Thai Journal of Obstetrics and Gynaecology
September 2024, Vol. 32, No. 5, pp. 365-376.

OBSTETRICS

Impact of Delivery Mode on Sexual Function in the First Year after Childbirth: A comparative study of vaginal delivery and cesarean section

Cem Terece, M.D.*,
Gökçe Turan, M.D.*,
Hasan Hüseyin Uçkan, M.D.*,
Ayla Eser, M.D.*,
Mustafa Rasit Özler, M.D.*,
Aygün Düyamalıyeva, M.D.*,
Deniz Karçaaltıncaba, M.D.*

** Gazi University, School of Medicine, Department of Obstetrics and Gynecology, Ankara, Turkey*

ABSTRACT

Objectives: Studies are showing that women's sexual functions are affected for a while after giving birth. However, there are relatively few studies showing which component of sexual function is affected by the mode of delivery. The aim of this study was to investigate the effect of the type of birth on sexual function.

Materials and Methods: This study was conducted with 228 participants who met the study criteria, 51 of whom had a vaginal delivery (VD), and 177 had a cesarean section (CS) delivery. The participants in the first year after childbirth, between 3-12 months, answered the Turkish version of the Female Sexual Function Index (FSFI) questionnaire. We compared the total FSFI and subscale scores of the groups.

Results: In both groups, weekly sexual intercourse frequency values after delivery were statistically lower than before delivery ($p < 0.001$ and $p < 0.001$, respectively). Additionally, low FSFI scores indicating the risk of Female Sexual Dysfunction (FSD) were obtained in both groups. When the group giving birth with VD was compared with the CS group, the total FSFI and whole subscale scores were lower. It was determined that the risk of sexual dysfunction increased 20.8-fold in participants who gave birth vaginally.

Conclusions: Regardless of the mode of delivery, all participating women in the first year after childbirth had deficiencies in total FSFI scores and all subscale scores, indicating sexual dysfunction. This inadequacy in sexual dysfunction was more pronounced in women who gave birth VD than those who gave birth by CS. Considering the importance of sexual health for life quality standards, it would be appropriate for all women in the first year after childbirth (especially those who give birth with episiotomy) to receive sexual counseling in terms of FSD risk and monitoring of FSD symptoms.

Keywords: female sexual function index, normal birth, cesarean section, postpartum period, sexual dysfunction.

Correspondence to: *Cem Terece, M.D., Gazi University, School of Medicine, Department of Obstetrics and Gynecology, Ankara, Turkey. E-mail: drcemterece@gmail.com*

Received: 1 June 2023, **Revised:** 2 May 2024, **Accepted:** 14 May 2024

Introduction

Female sexual dysfunction is defined as the person's dissatisfaction with the sexual act due to problems in desire, arousal, orgasm, or pain in the sexual cycle stage[1]. Sexual function may be affected by various reasons, such as psychological reasons, drugs used, previous surgical operations, or pregnancy[2, 3].

It has been shown that there are adverse changes in sexual functions in women due to various factors during pregnancy and in the first year after childbirth[3, 4]. While some factors, such as physiological changes in the body, hormonal changes, and insomnia, are blamed for sexual dysfunctions occurring during pregnancy, it has been reported that the factors affecting sexual function in the postpartum period are different from these reasons[4-6]. Barrett et al[7] reported that postpartum bleeding, dyspareunia, and difficulty in reaching orgasm were the leading causes of sexual dysfunction in the postpartum period. Considering the importance of pelvic anatomy in sexual function, it has been suggested that vaginal delivery (VD) and significantly assisted vaginal delivery can cause various damage to the pelvic floor[8, 9]. In parallel with this idea, studies showed that less sexual dysfunction occurs after cesarean (CS) deliveries[8, 10]. However, some studies have stated that the mode of delivery does not affect sexual functions[11, 12]. The effect of the mode of delivery on sexual functions is a controversial issue.

Female Sexual Dysfunction (FSD) is defined as the deficiency of at least one component in the sexual response cycle (desire, arousal, ability to reach orgasm, and pain during sexual intercourse). One of the modern and convenient ways to evaluate FSD is to use validated questionnaires and symptom scores. The Female Sexual Function Index (FSFI) is the gold standard method for screening female sexual function[13]. FSFI is a female sexual function index consisting of 19 questions and examining six sub-domains (desire, arousal, lubrication, orgasm, satisfaction, pain).

Our primary aim in this study was to investigate the effect of birth type on the total and subscale scores of FSFI. Our secondary objective was to determine the correlation of FSFI subscale scores with BMI, breastfeeding time (minutes) and time after birth depending on the type of birth. We also aimed to investigate factors that may have a negative impact on the sexual function of women in the first year after birth.

Materials and Methods

This cross-sectional study was conducted between 01/09/2020 and 01/09/2021 at Gazi University Faculty of Medicine, Department of Obstetrics and Gynecology, Ankara, Turkey. Women aged 18 and over who gave birth in our hospital within a year after informed consent from all participants and approval from our hospital's ethics committee (ethics committee no: 2020/604.01.01-18) were included in the study. Women with postpartum hemorrhage, infection, gestational hypertension, preterm birth, preeclampsia, and other postpartum severe complications, previous pelvic surgery, sexual dysfunction with an underlying organic cause before pregnancy, patients who used drugs that would cause sexual dysfunction, and patients who stated that they did not want to participate in the study at any stage of the study were excluded from the study. In addition, we did not include births without episiotomy in our study since our rates of episiotomy in vaginal deliveries are very high. The

patients who gave birth were called for follow-ups between 3 and 12 months after delivery. FSFI was filled in after recording all participants' body mass index (BMI), age, parity, education level, mode of delivery, time elapsed after birth, breastfeeding status, and duration of breastfeeding (approximately how many minutes each feed lasts). All interviews were conducted face-to-face and in the company of a doctor, paying attention to patient privacy. All participants were divided into two groups, CS (n = 177) and VD (n = 51) deliveries, and the FSFI scores of the groups were compared.

Female Sexual Function Index (FSFI)

Female sexual function was evaluated using the Turkish version of the FSFI index verified by the Turkish Society of Andrology[14, 15]. The FSFI questionnaire is a questionnaire containing six main headings and 19 questions. The distribution of these questions and titles is as follows. 1- desire (questions 1 and 2), 2- arousal (questions 3, 4, 5, 6), 3- Lubrication (questions 7, 8, 9, 10), 4- Orgasm (questions 11, 12, 13), 5- Satisfaction (questions 14, 15, 16), 6- Pain (questions 17, 18, 19). The scoring of the FSFI questionnaire is as follows: The scoring scale for questions 3 to 14 and 17 to 19 spans from 0 to 5, while for questions 1, 2, 15, and 16, it ranges from 1 to 5.

The total score is obtained by adding the scores in these six titles and multiplying their sums with the coefficients. These coefficients are 0.6 for desire, 0.3 for arousal and lubrication, and 0.4 for orgasm, pain, and satisfaction. Total scores range from 2 to 36. Patients with a total score of less than 26.5 will be considered risky for Female Sexual Dysfunction (FSD)[14]. Higher scores will be regarded as indicators of better sexual function. Furthermore, when evaluated separately for each sub-domains, scores below 4.28 for "desire," below 5 for "arousal," below 5.4 for "lubrication," below 5 for orgasm, below 5 for "satisfaction," and below 5.5 for "pain" will be considered insufficient in their respective fields[14, 15].

Statistical analysis

Continuous variables were expressed as mean ± standard deviation and median (min-max), and categorical data were expressed as numbers and percentages. Independent samples t-test was used to analyze continuous variables with normal distribution between the two groups, and Mann-Whitney U test was used for those that did not. Intergroup comparisons were made with the Wilcoxon Signed Ranks test. The chi-square test was used for comparisons between discrete/categorical data. The linear relationship between continuous variables was tested with the Spearman Correlation test. The independent predictors for predicting the risk of sexual dysfunction were initially examined using univariate logistic regression analysis (enter method), utilizing potential factors identified in previous analyses. For the multivariate model, variables found to be significant at the level of significance ($p < 0.250$) in the univariate analyses, including mode of delivery, time of birth, educational status, and BMI, were investigated through multivariate logistic regression analysis (backward LR). Model fit and significance were assessed using the Hosmer and Lemeshow test, Omnibus tests of model coefficient, and Nagelkerke R Square values. Analyzes were performed with IBM SPSS Package Program version 22.0 (IBM Corporation, Armonk, NY, USA). The statistical significance level was considered as $p < 0.05$. Power analysis was performed with the program G*power (version 3.1.9.7, Universität Kiel, Kiel, Germany).

Results

Between 01/09/2020 and 01/09/2021, 283 patients who applied to Gazi University Faculty of Medicine, Department of Gynecology and Obstetrics for gynecological examination were included in the study. Fifty-five patients were excluded from the study due to various reasons (Fig. 1). Participants were divided into two groups, CS and VD groups. The demographic data of the

participants are listed in Table 1. While no difference was observed between the groups in terms of age, fetal weight, duration of breastfeeding (approximately how many minutes breastfeeding lasts), and education period, statistically significant differences were found in terms of BMI, gravida, parity, monthly income level, time passed after birth, and breastfeeding status ($p < 0.05$). There was no significant difference between the two groups in the frequency of weekly sexual intercourse after delivery ($p = 0.117$). In both groups, weekly sexual intercourse frequency values after delivery were statistically lower than before delivery ($p < 0.001$ and $p < 0.001$, respectively).

The FSFI scores of the groups were compared in Table 2. We observed statistically significant decreased in desire, lubrication, orgasm, satisfaction, pain subscale scores, and FSFI scale total scores among women who delivered with VD compared to those who delivered CS ($p < 0.001$, $p < 0.001$, $p = 0.049$, $p = 0.001$, $p = 0.012$, and $p = 0.001$, respectively). In addition, while the total FSFI score was < 26.5 in all participants in the VD group, this rate was 70.6% in the CS group.

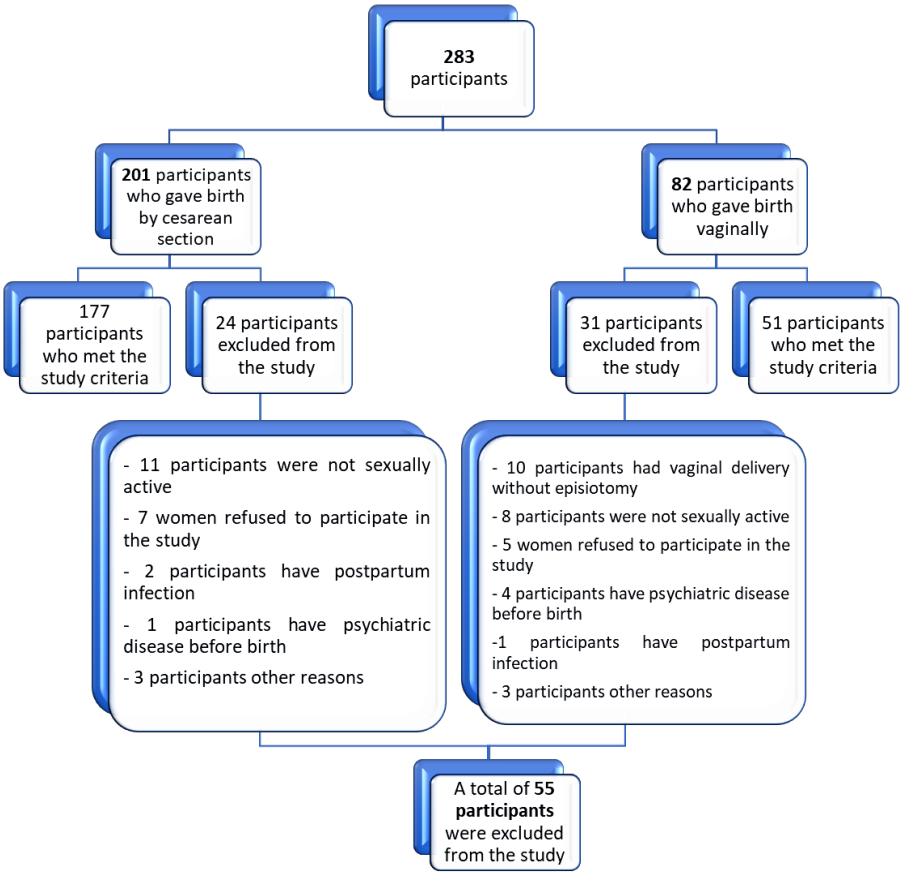

Fig. 1. Study flow.

Table 1. Comparison of the groups according to sociodemographic characteristics of participants' and some fetal parameters

Characteristics	VD (n = 51)	Cesarean Section (n = 177)	p value
Age (years) (mean ± SD)	28.8 ± 7.3	27.2 ± 4.3	0.058*
BMI (kg/m²) (mean ± SD)	27.2 ± 5.1	29.5 ± 4.8	0.003*
Gravidity [median (min-max)]	1 (1-4)	1 (1-3)	0.004**
Parity [median (min-max)]	1 (0-3)	1 (0-2)	0.027**
Fetal weight (g) [median (min-max)]	3300 (2850-4500)	3400 (2400-4050)	0.278**
Duration of breastfeeding (minute) [median (min-max)]	15 (10-20)	15 (0-20)	0.289**
Education, n (%)			
Primary	0 (0.0)	4 (2.3)	0.101***
Secondary	8 (15.7)	14 (7.9)	
High school	20 (39.2)	54 (30.5)	
Associate's degree	10 (19.6)	54 (30.5)	
University	13 (25.5)	41 (23.2)	
Master's degree	0 (0.0)	10 (5.6)	
Income (monthly), n (%)			
< 1600 TL (200$ ↓)	8 (15.7)	18 (10.2)	0.020***
1600-2500 TL (200-312 $)	6 (11.8)	55 (31.1)	
> 2500 TL (312$ ↑)	37 (72.5)	104 (58.8)	
Period after birth, n (%)			
Between 3-6 months	33 (64.7)	96 (54.2)	0.007***
Between 6-9 months	0 (0.0)	29 (16.3)	
Between 9-12 months	18 (35.3)	52 (29.3)	
Breastfeeding, n (%)			
Yes	51 (100.0)	132 (74.6)	< 0.001***
No	0 (0.0)	45 (25.4)	
Frequency of postpartum sexual intercourse (weekly) (min-max)	1(0-3)	1(0-2)	0.117**
Frequency of sexual intercourse before pregnancy (per week) [median (min-max)]	3 (1-5)	2 (1-3)	< 0.001**

* Independent samples t-test, ** Mann Whitney U test, *** Chi-square Test.
BMI: body mass index, VD: vaginal delivery, SD: standard deviation. 1$ = 8 Turkish Lira (TL).

Table 2. Comparison of the groups according to the total FSFI scores and its subscale scores.

Characteristics	VD (mean ± SD) (n = 51)	Cesarean Section (mean ± SD) (n = 177)	p value
Desire	2.69±1.02	3.46±1.02	< 0.001*
Arousal	3.20±1.15	3.33±1.20	0.487*
Lubrication	2.34±1.57	3.38±1.57	< 0.001*
Orgasm	2.80±1.62	3.34±1.92	0.049*
Satisfaction	3.01±1.49	3.93±1.77	0.001*
Pain	1.88±1.67	2.69±2.10	0.012*
Total FSFI score	15.94±6.70	20.16±8.21	0.001*

* Independent samples t-test. FSFI: Female Sexual Function Index, VD: vaginal delivery, SD: standard deviation.

Table 3 shows the correlation between BMI, breastfeeding time (minutes), and time after birth in the VD group with the FSFI total and subscale scores. In the VD group, It was found that there were positive, powerful, statistically significant correlations between BMI and desire, orgasm, satisfaction, pain, and FSFI total scores ($r = 0.747$, $p < 0.001$, $r = 0.756$, $p < 0.001$, $r = 0.775$, respectively, $p < 0.001$, $r = 0.737$, $p < 0.001$, and $r = 0.730$, $p < 0.001$). In the VD group, a positive, moderately strong, and statistically significant correlation was found between breastfeeding duration and arousal and lubrication subscale scores ($r = 0.474$, $p < 0.001$ and $r = 0.351$, $p = 0.012$, respectively). In contrast, a negative correlation between breastfeeding duration and desire and pain was found. It was determined that there were good, strong, statistically significant correlations in the direction ($r = -0.868$, $p < 0.001$ and $r = -0.310$, $p = 0.027$, respectively). In the VD group, while a negative, moderate-good, statistically significant correlation was found between the time passed after delivery and arousal subscale scores ($r = -0.597$, $p < 0.001$), there was a positive, good and statistically significant correlation between the time passed after delivery and lubrication and orgasm. Very strong, statistically significant correlations were

determined (r = 0.571, p < 0.001 and r = 0.707, p < 0.001, respectively).

Table 4 shows the correlation between BMI, breastfeeding time (minutes), and time after delivery in the CS group with the FSFI total and subscale scores. Within the CS group, it was found that the relationship between breastfeeding duration, lubrication, and pain subscale scores were negative with low and moderately statistical solid significance between them (r = -0.358, p < 0.001; and r = -0.444, p < 0.001, respectively). In the same group, it was also determined that there were positive, low to moderately strong statistically significant correlations between the time passed after delivery, lubrication, and pain subscale scores (r = 0.377, p < 0.001; and r = 0.376, p < 0.001, respectively).

Table 3. Correlation of FSFI total score and subscale scores with BMI, breastfeeding time (minutes), and time after birth in the VD group.

		BMI	Duration of breastfeeding (minute)	Time passed after birth
Desire	r	0.747	-0.868	0.283
	p	< 0.001*	< 0.001*	0.044
	N	51	51	51
Arousal	r	0.155	0.474	-0.597
	p	0.278	< 0.001*	< 0.001*
	N	51	51	51
Lubrication	r	0.388	0.351	0.571
	p	0.005	0.012	< 0.001*
	N	51	51	51
Orgasm	r	0.756	-0.250	0.707
	p	< 0.001*	0.077	< 0.001*
	N	51	51	51
Satisfaction	r	0.775	-0.197	0.163
	p	< 0.001*	0.165	0.253
	N	51	51	51
Pain	r	0.737	-0.310	0.122
	p	< 0.001*	0.027	0.395
	N	51	51	51
FSFI	r	0.730	-0.153	0.229
	p	< 0.001*	0.283	0.106
	N	51	51	51

* Spearman's rho (bold for p value < 0.05). FSFI: female sexual function index, BMI: body mass index, VD: vaginal delivery.

Table 4. Correlation of FSFI total score and subscale scores with BMI, breastfeeding time (minutes), and time after delivery in the cesarean section group.

		BMI	Duration of breastfeeding (minute)	Time passed after birth
Desire	r	0.345	-0.058	-0.028
	p	< 0.001*	0.445	0.708
	N	177	177	177
Arousal	r	0.411	0.121	0.028
	p	< 0.001*	0.109	0.713
	N	177	177	177
Lubrication	r	-0.2	-0.358	0.377
	p	0.002	< 0.001*	< 0.001*
	N	177	177	177
Orgasm	r	0.017	-0.015	0.225
	p	0.824	0.839	0.003
	N	177	177	177
Satisfaction	r	0.208	-0.195	0.094
	p	0.006	0.009	0.216
	N	177	177	177
Pain	r	-0.027	-0.444	0.376
	p	0.719	< 0.001*	< 0.001*
	N	177	177	177
FSFI	r	0.132	-0.132	0.254
	p	0.080	0.079	0.001
	N	177	177	177

* Spearman's rho (bold for p value < 0.05). FSFI: female sexual function index, BMI: body mass index.

In the univariate analyses performed according to FSFI: the mode of delivery being VD increased the odds of sexual dysfunction risk by 20.8 times (OR 20.800, 95%CI 2.799-154.57, p = 0.003). Additionally, having an educational status of high school or below was found to increase the odds of sexual dysfunction risk by 2.3 times (OR 2.393, 95%CI 1.228-4.662, p = 0.010). Moreover, it was determined that each unit increase in BMI acted as a protective factor for sexual dysfunction risk (OR 0.847, 95%CI 0.791-0.907, p < 0.001) (Table 5).

In the multiple logistic regression analysis of the multivariate model, it was determined that the mode of delivery (VD), period after birth (< 6 months), educational status (high school or below), and BMI variables continued to be significant factors (Table 5).

Table 5. Examination of factors associated with sexual dysfunction in women giving birth within one year using univariate (binary) and multivariate logistic regression analysis.

	OR (95% CI)	p value		OR (95% CI)	p value
Age (years)	0.981 (0.925-1.040)	0.516			
BMI (kg/m^2)	0.847 (0.791-0.907)	< 0.001	BMI (kg/m^2)	0.724 (0.640-0.819)	< 0.001*
Duration of breastfeeding (minute)	0.977 (0.934-1.023)	0.328			
Education (high school and below)	2.393 (1.228-4.662)	0.010	Education (high school and below)	5.075 (2.119-12.152)	< 0.001*
Income (monthly) ($200-$312)	1009671790.23 (0.0-)	0.997			
Income (monthly) (> $312)	1.424 (0.598-3.392)	0.424			
Mode of delivery (VD)	20.800 (2.799-154.57)	0.003	Mode of delivery (VD)	21.934 (2.310-208.314)	0.007*
Period after birth (< 6 months)	1.470 (0.778-2.781)	0.036	Period after birth (< 6 months)	7.146 (2.368-21.560)	< 0.001*
Breastfeeding status (no)	1.075 (0.492-2.349)	0.856			
Univariate (Binary) Logistic Regression analysis			* Multivariate Logistic Regression Analysis (Backward: LR) Omnibus Tests of Model Coefficients (p < 0.001). Nagelkerke R Square (p = 0.416) Hosmer and Lemeshow Test (p < 0.001) The mode of delivery, period after birth, educational status, and BMI variables have been included in the model.		

BMI: body mass index, OR: odds ratio, CI: confidence interval, VD: vaginal delivery.

Discussion

We found the complete set of FSFI scores and subscale scores within the VD group to be significantly lower during the first year after childbirth than the CS group results. It was determined that the main factors that increased the risk of sexual dysfunction during the first year after birth were having a vaginal birth, having a low education level (high school or below) and less than 6 months after birth. In the CS group, it was observed that the income level, education level, and parity number were significantly higher in the participants with a total FSFI score above 26.5.

Some studies and related literature discussed whether the mode of delivery affects sexual functions. Griffiths et al[8] analyzed the sexual functions of women two years after giving birth. Their study found that dyspareunia and sexual dissatisfaction were more prevalent among women who gave birth through VD. In a prospective study involving 304 participants, it was determined that women who had a VD at the postpartum third month had lower FSFI scores compared to women who had a CS[16]. Another study looked into how the type of delivery affected sexual functions, where they found that dyspareunia was also more common in women who gave birth through VD[10]. A recent meta-analysis investigating the risk factors for sexual dysfunction during the first year after childbirth and the sexual functions of those who gave birth through VD or CS was analyzed. Although there was no significant difference between the CS and VD groups when it came to sexual dysfunction (OR 1.14, 95%CI 0.89-1.46), it was found that dyspareunia was reported less in women who delivered through CS (OR 0.79, 95%CI 0.89–1.46)[17]. Other authors declare that the mode of delivery does not affect sexual functions in any significant way[11, 12, 18, 19]. Another recent meta-analysis did not find a meaningful relationship in terms of postpartum sexual dysfunction between patients with spontaneous/assisted delivery and patients with CS delivery. However, it is also emphasized that the regulatory factors in the studies that are the subject of meta-analysis may affect this relationship[20]. The effect of delivery method on sexual functions is quite controversial in the literature. In our study, we found that women who gave birth vaginally had an approximately 20-fold increased risk of developing sexual dysfunction compared to women who gave birth by CS. Both the FSFI scores, desire, lubrication, satisfaction, orgasm, and pain scores were found to be lower in women who delivered through VD than those who had given birth through CS. Additionally, some studies showed that dissatisfaction

during intercourse may cause a reduction in the frequency of sexual intercourse[21, 22]. Dyspareunia usually occurs during the first months after VD, increasing sexual dissatisfaction while also decreasing the frequency of sexual intercourse and affecting all other sexual functions negatively. Our study found that approximately 65% of participants who had given birth through normal delivery had lower sexual functions during the first 3-6 months after delivery compared to those who gave birth through CS. This may be due to sexual dissatisfaction experienced during the early stages of the postpartum period. Moreover, within the study, it was found that the frequency of postpartum sexual intercourse was lower than it was before delivery. At this point, it is necessary to discuss episiotomy, which has the potential to disrupt sexual function by affecting the perineum. Several studies also reported a positive relationship between the severity of dyspareunia experienced and painful experiences of perineal trauma and episiotomy[23]. Lagana et al found that sexual dysfunction in women led to significantly lower FSFI scores for patients who underwent episiotomy during childbirth[24]. Signorello et al[25] speculated that the degree of perineal trauma had a positive relation to the severity of postpartum dyspareunia, sexual sensation disorder, sexual satisfaction, and orgasm disorders. However, these findings were largely attributed by the authors to short-term changes in postpartum sexual functions. In contrast, other studies in the related literature have reported no such relationship between episiotomy and sexual dysfunction in women[26, 27]. A large prospective study found that the mode of delivery and episiotomy were unrelated to anorgasmia in primiparous women[28]. Furthermore, according to a systematic review evaluating the outcomes of routine episiotomy, no evidence suggests that episiotomy reduces impaired sexual function[9]. A randomized study compared the elective CS against VD in the case of a singleton fetus. Here, Hannah et al[29] suggested that there was no difference in sexual outcomes during a period of 3 months to 2 years after delivery. Episiotomy was performed on all patients who delivered vaginally (VD). Additionally, the majority of patients in the VD group were within the first 6 months after birth. The high risk of sexual dysfunction observed in the VD group may be attributed to the cumulative effect of episiotomy-induced iatrogenic perineal trauma and the early period after birth in this patient cohort (VD). Our results showed that the lowest FSFI subscale scores in the CS and VD groups were attributed to "pain". Considering the related literature, we suppose that pain is the main factor behind the reduction in the frequency of sexual intercourse. However, the number of patients who did not have episiotomy in our hospital was minimal, so the entire VD group consisted of patients with episiotomy. Therefore, we could not compare the FSFI scores between vaginal delivery without episiotomy and cesarean birth groups. In other words, we could not distinguish to what extent episiotomy had a negative impact on FSFI scores, especially on the pain sub-domain, in women who gave birth vaginally.

In some studies, low educational levels have been indicated to be associated with the risk of female sexual dysfunction[30, 31]. Nappi et al[30] stated that women with lower educational levels experienced a reduction in their ability to cope with stress, leading to a higher prevalence of sexual dysfunction problems. Another study suggested that women with lower educational levels talked less about sexual dysfunction problems, and therefore this could be a negative factor[31]. In our study, we found that low educational levels (high school and below) increased the risk of sexual dysfunction several times. These results may be attributed to women with lower educational levels potentially perceiving their sexual dysfunction problems as normal postpartum problems (due to misinformation and misperceptions) and consequently speaking less about them. Undoubtedly, the reluctance of women experiencing sexual dysfunction problems to discuss them may hinder them from seeking appropriate medical support, potentially worsening their sexual function.

Breastfeeding may also negatively affect some

sexual functions in women. A decrease in sexual function may occur in lactating women after childbirth, usually attributed to the hypoestrogenic state that arises due to breastfeeding. During the process, high levels of prolactin and low levels of estrogen and progesterone can increase breast sensitivity, which may negatively affect one's sexual desire. In contrast, a decrease in vaginal lubrication may be caused by hormonal changes[7, 32]. Saleh et al[33] reported that lactating women had statistically lower sexual desires and FSFI scores when compared to non-lactating women. According to the results of our study, it was found that desire scores decreased as breastfeeding duration increased in both groups. Additionally, it was determined that lubrication decreased as breastfeeding duration increased in the CS group. Considering the physiology of sexual arousal, sexual arousal increases vaginal blood flow and allows for the secretion of fluids that act as lubrication for sexual intercourse[34]. In this study, we found that there were increasing lubrication scores in the VD group that were positively correlated with breastfeeding duration. Therefore, considering the physiology of lubrication explained above, increasing arousal scores may have affected lubrication scores positively.

Our study also found that as time passed after the delivery of the child, lubrication increased, and less dyspareunia was observed in both groups. Since breastfeeding periods are more extended during the early postpartum period, hormonal and psychological changes during the breastfeeding process[7] may result in decreased lubrication levels. It is also clear that as time passes during the postpartum period, breastfeeding durations will reduce, and feelings of pain, weakness, and fatigue observed in the first days after delivery will subside. Therefore, it is customary to expect that lubrication based on FSFI subscales will increase while pain decreases the more time passes after childbirth.

Related literature also states that women with a BMI score of above 25 have lower sexual performance[35, 36]. In contrast, other studies say that there is no significant relationship between BMI scores and a woman's sexual performance[37, 38]. Although this issue is still widely debated, the results of our study found that all FSFI subscale scores were below typical levels for both VD and CS groups, with the disparity increasing as the participants' BMI scores increased. FSFI pain scores, arousal, and orgasm scores also seemed to increase as the participant's BMI score increased. Our results seem to contradict some data in the literature. First of all, it should be noted that studies indicating that obesity seriously negatively affects the FSFI score were conducted with a morbidly obese patient group[35, 39]. In another study conducted with 193 women with a mean BMI of 24.5 ± 3.75, BMI was not found to be related to FSFI total and subgroup scores[40]. Esposito et al[41] even stated that BMI may be positively correlated with desire, which is the FSFI subgroup. In our study, the mean BMI of participants was approximately 28. In other words, it was different from the study groups in the literature with women with very high BMI[35, 39]. Moreover, approximately 56% of the participants in our survey were in the first 3-6 months of their postpartum period. There is a societal pressure on women to rapidly lose weight and attain a desirable body shape immediately after childbirth, and this pressure may diminish gradually in the months following childbirth, potentially leading to weight regain after the initial months. Additionally, there is a documented relationship in the literature between being underweight and sexual dysfunction[42]. As an indirect result of this, an improvement in sexual functions can be expected, as in our study. Similar to our findings, O'Malley et al[43] and Szöllosi et al[42] stated that sexual dysfunction was less common in overweight mothers in the postpartum period.

There were several limitations in our study. Firstly, although the FSFI score is considered the gold standard in evaluating a woman's sexual functions, certain conditions such as psychological or subjective factors, childcare, body composition changes, and stress may have caused specific points to be missed while participants were evaluating the FSFI questionnaire. Another limitation of the study involved

the participants being uncomfortable and hesitating to talk about their sexual lives while filling out the questionnaire. This may have led to a decrease in the possibility of the participants answering the questionnaire correctly and honestly. Additionally, the educational status, socio-cultural, and socio-economical levels of the study participants may have affected their answers. One more limitation of the study was that the perineal traumas of the participants who gave birth through VD could not be properly evaluated. Therefore, the differences between 1st and 2nd perineal tears could not be differentiated as the number of CS patients was high. Our episiotomy rate was relatively high in our vaginal deliveries. Therefore, we did not include vaginal deliveries without episiotomy in our study. An evaluation could not be made regarding the sexual functions of the partners of the study's participants. However, we believe our study contributes to the body of knowledge surrounding this topic as it addresses critical issues that have not yet been given a clear conclusion.

The participants' sexual functions before pregnancy were not clearly known. Only the frequency of weekly sexual intercourse before pregnancy could be questioned.

Our study's participants were women within the first 12 months of postpartum. The data we gathered was mainly related to the sexual functions of women who were in their early postpartum periods. Another important limiting factor is the fact that we were not able to perform a medical interview by staying only on FSFI in the diagnosis of sexual dysfunction.

Despite some limitations, our study is essential in examining the relationship between delivery type and FSFI subscale scores. It also contributes to some controversial issues in the literature.

Conclusion

Regardless of the mode of delivery, all participants who were in the first year after childbirth were found to have had deficiencies in their FSFI scores and across all subscale scores (desire, arousal, lubrication, orgasm, satisfaction, pain), indicating sexual dysfunction risk within both groups. This increase in sexual dysfunction risk was found to be more pronounced in women who gave birth through VD than those who gave birth through CS. Considering the importance of sexual health for life quality standards, it would be appropriate for all women in the postpartum period (especially those who give birth vaginally) to receive sexual counseling in terms of FSD risk and monitoring of FSD symptoms.

Potential conflicts of interest

The authors declare no conflicts of interest.

References

1. Female sexual dysfunction: ACOG Practice Bulletin Clinical Management Guidelines for Obstetrician-Gynecologists, Number 213. Obstet Gynecol 2019;134:e1-e18.
2. Basson R, Berman J, Burnett A, Derogatis L, Ferguson D, Fourcroy J, et al. Report of the international consensus development conference on female sexual dysfunction: definitions and classifications. J Urol 2000;163:888-93.
3. Ninivaggio C, Rogers RG, Leeman L, Migliaccio L, Teaf D, Qualls C. Sexual function changes during pregnancy. Int Urogynecol J 2017;28:923-9.
4. Pauls RN, Occhino JA, Dryfhout VL. Effects of pregnancy on female sexual function and body image: a prospective study. J Sex Med 2008;5:1915-22.
5. Glazener CM. Sexual function after childbirth: women's experiences, persistent morbidity and lack of professional recognition. Br J Obstet Gynaecol 1997;104:330-5.
6. Rosen NO, Pukall C. Comparing the prevalence, risk factors, and repercussions of postpartum genito-pelvic pain and dyspareunia. Sex Med Rev 2016;4:126-35.
7. Barrett G, Pendry E, Peacock J, Victor C, Thakar R, Manyonda I. Women's sexual health after childbirth. BJOG 2000;107:186-95.
8. Griffiths A, Watermeyer S, Sidhu K, Amso NN, Nix B. Female genital tract morbidity and sexual function following vaginal delivery or lower segment caesarean section. J Obstet Gynaecol 2006;26:645-9.
9. Hartmann K, Viswanathan M, Palmieri R, Gartlehner G, Thorp J Jr, Lohr KN. Outcomes of routine episiotomy: a systematic review. JAMA 2005;293: 2141-8.
10. Klein K, Worda C, Leipold H, Gruber C, Husslein P,

Wenzl R. Does the mode of delivery influence sexual function after childbirth? J Womens Health (Larchmt) 2009;18:1227-31.
11. De Souza A, Dwyer PL, Charity M, Thomas E, Ferreira CH, Schierlitz L. The effects of mode delivery on postpartum sexual function: a prospective study. BJOG 2015;122:1410-8.
12. Fan D, Li S, Wang W, Tian G, Liu L, Wu S, et al. Sexual dysfunction and mode of delivery in Chinese primiparous women: a systematic review and meta-analysis. BMC Pregnancy Childbirth 2017;17:408.
13. Meston CM, Freihart BK, Handy AB, Kilimnik CD, Rosen RC. Scoring and interpretation of the FSFI: What can be Learned From 20 Years of use? J Sex Med 2020;17:17-25.
14. Rosen R, Brown C, Heiman J, Leiblum S, Meston C, Shabsigh R, et al. The Female Sexual Function Index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. J Sex Marital Ther 2000;26:191-208.
15. Aygin D. The Turkish adaptation of the female function index. Turkiye Klinikleri J Med Sci 2005;25:393-9.
16. de Sousa NQ, Borges AC, Sarabando R, Bivar L, Viana J, Cerqueira M, et al. The role of operative vaginal delivery in postpartum sexual dysfunction: MOODS - A prospective study. J Sex Med 2021;18:1075-82.
17. Cattani L, De Maeyer L, Verbakel JY, Bosteels J, Deprest J. Predictors for sexual dysfunction in the first year postpartum: A systematic review and meta-analysis. BJOG 2022;129:1017-28.
18. Gutzeit O, Levy G, Lowenstein L. Postpartum female sexual function: Risk factors for postpartum sexual dysfunction. Sex Med 2020;8:8-13.
19. Hosseini L, Iran-Pour E, Safarinejad MR. Sexual function of primiparous women after elective cesarean section and normal vaginal delivery. Urol J 2012;9: 498-504.
20. Nikolaidou E, Antoniou E, Sarella A, Iliadou M, Orovou E, Dagla M. The effect of type of delivery on female postpartum sexual functioning: A systematic review. Healthcare 2022;10:1212.
21. Johnson CE. Sexual health during pregnancy and the postpartum. J Sex Med 2011;8:1267-84; quiz 85-6.
22. Lorenz TK, Ramsdell EL, Brock RL. Communication changes the effects of sexual pain on sexual frequency in the pregnancy to postpartum transition. J Psychosom Obstet Gynaecol 2022;43:91-8.
23. Stjernholm YV, Petersson K, Eneroth E. Changed indications for cesarean sections. Acta Obstet Gynecol Scand 2010;89:49-53.
24. Laganà AS, Burgio MA, Ciancimino L, Sicilia A, Pizzo A, Magno C, et al. Evaluation of recovery and quality of sexual activity in women during postpartum in relation to the different mode of delivery: a retrospective analysis. Minerva Ginecol 2015;67:315-20.
25. Signorello LB, Harlow BL, Chekos AK, Repke JT. Postpartum sexual functioning and its relationship to perineal trauma: a retrospective cohort study of primiparous women. Am J Obstet Gynecol 2001;184:881-8.
26. Jiang H, Qian X, Carroli G, Garner P. Selective versus routine use of episiotomy for vaginal birth. Cochrane Database Syst Rev 2017;2:CD000081.
27. Chang SR, Chen KH, Lin HH, Chao YM, Lai YH. Comparison of the effects of episiotomy and no episiotomy on pain, urinary incontinence, and sexual function 3 months postpartum: a prospective follow-up study. Int J Nurs Stud 2011;48:409-18.
28. Connolly A, Thorp J, Pahel L. Effects of pregnancy and childbirth on postpartum sexual function: a longitudinal prospective study. Int Urogynecol J Pelvic Floor Dysfunct 2005;16:263-7.
29. Hannah ME, Whyte H, Hannah WJ, Hewson S, Amankwah K, Cheng M, et al. Maternal outcomes at 2 years after planned cesarean section versus planned vaginal birth for breech presentation at term: the international randomized Term Breech Trial. Am J Obstet Gynecol 2004;191:917-27.
30. Nappi RE, Cucinella L, Martella S, Rossi M, Tiranini L, Martini E. Female sexual dysfunction (FSD): Prevalence and impact on quality of life (QoL). Maturitas 2016;94:87-91.
31. Bachmann G. Female sexuality and sexual dysfunction: are we stuck on the learning curve? J Sex Med 2006;3:639-45.
32. Rowland M, Foxcroft L, Hopman WM, Patel R. Breastfeeding and sexuality immediately post partum. Can Fam Physician 2005;51:1366-7.
33. Saleh DM, Hosam F, Mohamed TM. Effect of mode of delivery on female sexual function: A cross-sectional study. J Obstet Gynaecol Res 2019;45:1143-7.
34. Levin RJ. Sex and the human female reproductive tract--what really happens during and after coitus. Int J Impot Res 1998;10 Suppl 1:S14-21.
35. Kolotkin RL, Binks M, Crosby RD, Ostbye T, Gress RE, Adams TD. Obesity and sexual quality of life. Obesity (Silver Spring) 2006;14:472-9.
36. Ribeiro MC, Nakamura MU, Torloni MR, Scanavino Mde T, Mancini PE, Forte BM, et al. Maternal overweight and sexual function in pregnancy. Acta Obstet Gynecol Scand 2016;95:45-51.
37. Daud S, Zahid AZM, Mohamad M, Abdullah B, Mohamad NAN. Prevalence of sexual dysfunction in pregnancy. Arch Gynecol Obstet 2019;300:1279-85.

38. Aydin M, Cayonu N, Kadihasanoglu M, Irkilata L, Atilla MK, Kendirci M. Comparison of Sexual Functions in Pregnant and Non-Pregnant Women. Urol J 2015;12:2339-44.
39. Kadioglu P, Yetkin DO, Sanli O, Yalin AS, Onem K, Kadioglu A. Obesity might not be a risk factor for female sexual dysfunction. BJU Int 2010;106:1357-61.
40. Erbil N. The relationships between sexual function, body image, and body mass index among women. Sex Disabil 2013;31:63-70.
41. Esposito K, Ciotola M, Giugliano F, Bisogni C, Schisano B, Autorino R, et al. Association of body weight with sexual function in women. Int J Impot Res 2007;19: 353-7.
42. Szollosi K, Komka K, Szabo L. Risk factors for sexual dysfunction during the first year postpartum: A prospective study. Int J Gynaecol Obstet 2022;157: 303-12.
43. O'Malley D, Higgins A, Begley C, Daly D, Smith V. Prevalence of and risk factors associated with sexual health issues in primiparous women at 6 and 12 months postpartum; a longitudinal prospective cohort study (the MAMMI study). BMC Pregnancy Childbirth 2018;18:196.