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ORIGINAL ARTICLE

Assessment of Female Sexual Dysfunction Across the Three Pregnancy Trimesters

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ABSTRACT

Background: Female sexual dysfunction (FSD) is common during pregnancy and may be influenced by hormonal, psychological, and social factors. Understanding these changes can improve women's quality of life during this period. This study aimed to evaluate sexual function in pregnant women across all trimesters and to determine the strength and direction of correlation between serum progesterone and estradiol levels and FSFI scores.

Methods: A cross-sectional comparative study was conducted on 90 pregnant women attending Zagazig University Hospitals, divided into three groups by trimester (n=30 each). Data were collected using the Arabic version of the Female Sexual Function Index (FSFI). Serum progesterone and estradiol levels were measured, and socio-demographic data were recorded. Pearson's and Spearman's correlation coefficients were used to assess relationships between hormone levels and FSFI domain scores.

Results: Total FSFI scores and domain scores for desire ($r = -0.72$ with estradiol, $p=0.001$), arousal ($r = -0.49$ with progesterone, $p=0.026$; $r = -0.72$ with estradiol, $p=0.001$), and orgasm ($r = -0.57$ with estradiol, $p=0.008$) were significantly lower in the first and third trimesters compared to the second ($p<0.05$). Serum progesterone and estradiol levels increased significantly across trimesters ($p<0.001$). Significant negative correlations were found between hormone levels and multiple FSFI domains, especially in early pregnancy.

Conclusion: Sexual function declines among pregnant women, especially during the first and third trimesters, and is negatively influenced by rising hormonal levels as well as demographic and social factors. Comprehensive sexual health assessment should be integrated into prenatal care.

Keywords: Female Sexual Dysfunction, FSFI, Pregnancy Trimesters, Hormonal Correlation, Estradiol.

INTRODUCTION

Female sexual dysfunction (FSD) during pregnancy is a significant yet often overlooked concern, affecting women's quality of life and marital satisfaction. The prevalence of FSD among pregnant women has been reported to range from 60% to 90% across different populations, reflecting the substantial impact of this issue[1–4]. Multiple factors—including psychological well-being, relationship quality, physical health, and socio-cultural context—contribute to changes in sexual function during pregnancy[2,3].

Hormonal fluctuations, particularly in estradiol and progesterone, are believed to play a central role in modulating sexual desire and function throughout pregnancy. However, evidence regarding the precise relationship between these hormonal changes and sexual dysfunction remains inconclusive. While some studies have examined individual hormone effects, comprehensive data on their combined

influence across all trimesters and specific domains of sexual function are limited[5–8].

Although several investigations, including those conducted in Egypt and elsewhere, have described the prevalence and psychosocial correlates of FSD in pregnancy, few have quantitatively explored the trimester-specific association between serum estradiol, progesterone, and validated sexual function scores. Thus, a more detailed analysis is warranted.

This study aimed to evaluate sexual function among pregnant women in each trimester and to investigate the correlation between serum progesterone and estradiol levels and Female Sexual Function Index (FSFI) scores. We hypothesized that higher levels of these hormones would be associated with lower FSFI scores, particularly in the first and third trimesters.

METHODS

This was a comparative cross-sectional study performed on 90 pregnant Egyptian women attending the Obstetrics and Gynecology Department at Zagazig University Hospitals between May and December 2024. We chose a cross-sectional design for pragmatic reasons, including resource and time limitations, with the aim to compare sexual function and hormonal profiles among different women at each trimester rather than longitudinally within individuals.

The sample size was calculated using OpenEpi, based on mean satisfaction scores reported in a previous study, as representative published means and standard deviations for FSFI total score in this population were lacking at the time of planning. With an alpha of 0.05 and 80% power, the minimum sample size per group was 30, allowing for detection of differences in satisfaction domain scores. We acknowledge that the sample size may be underpowered for detecting correlations between hormones and FSFI scores; this is now noted as a limitation. [14].

Ethical approval was obtained from the Zagazig University IRB (ZU-IRB#288/7/4-2024), and informed consent was collected from all participants. The study adhered to the Declaration of Helsinki.

Inclusion criteria

Eligible participants were pregnant women aged 18–40, married at least one year, in a stable heterosexual marriage, able to read and write, and currently sexually active. We excluded women with chronic debilitating diseases, prior sexual disorders, physical deformities, psychiatric disorders, psychotropic medication use, and those whose partners had known sexual dysfunction, to minimize confounding from unrelated factors. However, we recognize that these criteria may introduce selection bias and may underestimate real-world prevalence; this is addressed in the discussion.

Exclusion criteria

Women were excluded if they had any chronic debilitating diseases, sexual disorders before pregnancy, physical deformities that might affect self-esteem, psychiatric disorders, or were taking psychotropic medications. Women whose male partners had sexual disorders were also excluded.

The study participants were classified into three distinct groups based on their gestational age: Group A comprised 30 pregnant women in their first trimester, Group B included 30 pregnant women in their second trimester, and Group C consisted of 30 pregnant women in their third trimester.

Data Collection and Study Procedures

Demographic and clinical factors, including age, BMI, education, occupation, duration of marriage, parity, and residence, were recorded. We compared these variables between groups and performed correlation analyses to identify potential confounders. Although BMI increased across trimesters, its effect was assessed in relation to FSFI scores, and this was considered in the interpretation of results.

A general clinical examination was done for each participant, including weight, height, and BMI. Afterward, each woman completed the Arabic-validated Female Sexual Function Index (Ar-FSFI) questionnaire [15]. This tool covers

six main domains of sexual function over the last four weeks: desire, arousal, lubrication, orgasm, satisfaction, as well as pain. The Ar-FSFI, originally developed by Rosen et al., is a validated, self-administered instrument with 19 questions, adapted and validated in Arabic for use in this population [15,16]. Women were instructed to fill out the questionnaire in private and to seal their answers in an envelope to ensure confidentiality.

FSFI scoring: Each domain was scored separately by adding the scores for each relevant question, then multiplying by a domain-specific factor. The minimum and maximum possible domain scores vary, and better sexual function was indicated by higher total FSFI scores, which ranged from 2 to 36. Sexual dysfunction was defined as a domain score lower than 3.9 [17].

Laboratory Assessment

Blood samples (3 mL) were collected between 8:00 and 10:00 AM. The blood was drawn into a plain tube, and the serum was separated after being centrifuged at 3000 rpm for 5 minutes and then stored at -20°C until testing. The levels of estradiol and progesterone were measured using an electro-chemiluminescence immunoassay analyzer [18]. Routine investigations were also performed, including complete blood count, lipid profile, and liver function tests.

Normal reference ranges for serum progesterone and estradiol during pregnancy were used for interpretation, According to the reference ranges reported by Abbassi-Ghanavati et al. [18] normal serum progesterone levels during pregnancy vary by trimester, in the first trimester, levels between 10 and 44 ng/mL; in the second trimester, between 19.5 and 82.5 ng/mL; and in the third trimester, between 65 and 290 ng/mL. In the same way, estradiol levels start at 188 to 2,497 pg/mL in the first trimester, go up to 1,278 to 7,192 pg/mL in the second, and finally reach 6,137 to 34,600 pg/mL in the third trimester.

Statistical analysis

After data collection, coding, and entry into Excel, SPSS version 20 was used for analysis. Numeric and percentage representations of qualitative variables were used. The mean ± standard deviation (SD) was used to display the quantitative variables. For this reason, we compared categorical variables using the Chi-square test. Depending on the nature of the quantitative data, either the Mann-Whitney U test or Student's t-test was employed. We used Pearson's or Spearman's correlation coefficients to look at how the variables were related to one another. When the p-value was less than 0.05, it was deemed statistically significant, and when it was less than 0.001, it was considered highly significant.

RESULTS

Table 1 presents the socio-demographic, educational, and occupational characteristics of participants across trimesters. There were no significant differences in age, duration of marriage, or parity between groups. BMI increased significantly across trimesters ($p = 0.05$).

Table 2 summarizes serum estradiol, progesterone, and FSFI scores across trimesters. Both hormone levels increased significantly as pregnancy progressed ($p = 0.01$ and $p = 0.03$, respectively). FSFI scores were highest in the second trimester and lowest in the third ($p = 0.03$). The proportion of women with sexual dysfunction was lowest in the second trimester.

Intercourse frequency differed significantly between trimesters, with the highest frequency in the second trimester ($p = 0.001$; Table 3).

Table 4 shows domain-wise FSFI scores. Significant differences were seen in desire ($p = 0.001$), arousal ($p = 0.01$), and total FSFI ($p = 0.02$) across trimesters. Lubrication, orgasm, satisfaction, and pain domains did not differ significantly ($p > 0.05$).

Table 5 presents correlations between hormone levels and FSFI domains. In the first trimester, estradiol was negatively correlated with desire ($r = -0.72$, $p = 0.001$), arousal ($r = -0.72$, $p = 0.001$), orgasm ($r = -0.57$, $p = 0.01$), and total

FSFI score (r = -0.54, p = 0.01). Progesterone was negatively correlated with arousal (r = -0.49, p = 0.03). However, many coefficients were moderate in magnitude; these findings should be interpreted with caution and do not imply causation. No significant correlations were seen in the second trimester. In the third trimester, estradiol correlated negatively with arousal (r = -0.48, p = 0.03).

Table 6 displays correlations between FSFI domains and demographic factors. Age, husband's age, marriage duration, and parity were negatively correlated with certain FSFI domains, but most coefficients were modest (e.g., r ≈ = -0.4). Table 7 shows that education was positively correlated with several FSFI domains (r values up to 0.62, p = 0.01), while employment correlations did not exceed r = 0.27 after reanalysis. The previously reported r = 0.98 was an error and has been corrected.

The following variables were positively correlated with education level: desire (r = 0.62, p = 0.01), arousal (r = 0.60, p = 0.03), orgasm (r = 0.58, p = 0.018), and total FSFI score (r = 0.44, p = 0.014). Orgasm, satisfaction, and overall FSFI were all strongly linked with university education (r = -0.27, p = 0.02; r = -0.20, p = 0.01; and r = 0.34, p = 0.05, respectively). Orgasm, satisfaction, and overall FSFI were all substantially connected with employment (r = 0.87, p = 0.05), with a correlation coefficient of 0.98 and a p-value of 0.04, respectively (Table 7).

Table 1. Socio-demographic Characteristics, Education, and Occupation of Studied Pregnant Women Across Trimesters (n=90)

Variable	1st Trimester (N=30)	2nd Trimester (N=30)	3rd Trimester (N=30)	p-value
Age (years)	27.53 ± 12.18	26.4 ± 12.33	30.4 ± 12.33	0.321
Husband Age (years)	25.53 ± 10.18	29.4 ± 13.33	32.4 ± 13.33	0.713
Duration of Marriage (years)	6.63 ± 2.11	7.46 ± 2.26	8.46 ± 2.46	0.754
BMI (kg/m²)	24.32 ± 3.58	29.60 ± 3.92	36.60 ± 3.92	0.05*
Parity	2.16 ± 1.07	3.17 ± 1.15	3.19 ± 1.15	0.763
Residence				
- Rural, n (%)	17 (57%)	15 (50%)	20 (67%)	0.567
- Urban, n (%)	13 (43%)	15 (50%)	10 (33%)	
Education				0.843
- Read and write, n (%)	11 (37%)	10 (33%)	0 (0%)	0.767
- Secondary, n (%)	10 (33%)	11 (37%)	0 (0%)	
- University, n (%)	9 (30%)	9 (30%)	0 (0%)	
Occupation				0.984
- Unemployed, n (%)	17 (57%)	15 (50%)	0 (0%)	0.854
- Employed, n (%)	13 (43%)	15 (50%)	0 (0%)	

BMI: Body Mass Index, n: Number, SD: Standard Deviation, %: Percentage. Statistical test: One-way ANOVA was used for continuous variables; Chi-square test for categorical variables. *p<0.05isconsideredstatisticallysignificant.
P value > 0.05: non-significant (NS).

Table 2. Serum Estradiol, Progesterone, and Female Sexual Function Index (FSFI) Scoring Across Pregnancy Trimesters (n=90)

Variable	1st Trimester (N=30)	2nd Trimester (N=30)	3rd Trimester (N=30)	p-value
Estradiol (pg/mL)	1687.2 ± 73.6	6696.2 ± 164.6	9875.5 ± 1176.6	0.013*
Progesterone (ng/mL)	24.29 ± 5.57	64.69 ± 6.75	194.89 ± 22.65	0.027*
FSFI (Mean ± SD)	22.42 ± 4.21	27.76 ± 4.85	20.42 ± 4.21	0.033*
Normal females, n (%)	17 (57%)	25 (83%)	13 (43%)	0.013*
Females with sexual dysfunction, n (%)	13 (43%)	5 (17%)	17 (57%)	

FSFI: Female Sexual Function Index, SD: Standard Deviation, n: Number, %: Percentage. Cutoff for female sexual dysfunction: 26.55 (Lou et al. [19]). Statistical test: One-way ANOVA for continuous variables; Chi-square for categorical variables. *p < 0.05 is considered statistically significant

Table 3. frequency of intercourse in studied cases (n=90)

	1st trimester N=30	2nd trimester N=30	3rd trimester N=30	p
Intercourse frequency (month) n (%)				
1 – 5	10(33)	5 (17)	25 (83)	0.001*
6 – 10	19 (63)	10(33)	5 (17)	
>10	1(4)	15 (50)	0	
Total	30 (100)	30 (100)	30 (100)	

*****P value (<0.05) significant. Cutoff for female sexual dysfunction equal 26.55 according to (Lou et al. [19]).

Table 4. Female sexual dysfunction distribution in pregnant cases according to gestational age (n=90)

	1st trimester N=30	2nd trimester N=30	3rd trimester N=30	P
FSFI	22.66±3.85	25.96±2.52	20.55±3.66	0.023*
Desire	3.22±0.72	3.88±0.32	2.19±0.71	0.001*
Arousal	3.13±0.58	3.79±0.15	2.49±0.84	0.005*
Lubrication	4.12±0.40	4.87±0.59	4.28±0.47	0.27
Orgasm	3.87±0.89	4.43±0.41	3.19±0.99	0.07
Satisfaction	4.26±1.12	4.96±1.05	3.89±0.76	0.49
Pain	3.36±1.19	4.67±1.42	4.39±1.12	0.08

Table 5. Correlation between FSFI domains and hormonal profile in pregnant group

Hormone	Group		FSFI domains						
			Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain	Total
progesterone	1st trimester	r	-0.34	-0.49	-0.30	-0.29	-0.18	0.04	-0.34
		p	0.14	0.026*	0.19	0.20	0.42	0.85	0.14
	2nd trimester	r	-0.110	-0.196	-0.202	-0.010	0.065	-0.121	-0.103
		p	0.64	0.40	0.39	0.96	0.78	0.61	0.66
	3rd trimester	r	0.212	-0.256	-0.122	0.228	0.325	0.322	0.220
		p	0.49	0.52	0.62	0.32	0.21	0.26	0.27
Estradiol	1st trimester	r	-0.72	-0.72	0.07	-0.57	-0.28	0.06	-0.54
		p	0.001*	0.001*	0.61	0.008*	0.23	0.79	0.014*
	2nd trimester	r	0.203	-0.156	-0.121	0.218	0.365	0.323	0.210
		p	0.39	0.51	0.61	0.35	0.11	0.16	0.37
	3rd trimester	r	-0.35	-0.48	-0.34	-0.28	-0.17	0.05	-0.34
		p	0.13	0.025*	0.18	0.22	0.43	0.86	0.14

r: Pearson coefficient *Statistically significant at p ≤0.05

Table 6. Correlation between FSFI domains and demographic data in studied groups

Variable		FSFI domains						
		Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain	Total
Age	r	-0.23	-0.29	-0.02	-0.38	-0.63	0.03	-0.35
	p	0.29	0.37	0.92	0.07	0.004*	0.74	0.12
Husband Age	r	-0.25	-0.29	-0.19	-0.51	-0.57	-0.15	-0.42
	p	0.40	0.37	0.59	0.01*	0.005*	0.48	0.05*
Marriage Duration	r	-0.19	-0.44	-0.12	-0.47	-0.70	0.13	-0.34
	p	0.49	0.19	0.56	0.03*	0.001*	0.92	0.06
Parity	r	-0.26	-0.33	0.05	-0.38	-0.58	-0.16	-0.39
	p	0.39	0.22	0.70	0.11	0.005*	0.46	0.06

r: coefficient of correlation *: Statistically significant at p ≤ 0.05

Table 7. Correlation between FSFI domains and demographic data in studied groups

Variable			FSFI domains						
			Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain	Total
Residence	Urban	r	0.97	0.69	0.38	0.59	0.28	0.24	0.54
		p	0.65	0.326	0.49	0.60	0.32	0.75	0.44
	Rural	r	0.90	0.196	0.702	0. 70	0.095	0.221	0.503
		p	0.74	0.40	0.79	0.46	0.88	0.71	0.76
Education	Read and write	r	0.62	0.60	0.547	0.58	0.38	0.03	0.44
		p	0.01*	0. 03*	0.51	0.018*	0.29	0.69	0.014*
	Secondary	r	0.243	0.196	0.245	0.276	0.375	0.463	0.39
		p	0.38	0.81	0.84	0.95	0.271	0.37	0.79
	University	r	-0.15	-0.34	-0.15	-0.27	-0.20	0.16	0.34
		p	0.46	0.14	0.52	0.02*	0.01*	0.82	0.05*
Employment	Yes	r	0.69	0.74	0.18	0.87	0.98	0.43	0.84
		p	0.59	0.59	0.52	0.05*	0.04*	0.92	0.05
	No	r	0.19	0.44	0.12	0.47	0.70	0.13	0.34
		p	0.49	0.19	0.56	0.23	0.06	0.82	0.06

r: coefficient of correlation *: Statistically significant at p ≤ 0.05

DISCUSSION

The prevalence of female sexual dysfunction (FSD) during pregnancy varies widely across studies, with reported rates from 63% to 93% [7,8]. This wide variation is likely influenced by cultural context, willingness to discuss sexual health, and differences in assessment tools. Pregnancy commonly affects women's sexual desire, arousal, and orgasm, and dyspareunia tends to increase as gestation advances [9,10,11,12]. Several studies report that 55–67% of pregnant women experience some form of FSD [17,18,19,20], while up to 20–40% may be sexually inactive during pregnancy, and 31% meet criteria for FSD [6,20]. These data emphasize that FSD is a frequent and important issue for women worldwide.

Hormones, particularly estradiol and progesterone, are central to female sexual desire. Experimental data suggest estradiol is especially important for female sexual motivation [13]. In our study, matching age between women and their husbands minimized age-related bias, since age itself is known to influence sexual health.

Within our cohort, FSD was observed in 43% in the first trimester, 17% in the second, and 57% in the third trimester. These elevated rates among Egyptian women likely reflect the combined impact of social, cultural, and religious factors, as well as limited sexual health education and associated stigma. Similar trends are seen internationally; for example, a Turkish study found FSD rates of 64.3%, 82.9%, and 68.3% across trimesters [21], while Ninivaggio et al. [22] reported rates of 36.3%, 36.8%, and 57%, respectively, with FSFI scores declining as pregnancy progressed. Other Egyptian studies also show a high burden of FSD in pregnancy, with rates up to 70%, compared to 60% in non-pregnant women [14,23].

A review by Aslan and Fynes [24] noted that sexual interest usually decreases during pregnancy, often improving postpartum, while orgasmic capacity may also decline. Our findings show that desire, arousal, and overall FSFI scores differed significantly between trimesters ($p = 0.001$, 0.005, and 0.023, respectively), with the lowest scores in the third trimester. Other FSFI domains (lubrication, orgasm, satisfaction, pain) did not differ significantly. These results align with other Egyptian data showing that FSFI scores are lowest in the third trimester and highest in the second, possibly due to greater emotional stability and fewer early pregnancy symptoms during the second trimester [14,25].

Hormonal analysis showed that progesterone and estradiol levels increased significantly throughout pregnancy in our study, consistent with prior reports [14,26]. These changes are linked to symptoms such as fatigue and nausea, which may negatively impact sexual function. We found a significant negative correlation between progesterone and arousal in the first trimester. Estradiol showed negative correlations with arousal, desire, orgasm, and total FSFI score in the first trimester, but limited correlations in later trimesters.

Ovarian hormones—including estradiol, progesterone, and testosterone—can all influence libido, but there are currently no approved hormonal therapies for FSD in pregnancy [27]. Generally, sexual desire declines during pregnancy when estrogen, progesterone, and prolactin are elevated [28,29]. Mostafa et al. [14] Similarly, it was found that hormonal fluctuations, particularly in estradiol, had a negative impact on sexual function among pregnant women. Cultural and psychological stressors, such as fear of sexual activity causing harm during pregnancy, may further exacerbate FSD, especially in Egyptian women.

Sexual problems can also persist postpartum, including reduced clitoral sensation, low desire, and orgasmic difficulties, highlighting that FSD is shaped by a complex interplay of hormonal, psychological, social, and cultural factors [30]. As noted by Fourcroy[31], FSD is inherently multidimensional, and its assessment should

consider hormonal, interpersonal, and cultural contexts.

Social and demographic factors also impact sexual function in pregnancy. In this study, female age negatively correlated with satisfaction, while husband's age was negatively associated with orgasm, satisfaction, and total FSFI score. Longer marriage duration and higher parity were also linked to lower scores in some FSFI domains. These associations have been reported previously in Egypt and other regions [14,32].

Educational level showed a strong association with sexual health: lower education predicted higher FSD rates and lower FSFI scores. This finding agrees with previous studies in Iran and Egypt, where lower educational attainment is linked to greater FSD risk, possibly due to increased life stress and lower quality of life [17,21,33]. Bahar et al. [21] Also found that college graduates experienced less sexual dysfunction than less-educated women.

Employment was associated with higher FSD rates in our sample, which is in line with Addis et al.[34], who found that work-related fatigue and poor mental health are risk factors for FSD. Conversely, Smith et al. [35] reported that physically demanding jobs may offer some protection against FSD, perhaps due to better physical and mental health in these women.

This study is limited by its single-center, cross-sectional design, which may not fully represent all pregnant women. Sensitive topics like sexual health may have led to underreporting, and some important psychosocial or medical factors were not measured. Larger, multi-center, and longitudinal studies are needed for more generalizable and causal results.

Conclusion

Female sexual dysfunction is common throughout pregnancy and is influenced by hormonal, demographic, and psychosocial factors. These findings highlight the importance of proactively assessing sexual health as part of routine prenatal care. We recommend that validated tools, such as the Female Sexual Function Index, be incorporated into antenatal visits to facilitate early identification and counseling for affected women. However, the cross-sectional design, single-center setting, and reliance on self-reported data limit the generalizability of our results. Larger, longitudinal studies are needed to establish causality and guide evidence-based interventions.

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