INTRODUCTION

Postpartum sexual function may be influenced by hormonal, psychological, social, and other factors, and this influence may result in a woman suffering from sexual dysfunction during the postpartum period.1,2 According to previous studies, 20%–60% of women report dysfunctions in their sex life in the first 6 months postpartum.3-7 In the literature, physical and psychological factors such as relationship satisfaction, depression, and mode of delivery have been examined in association with postpartum female sexual dysfunction. However, reports of the effects of these factors on women's postpartum sexual function are inconsistent. This could be the result of methodologic limitations such as cross-sectional study design, lack of long-term follow-up studies and validated questionnaires.

1 School of PhD Studies, Semmelweis University, Budapest, Hungary
2 Department of Family Care Methodology, Faculty of Health Sciences, Semmelweis University, Budapest, Hungary
3 Department of Chemical and Environmental Process Engineering, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology and Economics, Budapest, Hungary
4 Heim Pál Children’s Hospital, Budapest, Hungary

Correspondence
Katalin Szöllősi, H - 1085 Budapest, Üllői street 26, Hungary.
Email: szollosi.katalin@se-etk.hu

Abstract

Objective: To assess the connection of postpartum sexual dysfunction with mode of delivery, amenorrhea, depressive symptoms, and relationship satisfaction.

Methods: For a prospective longitudinal study, we invited 729 Hungarian obstetrics patients to complete questionnaires at 3 months (T1), 6 months (T2), and 12 months (T3) postpartum. We sent them the Female Sexual Function Index (FSFI), the Edinburgh Postnatal Depression Scale (EPDS), the Relationship Assessment Scale (RAS), and a self-constructed questionnaire for body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters) and other data. Of the 389 who responded at T1, we selected 293 who met our criteria for age, obstetrical history, relationship history, completeness of response, and sexual activity. At T2 and T3, we selected 214 and 95. We analyzed their data by multivariate logit regression.

Results: The rates of sexual dysfunction were 44.70% (T1), 40.18% (T2), and 23.15% (T3). Mode of delivery was not a risk factor. Amenorrhea was a risk factor at T1 (P = 0.012) and T2 (P = 0.001). Obesity was a protective factor at T1 (P = 0.021). The higher the EPDS score (T1: P < 0.001; T2: P = 0.035; T3: P = 0.043), and the lower the RAS score (T1: P = 0.016; T2: P = 0.010; T3: P = 0.032), the greater was the risk of dysfunction.

Conclusion: Level of relationship satisfaction, severity of depressive symptoms, amenorrhea, and BMI are connected with sexual dysfunction within a year postpartum.

KEYWORDS
cesarean section, delivery, partner relationship satisfaction, postpartum, sexual dysfunction
retrospective data, or inappropriate selection criteria.\textsuperscript{2,8} The majority of studies have been cross-sectional or retrospective, and therefore limited in their ability to identify factors in the early postpartum period that are risk factors for sexual dysfunction.\textsuperscript{3,8}

The rate of cesarean section has been increasing in recent decades, including in Hungary, where 42.02\% of deliveries were by cesarean section in 2019.\textsuperscript{9} One explanation could be the perception by women that cesarean section preserves the quality of pre-pregnancy sexual function. However, the literature is inconsistent regarding the connection between the mode of delivery and postpartum sexual dysfunction. According to some studies, mode of delivery is not a risk factor for sexual dysfunction,\textsuperscript{5,8,10,11} according to others, it is.\textsuperscript{12-14}

The postpartum period can be considered a vulnerable period of life.\textsuperscript{1,2} According to therapists and previous studies, the normality of a couple's sexual function and their satisfaction with the relationship are linked. A high level of relationship satisfaction has been repeatedly reported to be connected with a high level of sexual function, and these two factors seem to vary concurrently.\textsuperscript{1,2,15} Another variable affecting postpartum sexual function is depression. Postpartum depression occurs within the first 12 months after delivery, and the prevalence of depressive symptoms ranges widely between 13\% and 19\% of mothers.\textsuperscript{16} Earlier studies have reported that postpartum depression increases the risk for developing sexual dysfunction. Conversely, the presence of sexual dysfunction may lead to depression.\textsuperscript{17,18} These results suggest that relationship dissatisfaction and depressive symptoms are important risk factors for sexual dysfunction in the postpartum period. Therefore, their role should be examined in a prospective study.

Our study sought to investigate the long-term connection between sexual dysfunction and potential risk factors such as mode of delivery, amenorrhea, level of relationship satisfaction, and severity of depressive symptoms at 3, 6, and 12 months after delivery.

\section{Materials and Methods}

This prospective study was carried out in three obstetric institutes in Budapest, Hungary. Women were personally invited within 3 days postpartum to participate. The invitation period was between June 2018 and August 2019. The purposes, procedures, risks, and benefits of the study, and the data protection regulations, were explained to all participants. The study was designed in accordance with the General Data Protection Regulation and approved by the Semmelweis University Regional and Institutional Committee of Scientific and Research Ethics in May 2018 (SE-REB number: 24/2017). All participants signed an informed consent form before enrolling.

Data were collected using online questionnaires at 3 months (T1), 6 months (T2), and 12 months (T3) postpartum. The SurveyMonkey program—which is a General Data Protection Regulation-compliant survey program specified for market and scientific research surveys—was used for designing the survey, collecting responses, creating the database, and pre-analyzing the results. Links to the questionnaires were sent via e-mail at every time-point. This was followed by a reminder e-mail for participants with no or partial responses 4 days after the initial invitation.

The inclusion criteria stipulated that participants must: (1) be between the ages of 18 and 45 years, (2) have been in the same relationship since at least 6 months before their last pregnancy, and (3) fully complete the questionnaire. Women who: (1) had multiple pregnancies, (2) had preterm deliveries (before the 37th gestational week), (3) gave inconsistent responses in the questionnaires, (4) terminated their relationship, (5) became pregnant, or (6) had an infant with a birth weight under 1500 g or over 4000 g or received long-term treatment in an intensive care unit were excluded from all questionnaires. Additionally, we excluded women from the current—but not necessarily from the subsequent—questionnaires who had not resumed sexual life since delivery or had not been sexually active in the last 4 weeks. A woman could be in more than one exclusion category.

The sample size was calculated by assuming the prevalence of sexual dysfunction to be 64.3\%,\textsuperscript{7} where the difference to be detected was a decrease of 20\% (to 51.4\%) with 95\% confidence interval (CI), with the type 1 error set at 5\% and the power at 90\%.\textsuperscript{19} Calculation based on these values produced a minimum sample size of 199.

We invited 729 women to participate in this study. Only 389 completed the questionnaire at T1. Of these 389, 278 completed the questionnaire at T2. Of these 278, 133 completed the questionnaire at T3. At T1, of the 389 women, 46 were not selected because they did not meet the selection criteria, and an additional 50 because of sexual inactivity. At T2, of the 278 women, 44 were not selected because they did not meet the selection criteria at T1 or T2, and an additional 20 because of sexual inactivity. At T3, of the 133 women, 32 were not selected because they did not meet the selection criteria at T1 or T2 or T3, and an additional 6 because of sexual inactivity. The final sample size was 293 at T1, 214 at T2, and 95 at T3.

Data on sociodemographic characteristics such as maternal age, educational level, and parity were collected in the first questionnaire (T1). Data on the menstrual cycle were collected at all time-points. Mode of delivery was analyzed based on five groups: (1) vaginal delivery with intact perineum (no sutures were needed), (2) vaginal delivery with episiotomy (sutures were needed after the delivery), (3) vaginal delivery with perineal tears (sutures were needed after the delivery), (4) acute cesarean section (cesarean section was decided during the labor), and (5) elected cesarean section (the day of the cesarean section was scheduled).

Body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters) was assessed at every time-point. BMI was categorized into four categories according to the WHO Classification as: (1) underweight (BMI < 18.5), (2) normal weight (18.5 ≤ BMI < 24.9), (3) overweight (25.0 ≤ BMI < 29.9) and (4) obese (BMI > 30.0).

Sexual function was evaluated using the Hungarian version of the Female Sexual Function Index (FSFI) at each time-point. The FSFI
is a 19-item survey that reflects women's sexual experience over the previous 4 weeks and assesses six domains of sexual function: desire, arousal, lubrication, orgasm, satisfaction, and pain. The score of each domain is multiplied by a correlation factor. Therefore, the lowest possible score is 2, and the highest is 36. The minimum–maximum subgroup scores are Desire: 1.2–6.0, Arousal: 0–6.0, Lubrication: 0–6.0, Orgasm: 0–6.0, Satisfaction: 0.8–6.0, and Pain: 0–6.0.\(^{20}\) We used 26.55 as a cut-off score, so a total FSFI score below 26.55 was considered an indication of sexual dysfunction (sexual dysfunction group), and a score above 26.55 was considered an indication of normal sexual function (no sexual dysfunction group).\(^{21}\)

Satisfaction with relationship was assessed by the Hungarian version of the Relationship Assessment Scale (RAS). RAS is a reliable and validated seven-item instrument that assesses the general satisfaction with a romantic relationship. The items are evaluated on a five-point Likert scale. Higher scores are associated with greater satisfaction.\(^{22}\)

Postpartum level of depression was evaluated by the Hungarian version of the Edinburgh Postnatal Depression Scale (EPDS). The EPDS is a popular validated screening tool to assess the severity of depressive symptoms in the postpartum period. The questionnaire contains 10 statements, and the total score can vary between 0 and 30, where a higher score means more severe depressive symptoms.\(^{23}\)

Data were analyzed using the TIBCO Statistica 13.5.0.17 program. Descriptive statistical values such as percentage, mean, mode, and standard deviation were calculated to describe the sample.

In a primary analysis, the Pearson chi-square test and the Mann-Whitney \(U\) test were used to determine the connection between independent variables and sexual dysfunction.

To obtain more precise estimates of the connection between sexual dysfunction and potential influencing variables, univariate and multivariate logistic regression models were developed. Univariate logistic regression was used to assess the connection between sexual function and those independent variables that were found to be significant in the primary analysis or that we assumed to be connected with sexual dysfunction. Variables that were in significant connection with sexual dysfunction in a univariate regression model were examined in a multivariate regression model. Their connection was adjusted for parity, age, and education level.

3 | RESULTS

The number of women with a bachelor's or master's degree was 195 (66.55%) at T1, 146 (68.22%) at T2, and 67 (70.52%) at T3. The number of women who were primiparous was 174 (59.38%) at T1, 115 (53.73%) at T2, and 52 (54.73%) at T3.

The mean age of the participants varied between 31.44 and 31.8 years over the study (Table 1).

Of the 293 T1 participants, 131 (44.70%) participants had sexual dysfunction according to their initial total FSFI scores. This rate decreased over time (T2: 40.18%; T3: 23.15%). Among the FSFI subgroups, the lowest mean scores appeared in the Desire subgroup at T1, T2, and T3. All subgroup mean scores increased over time, except for the Satisfaction scores, which slightly decreased at T2 (Figure 1).

Mean and median RAS scores were highest at T1, then mildly decreased at T2 and stagnated at T3. Mean and median EPDS scores slightly increased from T1 to T2, then decreased to the T1 level again at T3 (Table 1).

Table 2 characterizes the Sexual dysfunction and No sexual dysfunction groups at all measurement points, according to the values of their categorical and continuous variables. Sociodemographic factors were not connected with sexual dysfunction. Amenorrhea at T1 (\(P = 0.007\)) and T2 (\(P < 0.001\)) and BMI at T1 (\(P = 0.031\)) were significantly connected with sexual dysfunction. According to the results of the Mann-Whitney \(U\) test, significantly lower RAS scores (at T1 \(U = 8487, P = 0.003\); at T2 \(U = 8320, P < 0.001\), at T3 \(U = 466, P = 0.002\)) and significantly higher EPDS scores (at T1 \(U = 7649, P = 0.001\); at T2 \(U = 4364, P = 0.01\); at T3 \(U = 506.5, P = 0.009\)) were found in the Sexual dysfunction group. No difference was found in FSFI scores among the types of delivery at any time-points.

In the multivariate regression analysis, we found that obese women were 0.60 times less likely to have sexual dysfunction at T1 (odds ratio [OR] 0.60, 95% CI 0.24–1.47, \(P = 0.21\)); in contrast, underweight women have a higher risk for sexual dysfunction; however, this connection was just above the margin of significance (OR 4.06, 95% CI 0.96–17.07, \(P = 0.055\)). No further connection was found between BMI and sexual dysfunction at T2 and T3. Lower RAS scores increased the odds of having sexual dysfunction within 12 months postpartum, even after adjusting for other independent variables at each measurement point. A one-unit increase in the RAS score meant that participants were 0.90 times less likely to experience sexual dysfunction at T1 (\(OR = 0.90, 95\% \text{ CI } 0.83–0.98, P = 0.016\)), 0.90 times less likely at T2 (\(OR = 0.90, 95\% \text{ CI } 0.84–0.97, P = 0.010\)), and 0.84 times less likely at T3 (\(OR = 0.84, 95\% \text{ CI } 0.72–0.98, P = 0.032\)). In other words, a higher level of relationship satisfaction decreased the risk of postpartum sexual dysfunction. EPDS scores were mildly connected with sexual dysfunction, even after adjustment. A one-unit increase in the EPDS score meant a 1.11-fold increase in the odds of suffering from sexual dysfunction at T1 (\(OR = 1.11, 95\% \text{ CI } 1.04–1.17, P < 0.001\)), a 1.07-fold increase at T2 (\(OR = 1.07, 95\% \text{ CI } 1.01–1.14, P = 0.035\)), and a 1.12-fold increase at T3 (\(OR = 1.12, 95\% \text{ CI } 1.01–1.26, P = 0.043\)). Those women who were amenorrheic were 2.25 times as likely at T1 (\(OR = 2.25, 95\% \text{ CI } 1.19–4.24, P = 0.012\)) and 2.88 times at T2 (\(OR = 2.88, 95\% \text{ CI } 1.50–5.55, P = 0.001\)) to experience sexual dysfunction, compared with those who had already menstruated. Mode of delivery, parity, age, and educational level were not risk factors for sexual dysfunction at any time-point (Table 3).

4 | DISCUSSION

In our study, we longitudinally examined postpartum sexual dysfunction and the effect of potential influencing factors using validated questionnaires.
The proportion of participants who had sexual dysfunction corresponded to the proportions reported in previous studies.3-7 The proportion of postpartum women with sexual dysfunction is generally high; however, labeling postpartum women as sexually dysfunctional should not be done automatically. The postpartum period can be considered a vulnerable period of life,1,2 and a time of decreased sexual function, which is mostly transient.11 Our results showed that the number of women with sexual dysfunction decreased over time. There were increasing total FSFI and subgroups scores, in line with several previous studies.10,14

### TABLE 1 Descriptive analysis

|                          | T1 (n = 293) | T2 (n = 214) | T3 (n = 95) |
|--------------------------|-------------|-------------|-------------|
| **Educational level**    |             |             |             |
| Elementary school        | 0           | 0           | 0           |
| Vocational school        | 11          | 9           | 3           |
| High school              | 60          | 41          | 18          |
| Some college             | 27          | 18          | 7           |
| Bachelor’s or master’s degree | 195  | 146          | 67          |
| **Parity**               |             |             |             |
| Primiparity              | 174         | 115         | 52          |
| Multiparity              | 119         | 99          | 43          |
| **Mode of delivery**     |             |             |             |
| Vaginal delivery with intact perineum | 39     | 30          | 16          |
| Vaginal delivery with episiotomy | 69     | 56          | 33          |
| Vaginal delivery with perineal trauma | 36     | 28          | 9           |
| Acute cesarean section   | 61          | 42          | 12          |
| Elective cesarean section | 88        | 58          | 25          |
| **Menstruation**         |             |             |             |
| No menstruation          | 212         | 110         | 20          |
| Menstruation             | 81          | 104         | 75          |
| **BMI**                  |             |             |             |
| Underweight              | 12          | 11          | 7           |
| Normal weight            | 163         | 128         | 63          |
| Overweight               | 84          | 57          | 18          |
| Obese                    | 34          | 18          | 7           |
| **Age**                  |             |             |             |
| Mean ± SD                | 31.58 ± 4.76| 31.8 ± 4.66 | 31.44 ± 4.6 |
| Median (min–max)         | 31.0 (19–44)| 31.5 (19–44)| 31.0 (21–42)|
| **RAS**                  |             |             |             |
| Mean ± SD                | 31.87 ± 3.6 | 29.92 ± 4.80| 29.91 ± 3.39|
| Median (min–max)         | 33.0 (16–35)| 31.0 (10–35)| 31.0 (17–35)|
| **EPDS**                 |             |             |             |
| Mean ± SD                | 6.51 ± 5.0  | 6.73 ± 5.25 | 6.13 ± 4.81 |
| Median (min–max)         | 5.0 (0–27)  | 6.0 (0–28)  | 5.0 (0–20)  |
| **FSFI**                 |             |             |             |
| Mean ± SD                | 26.39 ± 5.87| 27.28 ± 5.34| 28.91 ± 4.85|
| Median (min–max)         | 27.4 (10.9–36)| 28.35 (8.8–36)| 29.4 (11.9–36)|

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by the square of height in meters); EPDS, Edinburgh Postnatal Depression Scale; FSFI, Female Sexual Function Index; RAS, Relationship Assessment Scale; SD, standard deviation.

Values are given as number and percentage, mean ± standard deviation or as median (range) as indicated.
According to the literature, lack of sexual interest is the most frequently reported sexual dysfunction in the postpartum period.\(^2,5,14\) Likewise, we found the lowest scores in the Desire subgroup among FSFI subgroups at each time-point (Figure 1). One explanation could be the sleep deprivation because of regular night-time nursing, which is common in the postpartum period, and can be accompanied by lower sexual interest.\(^3,16\) Sexual desire and activity are also higher during ovulation.\(^24\) Therefore, those women who have not menstruated are more likely to suffer from sexual dysfunction,\(^7\) which is in line with our results.

As mentioned before, conflicting results are found in the literature regarding the connection between mode of delivery and sexual dysfunction. Barrett et al.\(^13\) revealed in their early and highly cited study that after cesarean section women had significantly lower risk of having dyspareunia at 3 months postpartum than women with vaginal delivery; however, they used a cross-sectional study design.\(^13\) McDonald et al,\(^14\) also found a significant connection between sexual dysfunction and mode of delivery at 18 months postpartum. They reported that after having an emergency or elected cesarean section, women had a higher risk of dyspareunia than women who had vaginal delivery with an intact perineum or an unsutured tear.

Examining prospective studies from the last decade, which assess more categories of delivery, there are more consistent results. De Souza et al.,\(^8\) examined vaginal delivery, cesarean section, forceps, and vacuum delivery and found no difference among them. Lurie et al.,\(^10\) also found no significant difference among five types of delivery (vaginal birth without episiotomy, vaginal birth with episiotomy, instrumental delivery, emergent cesarean section, and elective cesarean section). In our study, we did not find mode of delivery to be a significant risk factor for sexual dysfunction.

Previous studies have shown that BMI may influence postpartum sexual functions.\(^3,5\) This connection can be explained with distorted body image after delivery\(^2\) and might be influenced by cultural aspects. O’Malley et al.\(^5\) reported that obese mothers have less likelihood of having sexual dysfunction, which is in a line with our results at 3 months postpartum. There is a pressure on women to get into shape soon after delivery, and at 3 months postpartum they might feel weight gain allowed for a short time. We also found a connection between being underweight and sexual dysfunction, which can suggest that for underweight women it might take more time to recover after delivery.

Our results confirm a significant connection between sexual dysfunction and level of relationship satisfaction, which is consistent with previous studies.\(^1,2,15\) One explanation could be that the lower the level of relationship satisfaction, the more likely the woman is to avoid sex as a way of giving feedback about the relationship. McDonald, et al.\(^15\) found in their longitudinal study that while sexual function seemed to improve over time, women’s satisfaction with their relationship decreased in the first 18 months after delivery. Similarly, in our study we found that although total FSFI scores increased over time, satisfaction decreased at T2, and total median RAS scores slightly decreased within 12 months after delivery. This may suggest that the longer women experience sexual dysfunction, the more they lose the interest of their partner, which can make them insecure about their partner’s commitment to their relationship and family.\(^25\)

In line with previous studies, in our study the more severe the depressive symptoms, the more likely that the participant suffered from sexual dysfunction at each time-point (Table 3).\(^17,18,23\) The mean EPDS score increased from T1 to T2, and then decreased to T3. This suggests that depressive symptoms such as sleeping difficulties, problems with appetite, and loss of energy can remain unrecognized in the early postpartum period because, according to the consensus, the puerperium is typically beset with similar problems.\(^16\) Significantly higher EPDS scores were found in the Sexual dysfunction group, compared with the No sexual dysfunction group at each time-point (Table 2). These results suggest that sexual dysfunction and the severity of depressive symptoms interact with each other in the postpartum period.\(^17,18\)
TABLE 2  The connection between independent variables and sexual dysfunction\(^a\)

|                      | T1 \((n = 293)\) |                      | T2 \((n = 214)\) |                      | T3 \((n = 95)\) |
|----------------------|------------------|---------------------|------------------|-------------------|------------------|
|                      | Sexual dysfunction | No sexual dysfunction | Sexual dysfunction | No sexual dysfunction | Sexual dysfunction | No sexual dysfunction |
|                      | \(n\) | % | \(n\) | % | \(n\) | % | \(n\) | % | \(n\) | % |
| Educational level\(^b\) |                  |                    |                  |                    |                  |                    |
| Elementary school    | 0               | 0                  | 0               | 0                  | 0               | 0                  |
| Vocational school    | 4               | 3.05               | 7               | 4.32               | 3               | 3.49               | 6               | 4.69               | 1               | 4.55               | 2               | 2.74               |
| High school          | 20              | 15.27              | 40              | 24.69              | 12              | 13.95              | 29              | 22.66              | 3               | 13.64              | 15              | 20.55              |
| Some college         | 11              | 8.40               | 16              | 9.88               | 6               | 6.98               | 12              | 9.38               | 2               | 9.09               | 5               | 6.85               |
| Bachelor’s or master’s degree | 96      | 73.28              | 99              | 61.11              | 65              | 75.58              | 81              | 63.28              | 16              | 72.73              | 51              | 69.86              |
| Parity\(^b\)         |                  |                    |                  |                    |                  |                    |
| Primiparity          | 78              | 59.54              | 96              | 59.26              | 48              | 55.81              | 67              | 52.34              | 10              | 45.45              | 42              | 57.53              |
| Multiparity          | 53              | 40.46              | 66              | 40.74              | 38              | 44.19              | 61              | 47.66              | 12              | 54.55              | 31              | 42.47              |
| Mode of delivery\(^b\) |                  |                    |                  |                    |                  |                    |
| Vaginal delivery with intact perineum | 14   | 10.69              | 25              | 15.43              | 10              | 11.63              | 20              | 15.63              | 4               | 18.18               | 12              | 16.44              |
| Vaginal delivery with episiotomy | 30   | 22.90              | 39              | 24.07              | 21              | 24.42              | 35              | 27.34              | 7               | 31.82              | 26              | 35.62              |
| Vaginal delivery with perineal trauma | 16   | 12.21              | 20              | 12.35              | 10              | 11.63              | 18              | 14.06              | 3               | 13.64              | 6               | 8.22               |
| Acute cesarean section | 32   | 24.43              | 29              | 17.90              | 17              | 19.77              | 25              | 19.53              | 4               | 18.18              | 8               | 10.96              |
| Elective cesarean section | 39   | 29.77              | 49              | 30.25              | 28              | 32.56              | 30              | 23.44              | 4               | 18.18              | 21              | 28.77              |
| Menstruation\(^b\)   |                  |                    |                  |                    |                  |                    |
| No menstruation      | 63              | 48.09              | 107             | 66.05              | 57              | 66.28              | 53              | 41.41              | 7               | 31.82              | 13              | 17.81              |
| BMI\(^b\)            |                  |                    |                  |                    |                  |                    |
| Underweight          | 9               | 6.87               | 3               | 1.85               | 4               | 4.65               | 7               | 6.46               | 3               | 13.63              | 4               | 5.47               |
| Normal weight        | 70              | 53.43              | 93              | 57.40              | 51              | 59.30              | 77              | 60.15              | 16              | 72.72              | 47              | 64.38              |
| Overweight           | 42              | 32.06              | 42              | 25.92              | 28              | 32.55              | 29              | 22.65              | 3               | 13.63              | 15              | 20.54              |
| Obese                | 10              | 7.63               | 24              | 14.81              | 3               | 3.48               | 15              | 11.71              | 0               | 0                  | 7               | 9.58               |
| Menstruation         | 36              | 27.48              | 55              | 33.95              | 29              | 33.72              | 75              | 58.59              | 15              | 68.18              | 60              | 82.19              |
| Age\(^c\)            |                  |                    |                  |                    |                  |                    |
| Mean ± SD            | \(31.96 ± 4.3\) | \(31.27 ± 5.07\) | \(32.26 ± 4.56\) | \(31.5 ± 4.72\) | \(31.59 ± 4.90\) | \(31.39 ± 4.54\) |
|               | T1 (n = 293) | T2 (n = 214) | T3 (n = 95) |
|---------------|--------------|--------------|-------------|
|               | Sexual dysfunction | No sexual dysfunction | Sexual dysfunction | No sexual dysfunction | Sexual dysfunction | No sexual dysfunction |
| n             | %             | n             | %             | n             | %             | n             | %             |
| 131           | 44.70         | 162           | 54.29         | 86            | 40.18         | 128           | 59.81         |
| Median (min–max) | 32.0 (21–44) | 31.0 (19–43) | 32.0 (22–44) | 31.0 (19–43) | 30.5 (25–41) | 31.0 (21–42) |
| RAS<sup>a</sup> | P = 0.003 | P = 0.001 | P = 0.002 |
| Mean ± SD     | 31.11 ± 4.12 | 32.48 ± 2.99 | 28.37 ± 5.49 | 30.97 ± 3.97 | 27.77 ± 3.79 | 30.56 ± 3.71 |
| Median (min–max) | 32.0 (16–35) | 33.0 (18–35) | 30.0 (10–35) | 32.0 (15–35) | 28.5 (22–35) | 31.0 (17–35) |
| EPDS<sup>c</sup> | P < 0.001 | P = 0.010 | P = 0.009 |
| Mean ± SD     | 7.82 ± 5.38  | 5.45 ± 4.4   | 8.09 ± 6.09  | 5.82 ± 4.40  | 8.95 ± 5.87  | 5.28 ± 4.12  |
| Median (min–max) | 7.0 (0–27) | 5.0 (0–25) | 7.0 (0–28) | 5.0 (0–19) | 8.5 (1–20) | 5.0 (0–16) |
| FSFI<sup>c</sup> | P < 0.001 | P < 0.001 | P < 0.001 |
| Mean ± SD     | 20.91 ± 3.98 | 30.81 ± 2.39 | 21.98 ± 3.92 | 30.84 ± 2.42 | 22.20 ± 4.36 | 30.93 ± 2.71 |
| Median (min–max) | 21.9 (10.9–26.5) | 31.0 (26.6–36) | 22.9 (8.8–26.5) | 30.65 (26.8–36) | 23.95 (11.9–26.3) | 31.1 (26.6–36) |

**Table 2 (Continued)**

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by the square of height in meters); EPDS, Edinburgh Postnatal Depression Scale; FSFI, Female Sexual Function Index; RAS, Relationship Assessment Scale; SD, standard deviation.

<sup>a</sup>Values are given as number and percentage, mean ± standard deviation or as median (range) as indicated.

<sup>b</sup>Comparison was performed using the Pearson χ² test.

<sup>c</sup>Comparison was performed using the Mann-Whitney U test.
| Mode of delivery                     | OR     | 95% CI     | P value | aOR^a   | 95% CI     | P value |
|-------------------------------------|--------|------------|---------|---------|------------|---------|
| T1                                  |        |            |         |         |            |         |
|                                     |        |            |         |         |            |         |
| Mode of delivery                    |        |            |         |         |            |         |
| Vaginal delivery with intact perineum | 1.42   | 0.64–3.11  | 0.239   |         |            |         |
| Vaginal delivery with episiotomy    | 1.03   | 0.54–1.96  | 0.918   |         |            |         |
| Vaginal delivery with perineal trauma | 0.99   | 0.45–2.18  | 0.956   |         |            |         |
| Acute cesarean section              | 0.72   | 0.37–1.39  | 0.154   |         |            |         |
| Elective cesarean section           | Ref.   |            |         |         |            |         |
| BMI                                 |        |            |         |         |            |         |
| Underweight                         | 3.98   | 1.03–15.40 | 0.045   | 4.06    | 0.96–17.07 | 0.055   |
| Normal weight                       | Ref.   |            |         | Ref.    |            |         |
| Overweight                          | 1.32   | 0.78–2.26  | 0.295   | 1.60    | 0.88–2.90  | 0.119   |
| Obese                               | 0.55   | 0.24–1.23  | 0.010   | 0.60    | 0.24–1.47  | 0.021   |
| Menstruation                        |        |            |         |         |            |         |
| Yes                                 | Ref.   |            |         | Ref.    |            |         |
| No                                  | 2.07   | 1.20–3.56  | 0.008   | 2.25    | 1.19–4.24  | 0.012   |
| RAS                                 | 0.89   | 0.83–0.95  | 0.001   | 0.90    | 0.83–0.98  | 0.016   |
| EPDS                                | 1.10   | 1.05–1.16  | <0.001  | 1.11    | 1.04–1.17  | <0.001  |
| T2                                  |        |            |         |         |            |         |
| Mode of delivery                    |        |            |         |         |            |         |
| Vaginal delivery with intact perineum | 0.53   | 0.21–1.35  | 0.471   |         |            |         |
| Vaginal delivery with episiotomy    | 0.64   | 0.30–1.36  | 0.815   |         |            |         |
| Vaginal delivery with perineal trauma | 0.59   | 0.23–1.52  | 0.686   |         |            |         |
| Acute cesarean section              | 0.73   | 0.72–1.64  | 0.825   |         |            |         |
| Elective cesarean section           | Ref.   |            |         |         |            |         |
| BMI                                 |        |            |         |         |            |         |
| Underweight                         | 1.86   | 0.23–3.13  | 0.282   |         |            |         |
| Normal weight                       | Ref.   |            |         |         |            |         |
| Overweight                          | 1.45   | 0.77–2.74  | 0.244   |         |            |         |
| Obese                               | 0.30   | 0.08–1.10  | 0.071   |         |            |         |
| Menstruation                        |        |            |         |         |            |         |
| Yes                                 | Ref.   |            |         | Ref.    |            |         |
| No                                  | 2.78   | 1.57–4.92  | <0.001  | 2.89    | 1.5–5.55   | 0.001   |
| RAS                                 | 0.89   | 0.83–0.94  | <0.001  | 0.91    | 0.84–0.97  | 0.010   |
| EPDS                                | 1.09   | 1.02–1.14  | 0.002   | 1.07    | 1.01–1.14  | 0.035   |
| T3                                  |        |            |         |         |            |         |
| Mode of delivery                    |        |            |         |         |            |         |
| Vaginal delivery with intact perineum | 1.75   | 0.35–8.66  | 0.988   |         |            |         |
| Vaginal delivery with episiotomy    | 1.41   | 0.35–5.69  | 0.608   |         |            |         |
| Vaginal delivery with perineal trauma | 2.62   | 0.43–15.85 | 0.522   |         |            |         |
| Acute cesarean section              | 2.62   | 0.50–13.68 | 0.473   |         |            |         |
| Elective cesarean section           | Ref.   |            |         |         |            |         |
| BMI                                 |        |            |         |         |            |         |
| Underweight                         | 2.20   | 0.45–10.63 | 0.325   |         |            |         |
| Normal weight                       | Ref.   |            |         |         |            |         |
Authors have no conflicts of interest.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

AUTHOR CONTRIBUTIONS

KS designed the study, recruited the participants, collect responses, and contributed to planning and performing the analysis. KS drafted the manuscript and designed the tables and figure. KK planned and performed the statistical analysis and contributed to interpretation of the results. LS took the lead in the research and was in charge of overall direction and planning. All authors provided critical feedback and helped shape the research, analysis, and manuscript.

REFERENCES

1. Matthies LM, Wallwiener M, Sohn C, Reck C, Müller M, Wallwiener S. The influence of partnership quality and breastfeeding on postpartum sexual function. Arch Gynecol Obstet. 2019;299(1):69-77.
2. Wallwiener S, Müller M, Doster A, et al. Sexual activity and sexual dysfunction of women in the perinatal period: a longitudinal study. Arch Gynecol Obstet. 2017;295(4):873-883.
3. Alligood-Percoco NR, Kjerulf KH, Repke JT. Risk factors for dyspareunia after first childbirth. Obstet Gynecol. 2016;128(3):512-518.
4. Banaei M, Kariman N, Ozgoli G, et al. Prevalence of postpartum dyspareunia: a systematic review and meta-analysis. Int J Gynecol Obstet. 2020;00:1-11. doi:10.1002/ijgo.13523.
5. 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(1):196.
6. Lagaert L, Weyers S, Van Kerrebroeck H, Elaut E. Postpartum dyspareunia and functional: a prospective cohort study. Eur J Contracept Reprod Health Care. 2017;22(3):200-206.
7. Khajehei M, Doherty M, Tilley PJJ, Sauer K. Prevalence and risk factors of sexual dysfunction in postpartum Australian women. J Sex Med. 2015;12(6):1415-1426.
8. De Souza A, Dwyer PL, Charity M, Thomas E, Ferreira CHJ, Schierlitz L. The effects of mode delivery on postpartum sexual function: a prospective study. BJOG. 2015;122(10):1410-1418.
9. NEAK: the number of deliveries and the rate of cesarean section. Accessed January 31, 2021. http://neak.gov.hu/data/cms1025544/Szules_csaszar_metsz_2015_2019_(2).pdf (in Hungarian)
10. Lurie S, Aizenberg M, Sulema V, et al. Sexual function after childbirth: a prospective cohort study. Arch Gynecol Obstet. 2013;288(4):785-792.
11. Rezaei N, Azadi A, Sayehmiri K, Valizadeh R. Postpartum sexual function and its predicting factors among Iranian women. Malays J Med Sci. 2017;24(1):94-103.
12. Barbara G, Pfirrotti P, Facchin F, et al. Impact of mode of delivery on female postpartum sexual function: spontaneous vaginal delivery and operative vaginal delivery vs cesarean section. J Sex Med. 2016;13(3):393-401.
13. Barrett G, Pendry E, Peacock J, Victor C, Thakar R, Manyonda I. Women’s sexual health after childbirth. BJOG. 2000;107(2):186-195.
14. McDonald EA, Garland D, Small R, Brown SJ. Dyspareunia and childbirth: a prospective cohort study. BJOG. 2015;122(5):672-679.
15. McDonald E, Woolhouse H, Brown SJ. Sexual pleasure and emotional satisfaction in the first 18 months after childbirth. *Midwifery*. 2017;55:60-66.

16. O’Hara MW, McCabe JE. Postpartum depression: current status and future directions. *Annu Rev Clin Psychol*. 2013;9:379-407.

17. Chang SR, Lin WA, Lin HH, Shyu MK, Lin MI. Sexual dysfunction predicts depressive symptoms during the first 2 years postpartum. *Women Birth*. 2018;31(6):E403-E411.

18. Asselmann E, Hoyer J, Wittchen H-U, Martini J. Sexual problems during pregnancy and after delivery among women with and without anxiety and depressive disorders prior to pregnancy: a prospective-longitudinal study. *J Sex Med*. 2016;13(1):95-104.

19. Hsieh FY, Bloch DA, Larsen MD. A simple method of sample size calculation for linear and logistic regression. *Stat Med*. 1988;17(14):1623-1634.

20. Rosen R, Brown C, Heiman J, 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(2):191-208.

21. Wiegel M, Meston C, Rosen R. The Female Sexual Function Index (FSFI): cross-validation and development of clinical cut off scores. *J Sex Marital Ther*. 2005;31:1-20.

22. Hendrick SS. A generic measure of relationship satisfaction. *J Marriage Fam*. 1988;50(1):93-98. doi:10.2307/352430.

23. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry*. 1987;150:782-786.

24. Caruso S, Aghello C, Mlandrino C, Lo Presti L, Cicero C, Cianci S. Do hormones influence women’s sex? Sexual activity over the menstrual cycle. *J Sex Med*. 2014;11(1):211-221.

25. Schlagintweit HE, Bailey K, Rosen NO. A new baby in the bedroom: frequency and severity of postpartum sexual concerns and their associations with relationship satisfaction in new parent couples. *J Sex Med*. 2016;13:1455-1465.

How to cite this article: Szöllősi K, Komka K, Szabó L. Risk factors for sexual dysfunction during the first year postpartum: A prospective study. *Int J Gynecol Obstet*. 2022;157:303-312. [https://doi.org/10.1002/ijgo.13892](https://doi.org/10.1002/ijgo.13892)