 showed that women's sexual desire and activity decreased slightly in the first trimester of pregnancy; it showed variable patterns in the second trimester and sharply reduced in the third trimester [10].

Numerous studies have evaluated the prevalence of sexual dysfunction during pregnancy and in different

trimesters and have reported a different estimate of its prevalence. Some studies have shown that sexual dysfunction rises with the increase of gestational age [11-13]. Others did not report a difference between trimesters [14, 15]. Therefore, it is necessary to combine these results using meta-analysis criteria. The present study was performed to estimate the prevalence of sexual dysfunction in different trimesters of pregnancy using the meta-analysis method. The Female Sexual Function Index (FSFI) is a widely-used multidimensional tool that assesses the key dimensions of sexual function in women [16]. The index is valid for different populations [17-19], and its use has been confirmed in various stages of life [20, 21]. Therefore, only studies that used this tool to measure sexual dysfunction were reviewed in this study.

Materials and Methods

This work is a systematic review and meta-analysis. A search was conducted on related studies published from 2000 to 2019 in PubMed, Scopus, Science Direct, and Google Scholar databases using the keywords of "pregnancy", "sexual", "sexuality", "pregnancy trimesters", "dysfunction", "function", "prevalence", and "women". All prospective cohort and cross-sectional studies were selected that investigated the prevalence of sexual dysfunction in pregnant women in different trimesters of pregnancy using the FSFI instrument. Studies would be excluded from the review and meta-analysis if they had not reported the prevalence of sexual dysfunction in any trimesters, those with unknown sample size, not used the FSFI instrument, reported dysfunction as a mean score, published in two or more journals (only one used), conference papers, those with gray literature, those published in languages other than English, secondary studies, and those with no minimum quality assessment score.

The full texts of all articles were extracted. After deleting duplicates, unrelated articles were removed by examining their titles, abstracts, and full texts. Their reference lists were also examined to increase the sensitivity and select a larger number of studies. To prevent bias caused by re-publication (transverse and longitudinal publication bias), we examined the findings of studies to identify and eliminate duplicates. After determining the relevant studies, a checklist used in previous studies was used to evaluate their quality. This checklist is a modified form of the STROBE (The Strengthening the Reporting of Observational Studies in Epidemiology) checklist [22, 23] and includes 12 questions that address various aspects of the methodology. It consists of the appropriate sample size, type of study, sampling method, study population, data collection method, the definition of variables, and how to examine samples. This tool covers data collection, statistical tests, study objectives, presenting findings appropriately and based on objectives. Each question had 1 point; any study obtained at least 8 points [22] was included in the meta-analysis. All stages were monitored by another member of the research team to determine that no study was omitted and the quality of the articles was evaluated correctly. In case of disagreement, a third opinion was sought. Finally, data were extracted for each study based on the title, author's name, and year of study, type of study, place of study, number of samples, and prevalence of sexual dysfunction in each trimester.

RevMan 5.2 software (Cochrane Collaboration, London, UK) was used for data analysis. The standard error of the prevalence of sexual dysfunction in each study was calculated based on the binomial distribution formula. Finally, the heterogeneity index between studies was determined using Cochran (Q) and I2 tests. Based on heterogeneity results, a random-effects model was used to estimate the prevalence of sexual dysfunction in pregnant women. Sensitivity analysis was also performed to determine the effective studies on heterogeneity. Point estimates of the prevalence of sexual dysfunction with a 95% confidence interval were calculated using the forest plots, in which the square size indicates the weight of each study and the lines on both sides show the 95% CI.

Results

The initial search yielded 1457 articles; 185 articles were removed due to duplication and overlapping databases. Subsequently, by deleting 1195 unrelated articles, 77 related articles remained. After examining their full texts, 60 were excluded for various reasons, including being irrelevancy (8 articles), not assessing sexual dysfunction (4 articles), not using the FSFI tool (15 articles), lacking cohort or cross-sectional design (5 articles), and not reporting the prevalence of sexual dysfunction (28 articles). Finally, 17 articles were evaluated with the checklist, of which 2 articles were removed due to insufficient points, and 15 articles entered the meta-analysis process (Figure 1 and Table 1).

Out of 15 articles, 4 were prospective cohorts (conducted in Iran, Poland, Egypt, and Brazil), and 11 were cross-sectional (conducted in Turkey, Iran, Egypt, Thailand, and Brazil). Their samples included nulliparous and multiparous pregnant women, but only one study investigated the prevalence separately in the two groups. The samples included adult pregnant women, and only

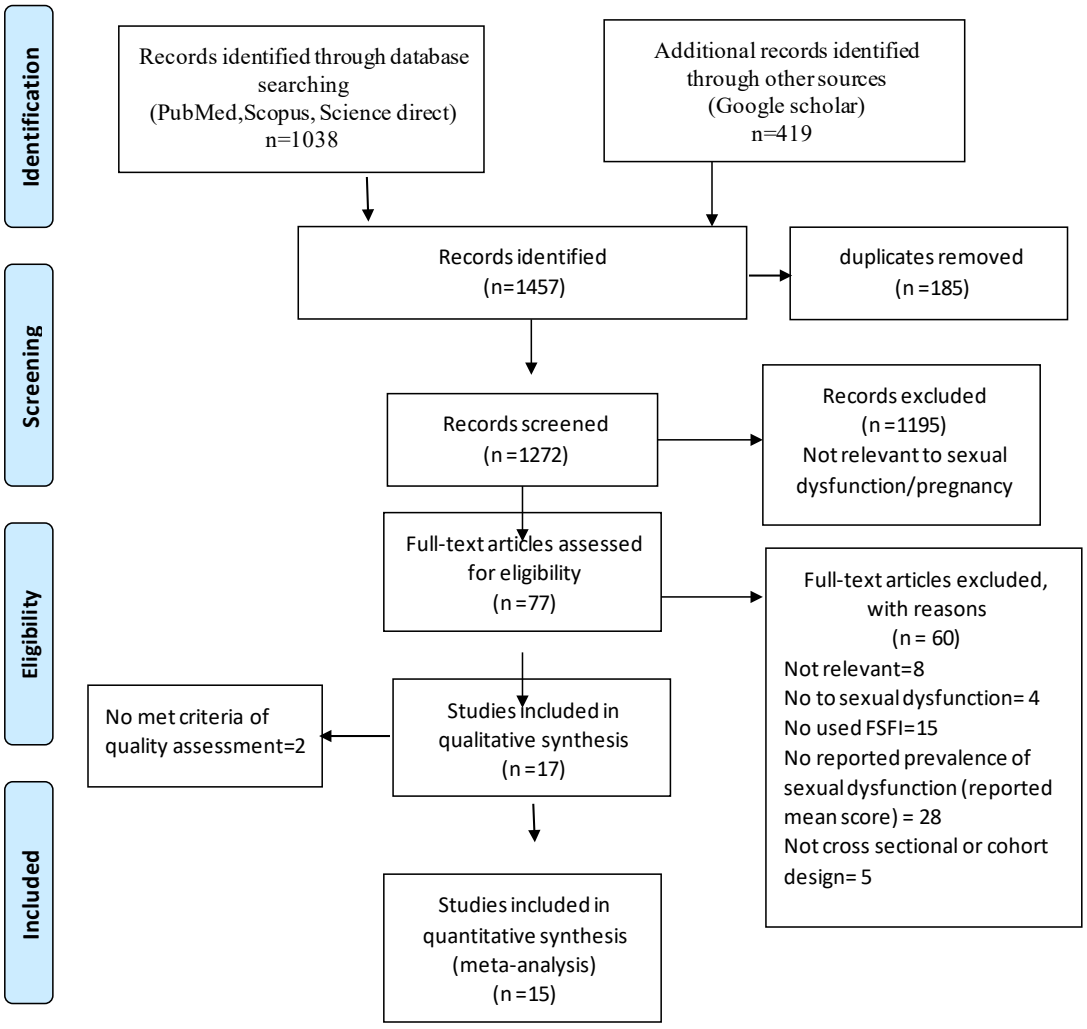

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart of studies inclusion

one study examined the prevalence in adolescent pregnant women. In a cross-sectional study by Erbil, the prevalence of sexual dysfunction was examined only in the third trimester [24]. Therefore, in the forest plot, 10 cross-sectional studies in the first and second trimesters and 11 studies in the third trimester were included in the meta-analysis. In a prospective cohort study conducted by Gałazka, the prevalence of sexual dysfunction in nulliparous and multiparous women was examined separately [25]. In the study by Leite, the prevalence of sexual dysfunction in adolescent and adult pregnant women was estimated separately [26]. Therefore, these two studies were included twice in the forest plot of prospective cohort studies.

The prevalence of sexual dysfunction in the first trimester varied from 10.4% in Seven's study [27] with a sample size of 286 pregnant women to 89.47% in Aydin's study [28] with a sample size of 246 pregnant women. In the second trimester, it ranged from 17.6% in Seven's study [27] to 90.14% in Aydin's study [28]. In the third trimester, it ranged from 46.2% in Jamali's study [29] with a sample size of 257 pregnant women to 93.2% in Aydin's study [28]. Based on the results of meta-analysis, the prevalence rates of sexual dysfunction in prospective cohort studies in the first, second, and third trimesters and overall were estimated to be 47.06% (95%CI; 38.24-55.88), 42.19% (95%CI; 31.20-53.18), 66.53% (95% CI; 55.97-77.08%), and 51.79% (95%CI; 44.06-59.53), respectively (Figure 2). In the meta-analysis of cross-sectional studies, the prevalence rates of sexual dysfunction were 54.09% (95%CI; 34.13-74.05) in the first trimester, 56.43% (95%CI; 38.68-73.19) in the second trimester, 76.12% (95%CI; 67.60-84.63) in the third trimester, and 62.63% (95%CI; 53.06-72.20) overall (Figure 3). Finally, In the meta-analysis of both prospective cohort and cross-sectional studies, the prevalence rates of sexual dysfunction in the first, sec-

Table 1. Studies in meta-analysis of the prevalence of sexual dysfunction in different trimesters of pregnancy

Row	Author(s)	Publication Year	Country	Study Design	Sample Size	Sexual Dysfunction Prevalence		
						First Trimester	Second Trimester	Third Trimester
1	Miranda et al. [43]	2019	Brazil	Cross-sectional	283	33.3%	50.9%	62%
2	Mobasher et al. [37]	2019	Egypt	Cross-sectional	300	70%	44%	72%
3	Astepe & Köleli [36]	2018	Turkey	Cross-sectional	137	64.3%	82.9%	68.3%
4	Erbil [24]	2018	Turkey	Cross-sectional	125	-	-	92%
5	Küçükdurmaz et al. [14]	2016	Turkey	Cross-sectional	207	87%	80.6%	92.6%
6	Seven et al. [27]	2015	Turkey	Cross-sectional	286	10.4%	17.6%	72.1%
7	Aydin et al. [28]	2015	Turkey	Cross-sectional	246	89.47%	90.14%	93.2%
8	Hanafy et al. [44]	2014	Egypt	Cross-sectional	300	68%	51%	72%
9	Jamali & Mosalanejad [29]	2013	Iran	Cross-sectional	257	23.4%	30.5%	46.2%
10	Kuljarusnont et al. [45]	2011	Thailand	Cross-sectional	260	58.1%	61.5%	88.5 %
11	Naldoni [46]	2011	Brazil	Cross-sectional	137	36.84%	55.17%	76.67%
12	Khalesi et al. [47]	2018	Iran	Prospective cohort	123	64.22%	70.73%	87.7%
13	Gałązka–Primi [25]	2015	Poland	Prospective cohort	95	39.0%	37.9%	56.8%
13	Gałązka-Multi [25]	2015	Poland	Prospective cohort	73	32.9%	38.4%	52.1%
14	Ahmed et al. [38]	2014	Egypt	Prospective cohort	451	56.1%	40.4%	63.4%
15	Leite-Teenagers [26]	2009	Brazil	Prospective cohort	125	40.8%	31.2%	63.2%
15	Leite-adults [26]	2009	Brazil	Prospective cohort	146	46.6%	34.2%	73.3%

ond, and third trimesters and overall were estimated to be 51.33% (95%CI; 37.41-65.25), 51.13% (95%CI; 38.93-63.33), 72.80% (95%CI; 65.78-79.81) and 58.65 (95% CI; 51.50-65.80), respectively (Figure 4). The results of various studies on the prevalence of sexual dysfunction in pregnancy cannot be directly compared for reasons such as the different definitions and methods used to assess sexual function during pregnancy.

Discussion

The results of various studies on the prevalence of sexual dysfunction in pregnancy cannot be directly compared due to the different definitions and methods used to assess sexual function during pregnancy. Therefore, in this meta-analysis, only studies that used the FSFI tool to diagnose sexual dysfunction were reviewed. According to the results, the prevalence of sexual dysfunction during pregnancy in the third trimester was higher in all forest plots. Findings of the prevalence of sexual dysfunction in the second trimester were contradictory. In cross-sectional studies, its prevalence was higher where the prevalence in the second trimester increased slightly compared to the first trimester and rose sharply in the third trimester. But prospective cohort studies showed a slight decrease in the prevalence of sexual dysfunction in the second trimester and then increased from the second to the third trimesters. Moreover, the meta-analysis results combined prospective cohort and cross-sectional studies were similar to prospective cohort studies.

The results of most studies on the prevalence of sexual dysfunction in pregnancy were different. The differences in age group, used tools, sample selection method and variation in the parity of pregnant women are the reasons for these discrepancies. Our results are similar to a meta-analysis conducted in 1999, which showed that sexual desire decreased slightly in the first trimester, had a different pattern in the second trimester, and significantly reduced in the third trimester [10]. In-

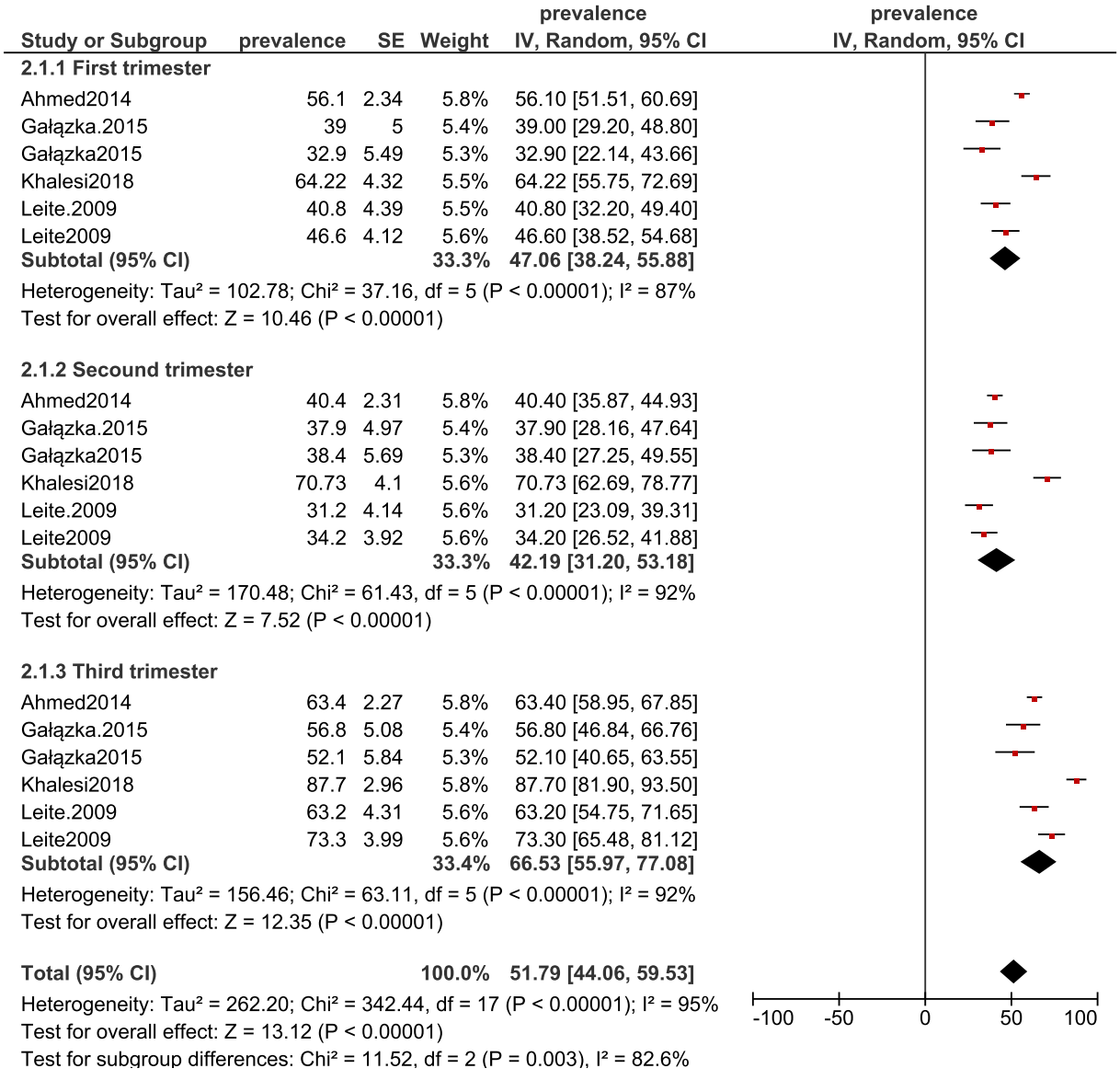

Figure 2. Prevalence of sexual dysfunction in different trimesters of pregnancy in prospective cohort studies

creases in estrogen, progesterone, and prolactin in the first trimester lead to biological changes causing nausea and vomiting, weight gain, fatigue, and chest pain, affecting sexual desire and arousal [30]. Thus, the highest decrease in sexual desire was reported in the first trimester [31]. Regardless of the physical responses of pregnant women to sex, some women reported the fear of harm to the fetus as an essential factor in their sexual dysfunction during pregnancy [32]. Senkumwong also reported that the main concern of women about sexual activity in pregnancy was the adverse effects of sexual intercourse on pregnancy outcomes, especially fetal harm [31]. In this regard, the results of a study showed that women who were unaware of their pregnancy had a higher frequency of sexual intercourse compared to women who were unaware of their pregnancy [19]. This outcome may be due to concerns about the consequences of pregnancy, such as fetal injury, miscarriage, or bleeding. Therefore, it should be reminded to these women that it is safe to have sexual activity in case of normal pregnancy, and it is better to limit sexual activity in case of pathological pregnancy.

In the second trimester, the frequency of sexual intercourse increases due to a higher sense of security increased sexual desire, and fewer physical symptoms associated with pregnancy in the previous trimester. However, although there may be a higher tolerance for engaging in sexual activity in the second trimester, changes in sexual desire, satisfaction, and frequency

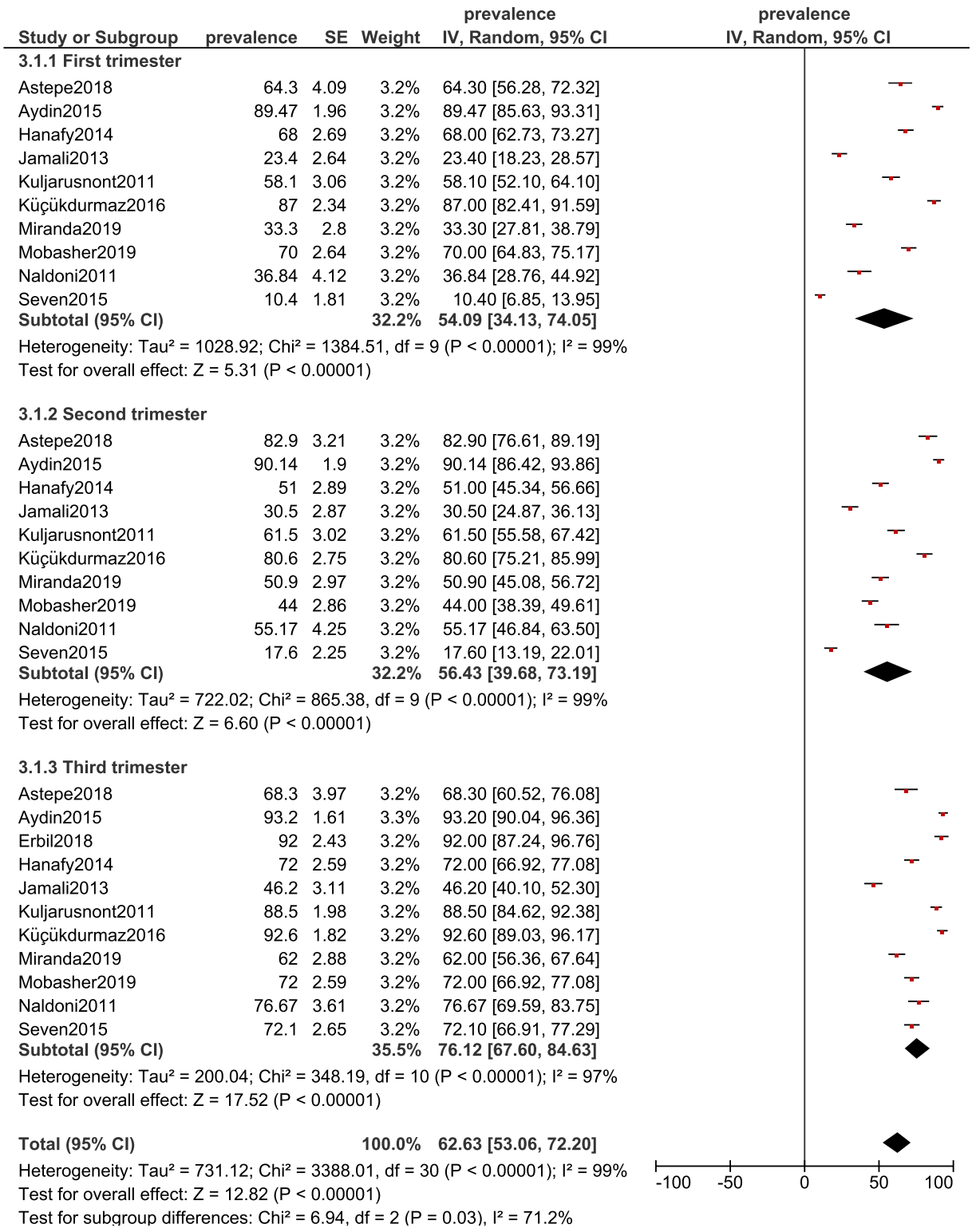

Figure 3. Prevalence of sexual dysfunction in different trimesters of pregnancy in cross-sectional studies

vary widely from the first trimester to the second trimester. A study by Fuchs et al. found no difference in sexual activity between the first and second trimesters of pregnancy [33], similar to a study conducted in Mexico [34]. Another study in Poland found that engagement in sexual activity was lower in the second trimester than in the first trimester [35]. While in a study in Turkey, the sec-

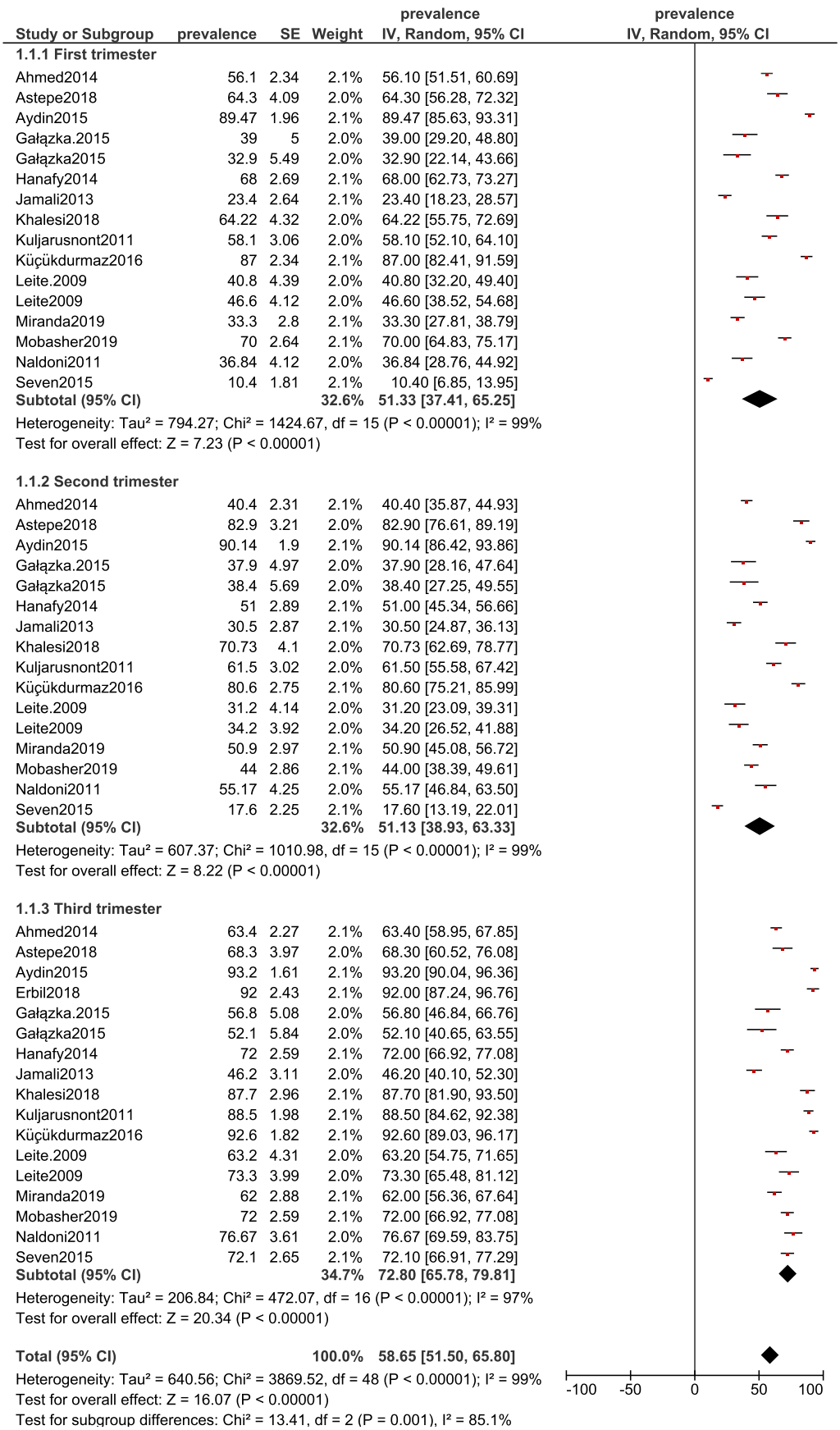

Figure 4. Overall prevalence of sexual dysfunction in different trimesters of pregnancy

ond trimester had the highest prevalence of sexual dysfunction compared to the first and third trimesters [36].

The fact is that most studies pointed to an improvement in sexual function in the second trimester [37, 38]. Some studies attributed the decrease in androgen levels in the third trimester to decreased sexual desire. At the same time, Erol et al. found no statistically significant relationship between a woman's overall sexual function and serum androgen levels [39]. Chang et al. reported a significant decrease in sexual activity during the third trimester compared to the first and second trimesters, but sexual satisfaction increased significantly in the third trimester [40]. The Corbacioglu Esmer et al. study also showed a significant relationship between the frequency of sexual intercourse and the trimester of pregnancy and the overall score of FSFI in the third trimester that was significantly lower than the overall score in the first and second trimesters [12]. The Aydos et al. study in Turkey also showed a decrease in the overall score of sexual activity with increasing gestational age [13]. However, studies by Küçükdurmaz et al. [14], Aydin et al. [28], and Tasdemir et al. [15], all conducted in Turkey, found a statistically significant relationship between different trimesters of pregnancy and sexual dysfunction.

Various studies have reported different factors (except the trimester) as predictors of sexual dysfunction in pregnancy, and changes in sexual behavior during pregnancy seem to be due to factors such as the duration of the couple's relationship, age, physical changes, and discomfort associated with this period [41]. In Küçükdurmaz et al.'s study, partners' educational level and pre-pregnancy sexual dysfunction were significantly related to sexual dysfunction in pregnancy. The most common concerns for having sexual activity in this study were fear of pain, fear of miscawage, and religious factors [14]. Ahmed et al. reported age, parity, and duration of the marriage as factors that negatively correlate with sexual function [38]. Güleroğlu and Beşer also showed old age and increased duration of the marriage as factors affecting women's sexual function during pregnancy [42], but in Tasdemir et al.'s study, age and duration of marriage were the predictors of sexual dysfunction [15]. Differences in results can be due to various reasons such as differences in the study population, age of participants, tools used to measure sexual dysfunction, and the study design (cross-sectional study or prospective cohort).

Conclusion

Since the distribution of these factors was very high and it was not possible to meta-analyze all the predictors, only the trimester of pregnancy was considered as a determining factor in sexual dysfunction. The next limitation of this study was not including studies on the prevalence of sexual dysfunction in different trimesters of pregnancy as an average score. Therefore, it is recommended that another systematic review and meta-analysis be conducted on the mean score of sexual dysfunction during pregnancy and its various trimesters and that the results be compared with the results of this study. Another limitation of the present study was the existence of heterogeneity between the results of the review. To overcome this limitation, a random effect model was used for estimation.

The present meta-analysis could estimate the prevalence of sexual dysfunction in general and in different trimesters of pregnancy for health policymakers and justify the need for sexual dysfunction prevention programs emphasizing pregnancy. The current meta-analysis showed that the trimester of pregnancy played an essential role as a predictor of sexual function in pregnancy. Therefore, it is imperative to pay attention to the trimester of pregnancy when obtaining a pregnancy history to maintain sexual and reproductive health and the family's foundation so that the necessary interventions can be done in various forms of counseling and education.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

Searching in databases: Mina Malary and Afsaneh Keramat; Data extraction: Mina Malary; Initial draft preparation: Mina Malary, Malihe Amerian, and Shadi Sabetghadam; Final approval of draft: Afsaneh Keramat and Mahmood Moosazadeh; Data analysis: Mina Malary and Mahmood Moosazadeh; Supervision: Afsaneh Keramat; Review and approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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