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Risk of sexual dysfunctions in breastfeeding females: protocol for a systematic review and meta-analysis

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ABSTRACT
Background Epidemiological studies do not provide accurate statistics on the percentage of breastfeeding women experiencing sexual dysfunctions and restraining from sexual activity. The data vary between 40% and 83% in the first group and 20–50% in the second one. Despite excessive studies on contributors to intimacy changes, breast feeding received little attention from researchers. The relationship between lactation and postpartum sexual dysfunctions remains unclear. This systematic review and meta-analysis will synthesise available data and establish the link between breast feeding and sexuality problems.

Methods and analysis A comprehensive literature search will be performed in biomedical databases PubMed/Medline, Scopus, Web of Science, EMBASE and CINAHL. We will extract peer-reviewed original studies written in English, Arabic or Polish from 2000 to June 2023. We will also search for reports from international health organisations and local health authorities. The preliminary search was performed on 04 April 2023. The studies must provide data on dysfunction prevalence/incidence and the strength of the relationship between breast feeding and sexuality in generally healthy women. The Covidence software will be used to perform literature screening, data extraction and quality assessment of individual studies. We will use a random-effects model meta-analysis to calculate pooled weighted frequency measures and effect size. Between-study heterogeneity will be assessed with the I² test.

Ethics and dissemination This meta-analysis does not require ethical approval because it synthesises data from previously published original studies. The final work will be published in a peer-reviewed journal and presented at scientific conferences.

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INTRODUCTION
Female sexuality: concepts and physiology
Mental and physiological changes affect sexual life, especially in the postpartum period. New mothers may experience dyspareunia (pain during intercourse) and insufficient lubrication; they may also have a lack of desire, excitement, satisfaction and orgasm. The persistent conditions causing distress in sexual life are classified as female sexual disorders (FSDs).1 The FSD triggers after delivery are painful recovery, changes in self-image, sleep deprivation and breast feeding.2 The diagnostic criteria for sexual dysfunctions in females are not clear. In particular, it is challenging to identify problems with arousal, lubrication and orgasm due to variability in definition of the female sexual dysfunction in distinct classification systems, including the Diagnostic and Statistical Manual of Mental Disorders (DSM) and the International Classification of Diseases and Statistics (ICD).4 According to the DSM-5, FSD is ‘any sexual complaint or problem resulting from disorders of desire, arousal, orgasm, or sexual pain that causes marked distress or interpersonal difficulty’. The ICD-10 placed FSDs in two different chapters: ‘diseases of the genitourinary system’ and ‘mental and behavioural disorders’.5 Division of sexual dysfunctions into these groups challenges diagnostics and treatment of FSDs. Recent evidence proves the interaction between

STRENGTHS AND LIMITATIONS OF THIS STUDY
⇒ The protocol is prepared following the Preferred Reporting Items for Systematic Review and Meta-Analyses Protocol checklist and registered in the PROSPERO database for systematic reviews.
⇒ The review will compare the effect of breastfeeding type on sexual dysfunctions.
⇒ The subgroup analysis will show the impact of breastfeeding type on a specific sexual dysfunction and prolonged sexual abstinence.
⇒ The review will analyse original studies and statistical reports from international health organisations and local health authorities.
⇒ A notable limitation of the review is that we will include a small number of articles in the analysis due to scarce research on sexuality in breastfeeding women.
physical and psychological factors resulting in occurrence of sexual problems. Consequently, FSDs remain unreported, which can result in women’s emotional distress, worries and feeling of isolation. Postpartum sexual dysfunctions are associated with numerous risk factors, including relationship dissatisfaction, depression, mode of delivery, amenorrhoea, obesity and hormonal changes. During lactation, the level of oestrogen decreases and prolactin increases, which results in dyspareunia and insufficient vaginal lubrication. Low sexual drive is associated with the oxytocin release and lowering of androgens during breast feeding.

Neurophysiological mechanisms of sexual function are not clearly specified. Sexual stimulation activates the medial preoptic region, the anterior hypothalamic region and the related limbic hippocampal structures. However, brain imaging studies could not identify the activity of these regions during sexual excitement and orgasm. Also, little is known about the pathological changes in women’s sexual functioning postpartum. It was found that functional MRI detected suppressed amygdala responses to sexual pictures in breastfeeding women. The role of other brain regions in postpartum sexual health has not been thoroughly studied because of ethical considerations in sexology research.

The current psychophysiology describes the concept of sexuality with two models. According to Masters and Johnson, the female sexual response follows a linear model and passes through four sequential phases: excitement (arousal), plateau, orgasm and resolution. Currently recognised, Rosemary Basson’s circular model of sexual response proposes the concept that desire can be responsive or spontaneous and that orgasm is not necessary for satisfaction. Moreover, she says that relationship factors can affect one’s willingness and ability to participate in sex. The latter is a combination of mental and physical states induced by stimuli triggering pleasure and desire to reach orgasm. In certain conditions, one component of arousal can occur without another, and subjective sexual arousal has a low or non-significant correlation with genital arousal. For example, a genital response can be evoked during sexual assault and other sexual threat stimuli. In contrast, female mental excitement depends on contextual pleasant factors. Peripheral mechanisms of genital arousal response cover vasocongestion, engorgement and production of lubricating mucus, which result from an increased blood flow to the clitoris, vagina and labia. A decrease in vaginal lubrication may cause pain and reduce sexual satisfaction. In case of a major disturbance at any stage of sexual activity, women are advised to seek professional help.

To diagnose FSDs, clinicians use multidimensional psychometric instruments which measure the physical and emotional components of sexuality. The most common inventory is the Female Sexual Function Index (FSFI). It consists of 19 items assessing sexual desire, arousal, lubrication, orgasm, satisfaction and pain. Recently, several studies examined the relationship between breast feeding and scores in sexuality domains assessed with FSFI: desire, arousal, lubrication, orgasm and pain. A summary of the findings on each component is provided below. Still, the data are insufficient for drawing conclusions regarding postpartum sexuality.

Sexual desire decreases during pregnancy and the decline may continue post partum. Many women still experience a reduced sex drive 6 months after delivery. In several studies, breast feeders reported lower sexual desire compared with those who ceased nursing. FSFI scores in the desire domain were significantly lower in exclusive breast feeders compared with mothers with mixed or bottle feeding. Contrarily, some studies stated that breast feeding did not impact FSFI scores including sexual desire, while change in routine decreased the willingness to engage in sex.

Sexual arousal disorder is the ‘persistent or recurrent inability to attain or maintain sufficient sexual excitement which causes personal distress’. In the peripartum, women have FSFI scores for arousal lower than those in the third trimester of pregnancy. The decreased arousal can be associated with the longer duration of breast feeding. The type of breast feeding does not affect FSFI scores. Lubrication develops slowly, and it is lower in quantity at 6 months post partum compared with the pre-pregnancy period. The amount of lubrication can come back to a peripartum level at 12 months. Women resorting to mixed feeding have better lubrication compared with exclusively breastfeeding mothers.

Orgasm differs in its intensity considerably among women, and confirmation of orgasm is subjective. During sexual intercourse, women may experience physiological responses like those occurring while giving milk. The spontaneous let-down of breast milk happens in some women because of the release of oxytocin and the uterine contractions after orgasm. Nursing women have weaker and shorter orgasms at 4–5 weeks post partum. Formula-feeding mothers have higher FSFI scores for orgasm compared with the ones feeding exclusively (5.2 vs 4.8).

Satisfaction is less likely to happen in nursing mothers compared with those who weaned their babies during 6 months post partum (adjusted OR 0.62). One and 4 months following childbirth, sexual satisfaction is greater in mothers opting for infant formula instead of breast milk for feeding their babies. If breastfeeding women are compared at 1 and 12 months post partum, their FSFI scores are similar.

Pain is diagnosed in 41% of women at 3 months post partum and 22% at 6 months. Dyspareunia incidence rates are higher in nursing women compared with those who ceased the process (21.2% vs 15.9%, respectively).

Impact of FSDs on quality of sexual life

The necessity of the study on postpartum sexual dysfunctions is supported by their unfavourable impact on life quality. Postpartum dissatisfaction with sexual life...
may negatively affect marital life and lead to divorce. The percentage of women with postpartum FSDs varies between 40% and 83%. A recent publication stated that 30.3% of nursing women did not get easily aroused, 20.2% of participants complained about difficult penetration and 14.4% of respondents could not reach orgasm. Banai et al estimated that the prevalence of dyspareunia was 35% at 2 months postpartum and 22% at 6–12 months. 85.6% of participants had insufficient lubrication. Other common disorders included lack of desire (69.7%) and pain (62.9%). Satisfaction and orgasmic disorders occurred in 7.3% and 9.7% of new mothers.

Because of unpleasant feelings during the first intercourse postpartum, women delay resuming active sexual life. In general, new mothers are advised to refrain from vaginal intercourse within 6 weeks after delivery. However, the actual return to sexual activity depends on the physical and mental state of women and the readiness of both partners to resume intercourse. Apart from physiological reasons, culture and sociodemographics influence the decision of women to return to sexual activity. According to recent studies, 20–50% of women do not engage in intercourse before 3 months postpartum. Breastfeeding mothers are less likely to resume sexual relations at early post partum. This observation was confirmed by a population study in 17 African and Asian countries. In a longitudinal study, 38.7% of breastfeeding and 58.2% of non-breastfeeding women resumed intercourse by 6 weeks post partum. Ninety per cent of women engage in intercourse with their partners within 24 months after the delivery. The role of the baby feeding methods in sexual avoidance is still not well covered in research.

Modern literature lacks conclusive evidence for an association between infant nursing and sexuality problems. Moreover, while some authors report a strong risk ratio for having FSDs in women breast feeding exclusively, others do not confirm any association between lactation and problems in the sexuality domains. With this systematic review, we aim to synthesise available data on sexual dysfunctions in breastfeeding women.

**Objective**

The primary objective is to find out the relationship between breast feeding and female sexual dysfunctions. The secondary objectives are as follows:

- Calculate pooled prevalence or incidence of sexual dysfunctions in nursing women.
- Identify the relationship between the type of breast feeding and problems in sexuality domains.
- Study the impact of breast feeding on the time to resumption of sexual activity after childbirth.
- Find risk factors for sexual dysfunctions in breastfeeding females (e.g., frequency of breast feeding, impaired lubrication).
- Identify the most common sexual dysfunction in breastfeeding females.

**METHODS AND ANALYSIS**

The protocol will be prepared per the Preferred Reporting Items for Systematic Review and Meta-Analyses Protocol checklist which is available as online supplemental file 1. Figure 1 illustrates the study pipeline.

**Study design and data source**

A comprehensive literature search will be performed in biomedical databases PubMed/Medline, Scopus, Web of Science, EMBASE and CINAHL. We will extract peer-reviewed original studies written in English, Arabic or Polish and published from January 2000 to June 2023. The start year corresponds to the first mention of the FSFI tool. The preliminary search was performed on 04 April 2023. The keywords will be as follows: breastfeeding, lactation, nursing, sex, sexuality, desire, arousal, aversion, orgasm, excitement, drive, interest, resolution, “sexual pain”, vulvodynia, dyspareunia, vaginismus, phobias, libido, lubrication, function. Online supplemental file 2 provides a detailed search strategy for the PubMed database.

We will also review official reports from international organisations and associations such as WHO, Africa Centers for Disease Control and Prevention, European Centre for Disease Prevention and Control, Pan American Health Organization, European Public Health
Association, and the American College of Obstetricians and Gynecologists. Health data from local health authorities will be also reviewed if they are available in English, Polish and Arabic. No other grey literature sources will be considered.

Eligibility criteria
The systematic review will focus on generally healthy breastfeeding females aged from 15 to 50 years who reported at least one sexual dysfunction or a condition negatively affecting sexual life. We will consider studies of observational, retrospective and cross-sectional designs which described sexual dysfunctions and/or abstinence within 5 years after giving birth. We will exclude dissertations, protocol papers, reviews, case studies and papers reporting data on women facing any type of violence or sexual abuse.

Study participants should be free from mental and psychological disorders, cerebrovascular diseases, organic pathologies of the central nervous system, addictions and other conditions that may impact sexuality, for example, diabetes mellitus and systemic mastocytosis. Original papers should not include participants who had serious fetal abnormalities and sexual dysfunctions known before pregnancy. Official documents should state a number of participants, scales used to assess sexual health, age of the surveyed population, time since giving birth and prevalence/incidence rates of sexual dysfunctions.

Study records
Selection process
All papers matching the search strategy will be uploaded to the Covidence software for automatic deduplication. Once duplicates are removed, two independent reviewers will screen the titles and abstracts of the studies for eligibility. If the reviewers cannot reach an agreement on the exclusion of the article, a third reviewer will resolve the conflict. The final decision on the inclusion of the papers will be performed at the full-text screening stage. A clear reason for the exclusion of articles will be specified. Once the reviewers complete screening articles uploaded to the Covidence, they will perform a hand screening of reference lists of the retrieved studies. The eligible studies will be uploaded to the Covidence software to ensure their presentation in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow chart.

To assess the accuracy of reviewers and the compliance of the selected studies with inclusion criteria, we will calculate Cohen’s kappa index ranging from 0 to 1. A greater value signals a better inter-reviewer reliability and shows that the agreement between judges is not due to chance. We will calculate kappa index at both screening stages.50

Data extraction
Two reviewers will use an online workbook to enter study characteristics. Basic information will include author name, publications, country, study design, sample size, age of participants, time since delivery, breastfeeding type, an instrument used for the assessment of sexual dysfunctions and FSD. Outcome measures will consist of a return to sexual activity in months, prevalence/incidence rates of sexual dysfunctions or abstinence, FSFI score for each sexuality domain and OR of having a disorder.

Quality assessment of individual studies
The two reviewers will score the papers for potential risk of bias using Joanna Briggs Institute checklists for cross-sectional, cohort and prevalence studies. In case of disputes, the third reviewer will decide on the final score. To assess publication bias due to a sample size of individual studies, we will use Begg’s and Egger’s tests and construct funnel plots.

Data analysis and synthesis
Once the data are extracted, we will identify the outcome measures for statistical analysis. If 3 and more studies have a similar methodology and interpret the same estimates, two reviewers will assess these studies for homogeneity using I² statistics. If the heterogeneity index does not exceed 75%, we will perform a meta-analysis. If the retrieved literature does not meet the criteria, we will do a narrative review of relevant papers and official reports. We expect that the literature will have methodological interstudy heterogeneity. The variability can occur in age range of the participants, type of baby feeding and time from delivery. To ensure uniform presentation of data, we will perform a subgroup analysis. The subgroups will be identified once the outcome measures are extracted from the retrieved studies. To address the first specific objective, we will perform random-effects model meta-analysis for calculating pooled weighted incidence and prevalence. The random-effects model estimates the mean of the distribution of true effects. Therefore, it is an optimal choice due to anticipated methodological variance and non-uniform effect sizes between the studies.51 Working on the second specific objective, we will compute pooled OR for having specific sexual dysfunctions in women choosing either exclusive or mixed breast feeding. The subgroup analysis will help us to identify a likelihood of each sexual dysfunction in females opting for a particular feeding type. In the third specific objective, we will explore the relationship between breast feeding and the time to resumption of sexual activity by computing pooled OR. All pooled estimates will be provided with 95% CIs. For the fourth and fifth specific objectives, we will rank identified risk factors and sexual dysfunctions. The meta-analysis will be performed using the R package ‘meta’.52 To verify the robustness of the study results, we will perform a sensitivity analysis using leave-one-out method. It investigates the influence of each included study on the overall results of the meta-analysis. The presence of outliers in the meta-analysis signals insufficient interstudy homogeneity and questions the results of the study.53 The calculation will be performed in the R package ‘metaphor’.54
Patient and public involvement
The study does not include patients and the general public.

Review status
The review is set to start in April 2023.

Potential amendments
To avoid potential amendments, we performed the initial literature search and identified inclusion and exclusion criteria. Any modifications during the review preparation will be documented and updated in the PROSPERO protocol.

ETHICS AND DISSEMINATION
The study does not require ethical approval because it synthesises data from previously published original studies. The final work will be published in a peer-reviewed journal.

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REFERENCES
5 Kershaw V, Jha S. Female sexual dysfunction. Obstet Gynecol 2022;24:12–23.


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