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Women's sexual function before and during COVID-19 pandemic: A systematic review and meta-analysis

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Abstract

Background: To systematically review and summarize the available literature regarding the women's sexual function during COVID-19 pandemic and compare it to pre-pandemic period.

Methods: We searched PubMed and Embase from the inception of the databases until 15th April 2021. Data regarding the sexual function, measured by female sexual function index (FSFI), of adult sexually active women were extracted from the eligible studies and compared between the before and during the COVID-19 pandemic. The secondary outcome was the frequency of intercourse during pandemic time. The random-effect model was used to pool the mean differences and corresponding 95% confidence intervals (CIs). Heterogeneity was assessed using the I^2 value.

Results: Our search resulted in a sample of six eligible studies, which involved 1114 female participants. The total FSFI score among study participants during pandemic was 22.93 (95% CI: 19.26–26.59), which indicated a significant decrease in sexual function of women during pandemic as compared to pre-pandemic time (mean difference = −3.80, 95% CI: −6.48 to −1.12, $p = 0.005$, $I^2 = 96\%$). We also conducted a meta-analysis of individual FSFI domains. During pandemic, women had problems with arousal ($p < 0.0001$), orgasm ($p = 0.0008$), satisfaction ($p = 0.0009$), and pain ($p = 0.009$). No significant difference in frequency of intercourse was observed between pre- and during pandemic ($p = 0.80$). Furthermore, no significant publication bias was present among included studies.

Conclusion: Overall, there was a significant decrease in sexual function of sexually active adult women during COVID-19 pandemic. The most affected areas of sexual function were arousal, orgasm, pain, and satisfaction. Physicians must be aware of COVID-19 impact on sexual life of women and provide proper counseling.

Key words: COVID-19, female sexual function index, meta-analysis, pandemic, sexual health, women.

Background

In December 2019, unusual cases of patients presenting with respiratory signs and symptoms caused by the new Coronavirus (COVID-19) were reported in Wuhan, China and the spread of the virus rapidly became a global health concern.[1] COVID-19 pandemic is not just a medical phenomenon; it also

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distresses individuals and society and causes disruption, stress, anxiety, stigma, and depression all around the world.[2]

Recent studies suggest that reduced interpersonal communication, due to quarantine, may increase the odds of depression and anxiety and exacerbate the preexisting psychological conditions.[3] Depression has been shown to be strongly associated with hypoactive sexual desire disorder and anxiety has been suggested to interfere with arousal and the ability to achieve orgasm among female patients.[4] Accordingly, long-term dyspareunia is up to 10-times more common in women diagnosed with depression and/or anxiety.[4]

Fuchs et al. assessed the influence of COVID-19 pandemic on the quality of sexual lifestyle and frequency of intercourse among Polish women and found that all domains of sexual function of women including desire, arousal, lubrication, orgasm, satisfaction significantly deteriorated during pandemic.[5] On the other hand, data from Turkish women during the COVID-19 pandemic suggested that sexual desire and frequency of intercourse significantly increased among women, whereas the quality of their sexual life decreased significantly.[6] This variation in findings may be due, in part, to difference number of study participants and their demographics such as age, marital status, and education level, thus a comprehensive review seems necessary to give a conclusive picture on what we know about the impact of pandemic and quarantine on sexual life of women.

This meta-analysis was designed to assess sexual function in women during the pandemic using the female sexual function index (FSFI) scores. The results can be used to provide guidance for the clinical care of women during COVID-19 pandemic and will offer an objective basis for health decision-making in this particular population.

Methods and Materials

This systematic review and meta-analysis were conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist.[7] The study protocol for this systematic review was registered in the PROSPERO international prospective register of systematic reviews (Registration number: CRD42021248333).

Search strategy

Systematic literature search was performed by two independent authors (Kamran Hessami and Nicolas Sayegh) on PubMed and Embase from inception to 15th April, 2021. Search was conducted using the following keywords: ("sexual function" OR "sexual dysfunction" OR "sexual desire" OR "female sexual" OR "sexual behavior" OR "sexual activity" OR "sexuality" OR "sexual health") AND ("COVID-19" OR "Coronavirus" OR "Severe Acute Respiratory Syndrome" OR "Coronavirus" OR "2019nCoV" OR "Corona Virus" OR "Coronavirus" OR "COVID" OR "COVID19" OR "COVID-19" OR "SARS CoV 2" OR "SARS-CoV" OR "SARS-CoV-2"). References of relevant articles were manually reviewed, and eligible studies were added to results from electronic literature search.

Inclusion/exclusion criteria

Observational studies, such as cohort, case–control, and cross sectional, which include adult women filling FSFI questionnaire before and during pandemic were selected. Considering of the large number of articles concerning the sexual function during COVID-19 pandemic, articles presenting data on all domains of FSFI and written in English were eligible.

Exclusion criteria were defined as husband or partner treated for erectile dysfunction, women with any sexual dysfunction hindering sexual relations before or during the pandemic. Only published studies were considered eligible for this meta-analysis.

Outcome measure and female sexual function index

The primary outcome of this meta-analysis is to compare the FSFI score before and during COVID-19 pandemic and the secondary outcome is to compare the frequency of sexual intercourse before and during pandemic. The FSFI is a reliable, multidimensional, and validated self-assessment questionnaire consisting of 19 items and 6 domains that assess the main dimensions of sexual function in women. FSFI questionnaire assesses the patients in six dimensions of sexual desire, arousal, lubrication, orgasm, satisfaction, and pain. The FSFI total score is the sum of the six domain scores and has a maximum score of 36, and the lower scores indicate more problematic sexual functions.[8] The cut-off point of 26.55 was used for diagnosing the sexual dysfunction in women.[9]

Data extraction

Data abstraction of included articles was performed by two independent authors (Kamran Hessami and Nicolas Sayegh) using a standardized sheet. The following data were abstracted: author's name, publication year, study design, patients' demographic data, FSFI score (both total and domain-specific scores) before and during pandemic, interval period between FSFI assessments and frequency of sexual intercourse.

In case of overlap or duplications in patients between studies, the study with the larger sample size was included for review. Overlap of population was assessed according to the authors and institution where the study was performed and the year of publication.

Quality assessment

For assessing the quality of the studies, the Newcastle-Ottawa Scale (NOS) was selected.

NOS was used to evaluate the quality of included studies and risk of bias. NOS comprises "participant selection," "comparability of study groups," and "assessment of outcome or exposure." A score above 7 is considered as high quality.[10]

Statistical analysis

Statistical analysis was performed using Review Manager (RevMan) version 5.4 (The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen) and STATA version 12.0 (Stata Corp., College Station, TX). Pooled effect sizes (ESs) were presented using mean difference with 95% confidence interval (CI) for continuous variables. Only outcomes that were reported in more than two studies were analyzed. I-squared tests (I^2) were used to examine heterogeneity across the included studies; $I^2 \geq 50\%$ and $p < 0.05$ indicate heterogeneity. A random-effects model was used due to anticipated heterogeneity of included studies. Publication bias was also assessed with the Begg and Egger's tests.

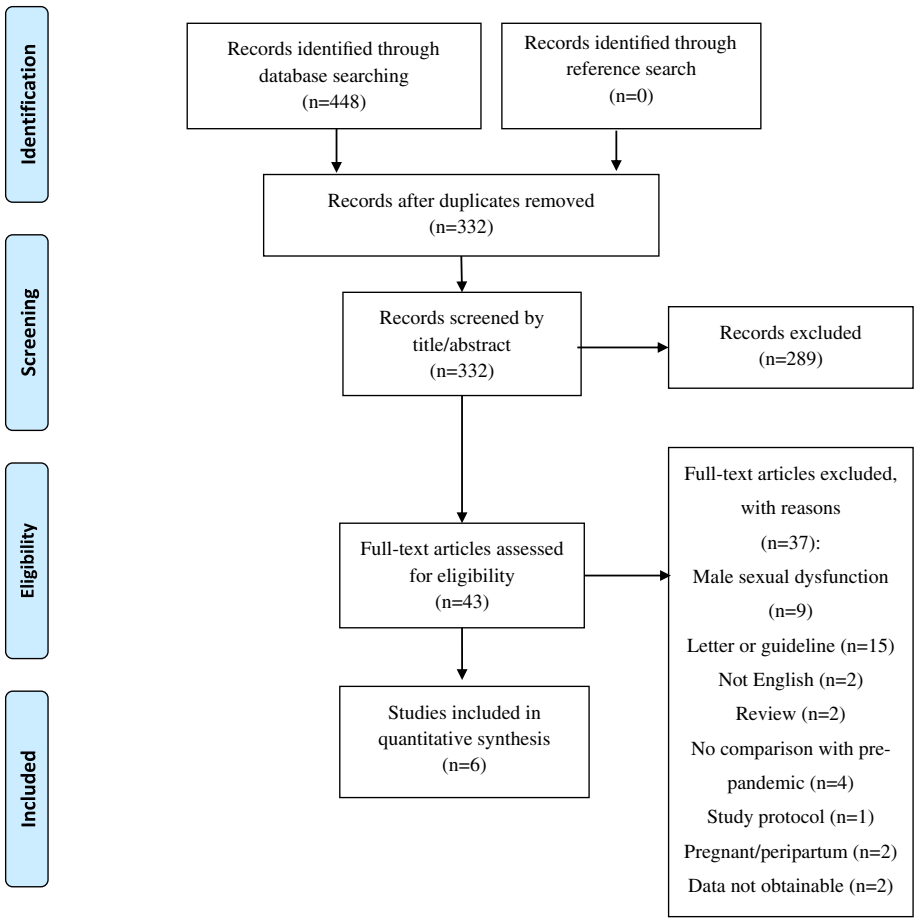


FIGURE 1 PRISMA flowchart

TABLE 1 Included studies characteristics

First author	Publication year, design	Country	Sample size	Age	Education	Marital status	Inclusion/exclusion criteria	Timeline of the first and second FSFI assessment	NOS
Bhambhvani et al.[15]	2021, prospective	USA	91	43.1 ± 11.8	NR	82.4% married, 15.4% single, and 2.2% unknown	Convenience sample of women surveyed for a separate study of sexual function which began enrollment immediately prior to the onset of the COVID-19 pandemic, between October 20, 2019 and March 1, 2020 that comprised our pre-COVID dataset.	The first survey was conducted between October 20, 2019 and March 1, 2020. The second survey was conducted between August 1, 2020 and October 10, 2020.	8
Karagöz et al.[13]	2020, cross-sectional	Turkey	97	34.7 ± 6.67	90.7% university degree, 9.3% high school or less	100% married	Inclusion criteria: women 18–65 years old and married or co-habiting heterosexual couples who were living together before the pandemic and continued to do so during this period. Exclusion criteria: partner with erectile dysfunction, women with any sexual dysfunction hindering sexual relations before or during the pandemic, individuals and their partners treated for or suspected COVID-19 or isolated after testing, pregnant women and their partners and those previously under treatment for anxiety or depression.	The first survey was conducted before COVID-19 pandemic (exact time not reported by authors). The second survey was conducted between 6th of May 2020 and 20th of May 2020.	8

TABLE 1 Continued

First author	Publication year, design	Country	Sample size	Age	Education	Marital status	Inclusion/exclusion criteria	Timeline of the first and second FSFI assessment	NOS
Kaya et al.[12]	2020, retrospective	Turkey	15	33.3 ± 5.6	33.3% university degree, 66.7% high school or less	NR	Exclusion criteria: no regular sexual relationship, below 18 years old or above 65 years old, being in menopause, having history of gynecological surgery, having urological/ neurological/ psychiatric/ oncological/heart/ kidney disease or a diagnose of sexual dysfunction.	The first survey period was not reported by authors. The second survey was at least 14 days after hospital discharge.	7
Schiavi et al.[11]	2020, NR	Italy	89	39 (28–50)[a]	46.1% university degree, 53.9% high school or less	NR	Inclusion criteria: women in reproductive age (18–45 years old); sexually active women who live with them; not infected with COVID-19 virus and consent to the processing of health data for research purposes. Exclusion criteria: no sexually active women; under the age of 18; COVID-19 positivity; dyspareunia; chronic pelvic pain; deep endometriosis or interstitial cystitis/bladder pain syndrome; neurogenic	The first survey was conducted at between February 2018 and February 2020. The second survey was conducted 4 weeks after the introduction of the social distancing measures due to the COVID-19 outbreak in Italy.	7

(*Continues*)

TABLE 1 Continued

First author	Publication year, design	Country	Sample size	Age	Education	Marital status	Inclusion/exclusion criteria	Timeline of the first and second FSFI assessment	NOS
							bladder; gynecological cancer or urological cancer; history of pelvic radiotherapy; pelvic organ prolapse; menopause; premature ovarian failure; and no signature of informed consent.		
Fuchs et al.[5]	2020, prospective	Poland	764	25.1 ± 4.3	74.2% university degree, 25.8% high school or less	24.8% married, 68% informal relationship, 7.2% single	Inclusion criteria: being sexually active, in reproductive age. Exclusion criteria: being under 18 years old, COVID-19 positive, mental illness such as depression or personality disorders and using medicine that reduces libido for the previous 3 months.	The first survey had been gathered at the beginning of March, before the first case of COVID-19 in Poland. Second survey was conducted in second half of April and referred to the time of social quarantine in Poland.	8
Yuksel and Ozgor[6]	2020, prospective	Turkey	58	27.6 ± 4.4	12% university degree, 88% high school or less	100% married	Inclusion criteria: married women who were older than 18 years and not menopausal. Exclusion criteria: urinary incontinence, gynecological operation or pelvic surgery, pelvic organ prolapse, any malignancy, any psychiatric or neurological	First survey was conducted 6–12 months prior to the pandemic. Second survey was conducted at March 11 to April 12, 2020.	8

TABLE 1 Continued

First author	Publication year, design	Country	Sample size	Age	Education	Marital status	Inclusion/exclusion criteria	Timeline of the first and second FSFI assessment	NOS
							disease, pelvic radiation, heart disease, renal impairment, hepatitis B, hepatitis C, or HIV infections. Patients currently experiencing marital relationship problems and COVID-19 positive.		

Abbreviations: FSFI, female sexual function index; NOS, Newcastle–Ottawa Scale; NR not reported. and [a]Median (range).

Results

Study selection and characteristics

The literature search yielded 448 potentially relevant trials according to the keywords and MESH terms applied as shown in Figure 1. After excluding duplicates and irrelevant article by screening titles/abstracts and assessing the full text of relevant studies for eligibility, finally six articles were eligible and have been selected for this meta-analysis.[5,6,11–14] Three studies were conducted in Turkey,[6,12,13] one in Poland,[5] one in United States,[14] and one in Italy.[11] Total number of included women, who filled the questionnaires, was 1114 individuals. Age ranged from 25.1 ± 4.3 (mean $\pm$ SD)[5] to 43.1 ± 11.8 (mean $\pm$ SD).[14] The findings of quality assessment using NOS are also summarized in Table 1, which revealed that all the included studies ($n = 6$) met our criteria for quality (NOS ≥ 7).

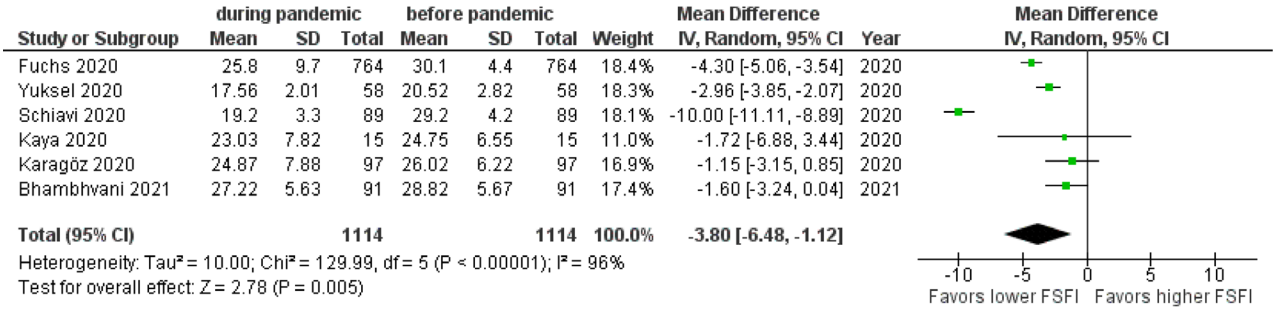
Meta-analysis

The pooled score of total FSFI score (n of studies = 6) before pandemic was 26.60 (95% CI: 22.95–30.26) and during the pandemic was 22.93 (95% CI: 19.26–26.59). The results showed a significant decrease in total FSFI score during COVID-19 pandemic (mean difference = −3.80, 95% CI: −6.48 to −1.12, $p = 0.005$, $I^2 = 96\%$). We also performed a meta-analysis of individual FSFI domains. We found statistically significant decrease in arousal (mean difference = −0.75, 95% CI: −1.09 to −0.41, $p < 0.0001$, $I^2 = 83\%$), orgasm (mean difference = −0.65, 95% CI: −1.03 to −0.27, $p = 0.0008$, $I^2 = 86\%$), pain (mean difference = −0.40, 95% CI: −0.70 to −0.10, $p = 0.009$, $I^2 = 76\%$), and satisfaction (mean difference = −0.65, 95% CI: −1.03 to −0.26, $p = 0.0009$, $I^2 = 86\%$) scores. However, no significant difference was found regarding desire and lubrication scores before and during pandemic (Figure 2). Frequency of intercourse (per week) during pandemic was not significantly different from pre-pandemic time (mean difference = −0.16, 95% CI: −1.38 to 1.06, $p = 0.80$, $I^2 = 97\%$) (Figure 3).

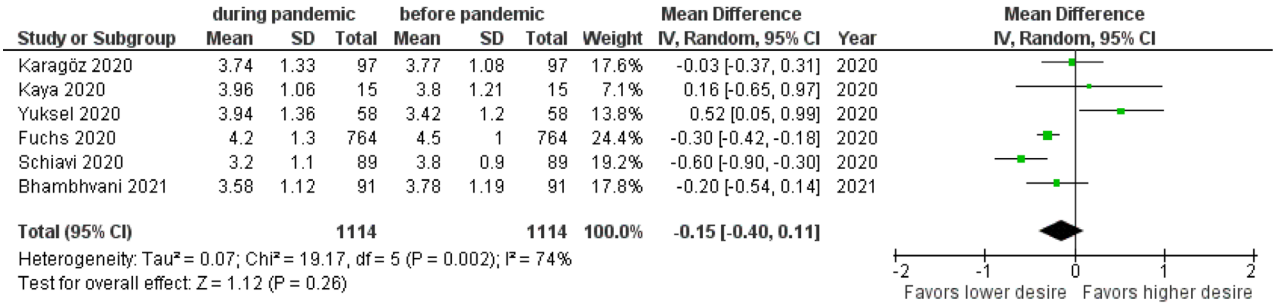
Publication bias

Begg's and Egger's statistics indicated that there was no significant evidence publication bias among the included studies comparing the total FSFI score (p Begg's test = 0.851, p Egger's test = 0.722) and frequency of sexual intercourse (p Begg's test = 0.602, p Egger's test = 0.556) before and during the pandemic.

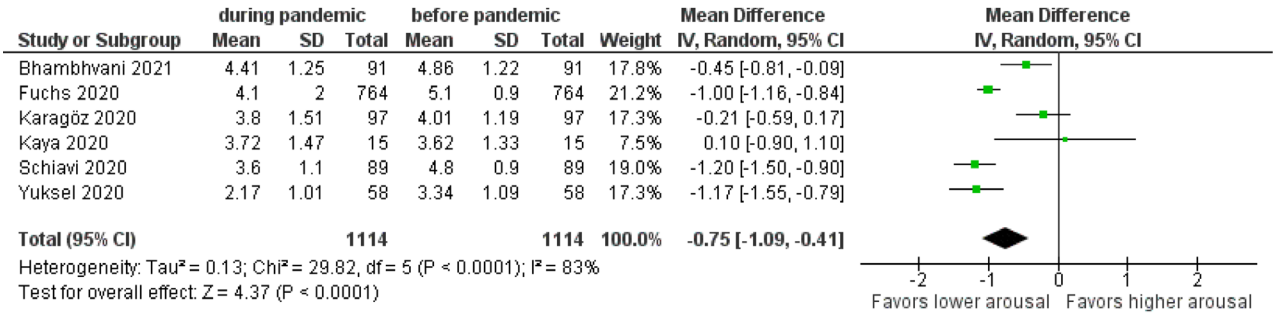
(a) Total FSFI



(b) desire



(c) arousal



(d) lubrication

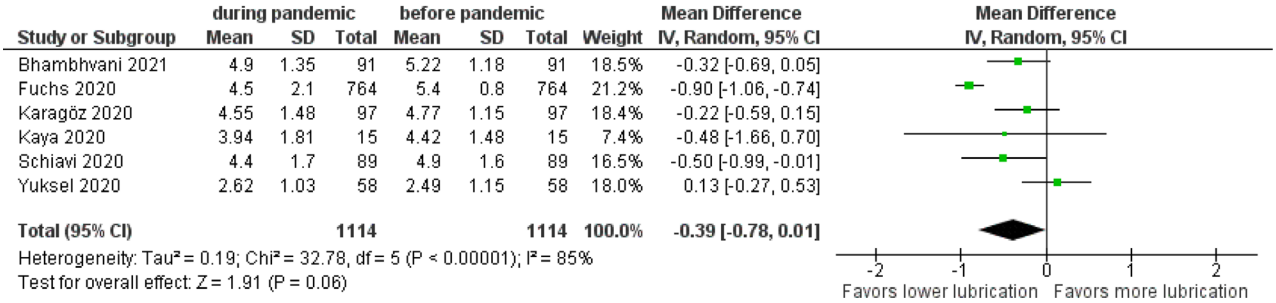
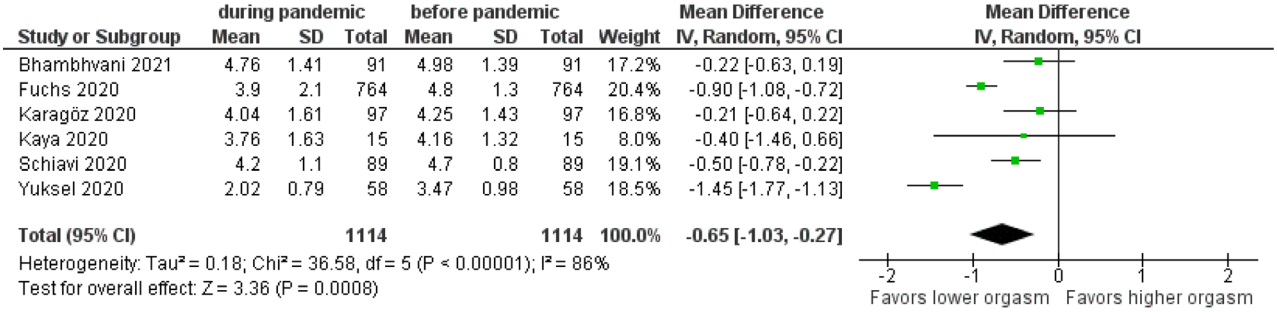
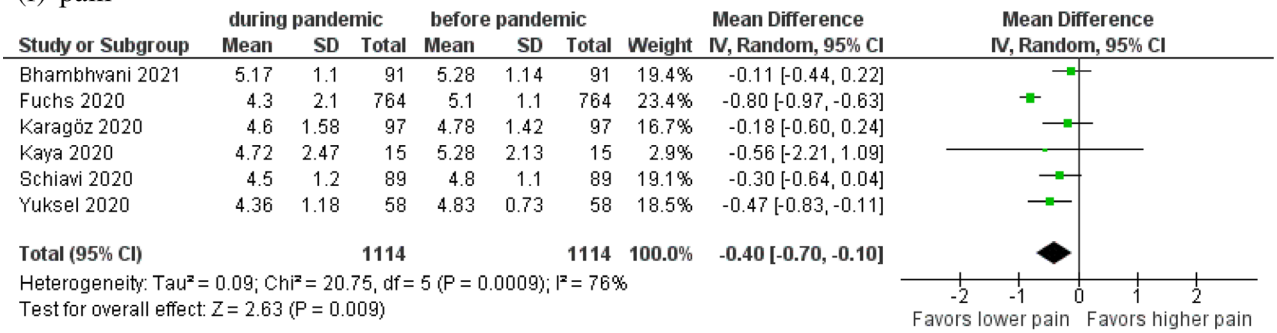


FIGURE 2 Forest plots of (a) Total FSFI, (b) desire, (c) arousal, (d) lubrication, (e) orgasm, (f) pain, and (g) satisfaction during pandemic versus pre-pandemic

(e) orgasm



(f) pain



(g) satisfaction

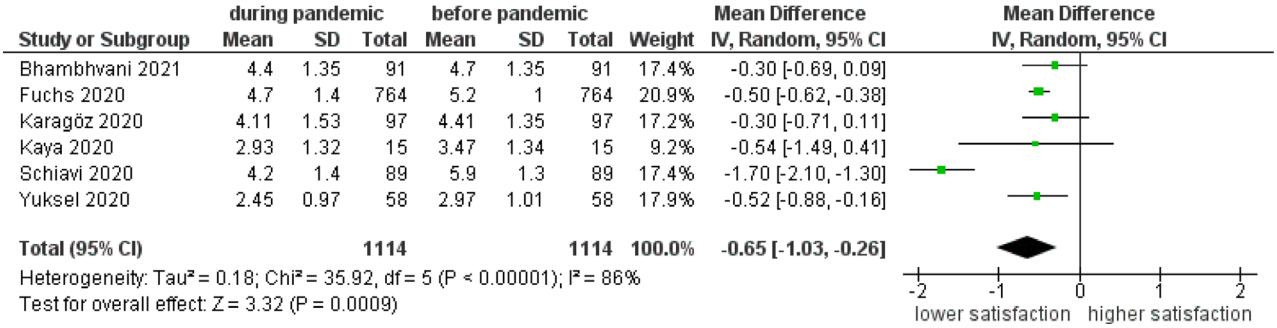


FIGURE 2 *(Continued)*

Discussion

The COVID-19 pandemic undeniably resulted in disruption of healthcare, economic growth, social life, and mental health. Significantly high rates of clinically relevant psychological distress have been reported.[16] Our findings show an overall decrease in the FSFI score in women of reproductive age indicating a lower quality of sexual life during the pandemic. However, no statistically significant decrease in sexual intercourse frequency has been demonstrated. This could be explained by the fact that stress symptoms have been historically correlated with both hypersexuality and reduced sex drive. A cohort study of 992 women aged 18 to 20 years reported a positive association between sexual intercourse frequency and psychological stress.[17] Conversely, an observational study by Hamilton et al. showed that chronic psychosocial stress related to less genital arousal.[18]

Among the FSFI components, we found lower scores for arousal, orgasm, satisfaction, and pain but no statistically significant change in lubrication and desire scores. We suggest that daily routine with lack of activity in quarantine might be related to decreased arousal and orgasm. Moreover, the fear of pregnancy

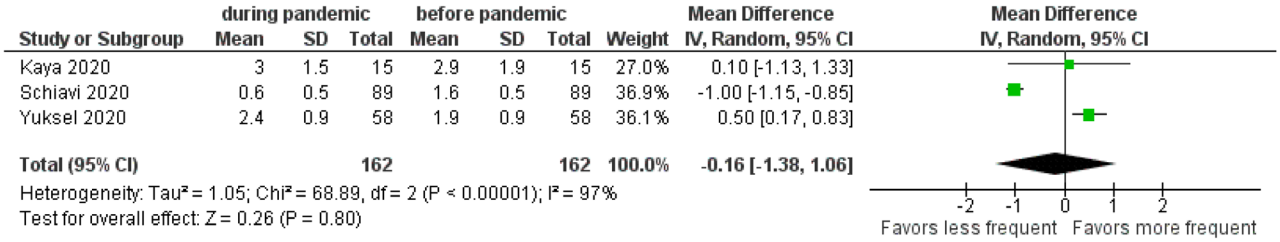


FIGURE 3 Frequency of sexual intercourse during pandemic versus pre-pandemic

in times of economic uncertainty and the unelucidated obstetric effects of COVID-19 may also contribute. Yuksel and Ozgor reported a significant decrease in desire to become pregnant during the pandemic among Turkish women.[6] It is worth noting that anxiety is a well-known independent risk factor for female sexual dysfunction specially in pain domain; in a multicenter cross-sectional study including 450 women, the presence of anxiety symptoms was associated with worse pain scores using the FSFI (5.10 vs. 3.02 and 4.88 vs. 4.49, respectively).[19]

Research implications

The analysis we performed demonstrated that COVID-19 pandemic undoubtedly led to the deterioration of women's quality of sexual life. However, information about sexual dysfunction during pandemic is scarce and results are often discordant. More investigation should be directed toward the diagnosis of sexual disorders (e.g., hypoactive sexual disorder, genito-pelvic pain/penetration disorder, dysmenorrhea) in isolated and/or infected women. Another interesting aspect would be to explore the effect on solitary sex. In fact, in a cross-sectional study by Li et al. including 967 female and male participants, 30% reported an increase in masturbation frequency.[20]

Clinical implications

Maintaining sexual health has a documented powerful effect on overall health and quality of life.[21] Following our findings we recommend regular screening of sexual dysfunction among women of childbearing age, especially during periods of psychological distress, as well as for any underlying affective disturbance and anxiety. Although lubrication and desire were not significantly decreased, all FSFI components should be assessed during routine gynecologic/urologic office visits in addition to a detailed sexual history. The issues should be addressed with specific health information, psychological support (e.g., referral for counseling), and if necessary, pharmacotherapy and psychiatric referral.

Strengths and limitations

The strength of our analysis resides in the large number of participants. Additionally, the studies included were performed in culturally distinct countries; nonetheless they were geographically restricted to the Eurasian region. A limitation of our study is that it did not involve data from other widely used questionnaires such as the Female Sexual Distress Scale-Revised (FSDS-R), the Golombok-Rust Inventory of Sexual Satisfaction (GRISS) or the Sexual Quotient-Female (SQ-F) due to paucity of literature. Several other studies exploring COVID-19-related sexual disturbances in women have used nonstandardized questionnaires; however, we preferred excluding those to limit measurement bias.[22] Another weakness would be the lack of categorization between solitary and nonsolitary sex. Also, we are aware that many other factors concurring with the lockdown can affect a woman's sexual function and should be considered such as economic stability, marital status, work situation (working at home or on site, if employed), living conditions, comorbid diseases, etc. Finally, FSFI is a screening tool, not a diagnostic measure for female sexual dysfunction and this should be considered when interpreting the findings of this meta-analysis.

Conclusion

In conclusion, our study constitutes high-evidence of women's quality of sexual life deterioration during COVID-19 pandemic with no significant influence on the frequency of intercourse. These results provide the rationale for regular screening and management of sexual dysfunctions among women, by taking a detailed sexual and psychiatric history and eventual referral to specialists (sexologist, psychologist, or psychiatrist).

Author contributions

KH developed the research idea. KH, ASA and MD conducted the literature search and extracted data. NS, SB, SQ, TS and FB conducted the analysis and drafted the primary manuscript. KH and ASA supervised and critically revised the final manuscript.

Acknowledgments

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Conflict of interest

The authors have nothing to disclose.

Data availability statement

No data available.

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