

Prevalence and Predictive Factors of Female Sexual Dysfunction in Saudi Arabia: A Cross-sectional Study

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Abstract

Introduction: Female Sexual Dysfunction (FSD) adversely affects multiple aspects including quality of life, interpersonal relationships, and self-esteem. It takes different forms, including lack of sexual desire, impaired arousal, inability to achieve orgasm, and pain with sexual activity. It is reported in approximately 30-60% of females worldwide. FSD has not been adequately investigated in Saudi Arabia for several reasons.

Aim: To assess the prevalence and predictors of FSD in a community-based sample of Saudi women.

Method: This cross-sectional study included a convenience sample of Saudi women aged 20 years or older who were sexually active. Data were collected using a validated questionnaire consisting of multiple variables, including female demographic data and the Female Sexual Function Index [FSFI]. The Validated Arabic version of the FSFI [ArFSFI] was used to assess FSD.

Results: A total of 822 participants were included and a total of 459 (55.8%) had FSD (FSFI ≤ 26.55). FSD was positively associated with taking medications, especially antidepressants ($p < 0.001$), longer duration of marriage ($p < 0.001$), higher number of deliveries ($p < 0.001$), menopause ($p = 0.001$), need for lubricants ($p < 0.001$), encountering sexual assault ($p = 0.042$), and lower ratings of relationships with partners ($p < 0.001$). The domain with the lowest score was desire (3.47 ± 1.22), followed by arousal (3.76 ± 1.48), orgasm (4.04 ± 1.61), pain (4.24 ± 1.54), satisfaction (4.24 ± 1.60), and lubrication (4.35 ± 1.39).

Conclusion: The estimated prevalence of FSD in Saudi women is 56%. Desire and arousal were the most significantly affected domains, followed by orgasmic problems. The most important risk factor for FSD is antidepressant use. More studies that implement structured interviews with both partners to examine risk factors and predictors are strongly warranted. Finally, it is essential to educate women about the types of FSD and overcome cultural barriers to provide a better quality of life.

Keywords: Female Sexual Dysfunction; Female Sexual Function Index; Saudi; Prevalence; Risk Factors.

Plain Language Summary

Female Sexual Dysfunction (FSD) adversely affects multiple aspects including quality of life, interpersonal relationships, and self-esteem. It takes different forms, including lack of sexual desire, impaired arousal, inability to achieve orgasm, and pain with sexual activity. It is reported in approximately 30-60% of females worldwide. FSD has not been adequately investigated in Saudi Arabia for several reasons. Our aim is to assess the prevalence and

predictors of FSD in a community-based sample of Saudi women. This study included a convenient sample of Saudi women aged 20 years or older who were sexually active. We used a questionnaire consisting of multiple variables, including female demographic data and an index that measures Female Sexual Function [FSFI]. A total of 822 females were included and a total of 459 (55.8%) had FSD. FSD was positively associated with taking medications, especially

antidepressants, longer duration of the marriage, a higher number of deliveries, menopause, need for lubricants, encountering sexual assault, and lower ratings of relationships with partners. Desire and arousal were the most significantly affected domains, followed by orgasmic problems. The most important risk factor for FSD is antidepressant use. More studies that implement structured interviews with both partners to examine risk factors and predictors are strongly warranted. Finally, it is essential to educate women about the types of FSD and overcome cultural barriers to provide better quality of life.

Introduction

Sexual function is a fundamental component of life, and dysfunction can negatively affect an individual's well-being [1]. Female Sexual Dysfunction (FSD) is a sexual problem associated with anatomical, physiological, medical, psychological, and social components that adversely affect multiple aspects of an individual's life, including the quality of life, interpersonal relationships, and self-esteem [2]. FSD takes different forms, including a lack of sexual desire, impaired arousal, and inability to achieve orgasm or pain with sexual activity. Although each condition can be defined separately in medical terms, there is significant clinical overlap in the affected patients [1,3]. According to the Diagnostic and Statistical Manual of Mental Diseases, sexual dysfunction is a disturbance in the sexual response cycle or pain associated with sexual intercourse [4] and it is reported in approximately 30-60 percent of women worldwide [1,5]. FSD in Saudi Arabia was reported by Madbouly et al. in their study using a clinic-based survey involving 200 Saudi women attending primary care and gynecology clinics at a University Hospital in Riyadh. They reported that (88.5%) were relatively satisfied or satisfied with their partner's sexual ability and 120 (60%) had a risk of FSD [5]. The prevalence of FSD varies worldwide as it is caused by multiple factors and can be associated with age, socioeconomic status, degree of education, employment, biological, medical, and psychological factors [3,6]. Although FSD is highly prevalent, it remains an underestimated health problem [3,7]. Female sexual function and FSD can be evaluated in multiple ways, including by questionnaires, structured interviews, or taking a thorough case history. Questionnaires are initially used to screen individuals into different FSD categories [1,5]. The Female Sexual Function Index (FSFI) is a validated 19-item multidimensional self-report measure that quantifies six domains, including desire, arousal, lubrication, orgasm, satisfaction, and pain, for evaluation of sexual function in women [8]. The FSFI has been used to determine sexual dysfunction among female populations in various countries [1,3,7], and the Arabic Version of the Female Sexual Function Index (ArFSFI) has been validated and regarded as a reliable tool for FSD assessment in the Arabic world [9]. FSD has been inadequately investigated in Saudi Arabia for many reasons; this can be mainly attributed to women's hesitancy to discuss their sexuality and sexual health. Moreover, published reports on the prevalence and risk of FSD in Saudi Arabia are scarce. Therefore, in this study, we aimed to assess the prevalence and predictors of

FSD in a large community-based sample of Saudi women. Overall, gaining knowledge about FSD and its risk factors may have public health and clinical implications, and understanding its nature and prevalence might help to increase awareness, improve treatment, and decrease the probability of adverse outcomes.

Methods

In this cross-sectional study, we administered a community-based questionnaire to Saudi women from November 2022 to February 2023. The questionnaires were disseminated online through social media platforms, such as Twitter and WhatsApp. Inclusion criteria were as follows: non-pregnant, non-lactating Saudi women aged 20 years and older, sexually active during the past 6 months, able to give consent, and able to understand and read Arabic. Participants with missing data were excluded from this study.

Questionnaire

Data were collected using online questionnaires. The participants spent approximately five minutes answering the questionnaire. The questionnaire consisted of multiple variables, including female demographic data such as age, marital status, number of pregnancies, education, income, and employment status. Data on working hours, work environment, chronic medical conditions, and medication use were collected. The FSFI was used to assess sexual function or problems that had occurred during the past four weeks. According to the FSFI, sexual function domains include sexual desire, arousal, lubrication, orgasm, satisfaction, and pain during sexual intercourse. Sexual desire was assessed in terms of the frequency and desire level by asking two questions. Arousal was assessed in terms of frequency, level, confidence, and satisfaction by asking four questions. Lubrication was assessed in terms of frequency, difficulty, frequency of maintaining lubrication, and difficulty in maintaining lubrication by asking four questions. Orgasm was assessed in terms of frequency, difficulty, and satisfaction by asking three questions. Satisfaction was assessed as the amount of partner closeness, sexual relationships, and overall sex life by asking three questions. Pain was assessed as pain frequency during vaginal penetration and pain frequency following vaginal penetration using three questions. The FSFI has been used to determine sexual dysfunction in female populations in different countries. The Arabic version of the FSFI was adapted and translated from its English version, while retaining the same format as the original FSFI [9]. The ArFSFI total score and scores of various domains showed high test-retest reliability ($r = 0.92$ to 0.98) and the ArFSFI domains showed high internal consistency ($r = 0.85$ to 0.94).

Ethical Approval

All procedures were consistent with the ethical standards of the Institutional Research Committee. The study was approved by Institutional Review Board [IRB] at King Saud University Medical City [KSUMC] (reference number: 18/0279/IRB) in February 2021. The purpose and aim of the study were explained at the beginning

of the questionnaire to all recruited subjects and an informed written consent form was obtained from all the participants before starting the questionnaire. Participation was voluntary, and complete privacy was ensured.

Statistical Analysis

Categorical data are presented as frequencies and percentages, while continuous data are presented as mean and standard deviation (SD). The overall and domain specific FSFI scores were calculated by summing the relevant responses. In addition, the points were transformed into a 100-scale to facilitate interpretation. FSD was defined as an FSFI score ≤ 26.55 . Demographic characteristics as well as the medical, marital, and sexual histories of the participants

were compared according to the FSD status. The Chi-square or Fisher's exact test, as appropriate, was used to examine differences in categorical variables, while the student's t-test or Mann Whitney U test, as appropriate, was used to examine differences in continuous variables. A multivariate logistic regression analysis model was run to detect factors independently associated with FSD, after adjusting for the variables that were significantly associated with FSD in the univariate analysis (Tables 1 & 2). Backward elimination was used to allow non-significant variables to leave the model. All P-values were two-tailed and statistical significance was set at $p < 0.05$. Unless otherwise mentioned, SPSS (version 25.0. Armonk, NY: IBM Corp) was used for all statistical analyses.

Table 1: Demographic characteristics by female sexual dysfunction status (N=822).

	Overall	FSD	No FSD	P-value
Age (years)				
≤ 35	299 (36.4%)	154 (51.5%)	145 (48.5%)	0.045
36–45	329 (40.0%)	183 (55.6%)	146 (44.4%)	
≥ 46	194 (23.6%)	122 (62.9%)	72 (37.1%)	
Education				
High school or less	120 (14.6%)	73 (60.8%)	47 (39.2%)	0.452
University	503 (61.2%)	279 (55.5%)	224 (44.5%)	
Postgraduate	199 (24.2%)	107 (53.8%)	92 (46.2%)	
Employment				
No	316 (38.4%)	173 (54.7%)	143 (45.3%)	0.618
Yes	506 (61.6%)	286 (56.5%)	220 (43.5%)	
If yes, working hours per week	26.80 $\pm$ 17.98	26.77 $\pm$ 18.04	26.85 $\pm$ 17.96	0.632
Amount of physical and emotional pressure at work				
Low	14 (2.3%)	9 (64.3%)	5 (35.7%)	0.861
Moderate	213 (35.7%)	122 (57.3%)	91 (42.7%)	
High	369 (61.9%)	210 (56.9%)	159 (43.1%)	
Partner's education				
High school or less	166 (20.2%)	109 (65.7%)	57 (34.3%)	0.007
University	448 (54.5%)	247 (55.1%)	201 (44.9%)	
Postgraduate	208 (25.3%)	103 (49.5%)	105 (50.5%)	
Family monthly income (SAR)				
<15,000	240 (29.2%)	144 (60.0%)	96 (40.0%)	0.248
15,000–30,000	320 (38.9%)	177 (55.3%)	143 (44.7%)	
>30,000	262 (31.9%)	138 (52.7%)	124 (47.3%)	
Residency				
Central	433 (52.7%)	254 (58.7%)	179 (41.3%)	0.086
Western	135 (16.4%)	69 (51.1%)	66 (48.9%)	0.226
Eastern	86 (10.5%)	38 (44.2%)	48 (55.8%)	0.021
North	85 (10.3%)	47 (55.3%)	38 (44.7%)	0.915
South	83 (10.1%)	51 (61.4%)	32 (38.6%)	0.278

Body mass index (BMI)				
Weight	69.2±13.6	69.9±14.0	68.3±13.1	0.109
Height	160.1±6.4	160.0±6.6	160.1±6.1	0.731
BMI	27.0±5.2	27.3±5.2	26.6±5.1	0.07
Obese (≥30)	206 (25.1%)	131 (63.6%)	75 (36.4%)	0.01

Table 2: Medical, marital, and sexual history by female sexual dysfunction status (N=822).

	Overall	FSD	No FSD	P-value
Comorbidity				
Hypertension	49 (6.0%)	30 (61.2%)	19 (38.8%)	0.434
Diabetes	31 (3.8%)	19 (61.3%)	12 (38.7%)	0.533
Hyperlipidemia	21 (2.6%)	14 (66.7%)	7 (33.3%)	0.311
Hypothyroidism	81 (9.9%)	48 (59.3%)	33 (40.7%)	0.514
Asthma	19 (2.3%)	11 (57.9%)	8 (42.1%)	0.855
Pelvic disease	9 (1.1%)	4 (44.4%)	5 (55.6%)	0.518
Others	75 (9.1%)	52 (69.3%)	23 (30.7%)	0.014
Medications used				
Oral contraception	165 (20.1%)	99 (60.0%)	66 (40.0%)	0.229
Antidepressant	54 (6.6%)	45 (83.3%)	9 (16.7%)	<0.001
Anti-diabetic	27 (3.3%)	17 (63.0%)	10 (37.0%)	0.448
Anti-hypertensive	45 (5.5%)	28 (62.2%)	17 (37.8%)	0.375
Levothyroxine	75 (9.1%)	45 (60.0%)	30 (40.0%)	0.447
Duration of marriage (years)				
Mean±SD	15.62±10.29	16.84±10.57	14.08±9.71	<0.001
<10	269 (32.8%)	134 (49.8%)	135 (50.2%)	0.011
10–20	309 (37.6%)	172 (55.7%)	137 (44.3%)	
>20	243 (29.6%)	153 (63.0%)	90 (37.0%)	
Number of deliveries				
Mean±SD	3.03±1.95	3.26±1.98	2.73±1.87	<0.001
None	100 (12.2%)	38 (38.0%)	62 (62.0%)	<0.001
3-Jan	399 (48.5%)	219 (54.9%)	180 (45.1%)	
>3	323 (39.3%)	202 (62.5%)	121 (37.5%)	
Mode of delivery				
Normal vaginal delivery	443 (61.4%)	265 (59.8%)	178 (40.2%)	0.39
Cesarean section	157 (21.8%)	91 (58.0%)	66 (42.0%)	
Both	121 (16.8%)	64 (52.9%)	57 (47.1%)	
Menopause				
No	698 (84.9%)	373 (53.4%)	325 (46.6%)	0.001
Yes	124 (15.1%)	86 (69.4%)	38 (30.6%)	
Need for lubricants				
No	402 (48.9%)	199 (49.5%)	203 (50.5%)	<0.001

Yes	175 (21.3%)	120 (68.6%)	55 (31.4%)	
Sometimes	245 (29.8%)	140 (57.1%)	105 (42.9%)	
Ever encountered sexual assault				
No	667 (81.1%)	359 (53.8%)	308 (46.2%)	0.042
Yes	104 (12.7%)	65 (62.5%)	39 (37.5%)	
Don't want to answer	51 (6.2%)	35 (68.6%)	16 (31.4%)	
Own rating of relationship with partner				
Daily problems	44 (5.4%)	39 (88.6%)	5 (11.4%)	<0.001
Problems now and then	132 (16.1%)	97 (73.5%)	35 (26.5%)	
Stable	149 (18.1%)	118 (79.2%)	31 (20.8%)	
Good	293 (35.6%)	155 (52.9%)	138 (47.1%)	
Great	204 (24.8%)	50 (24.5%)	154 (75.5%)	

Results

In total, 822 participants were included in the analysis and a total of 459 participants (55.8%) had FSD (FSFI ≤ 26.55). The details of the answers to the FSFI questions are provided in Supplementary Table 1 while Table 1 presents the demographic characteristics. Approximately 40% of the participants were between 36 and 45 years of age, with 36.4% aged ≤ 35 years and 23.6% aged ≥ 46 years. The majority (85.4%) of the participants had either a university degree (61.2%) or a postgraduate degree (24.2%). Most (61.6%) of the participants worked, with an average of 26.8 ± 18.0 hours per week, and most (61.9%) of the working participants had a high amount of physical and emotional pressure at work. More than two-thirds (79.8%) of the participants' partners had either a university degree (54.5%) or a postgraduate degree (25.3%). Approximately 38.9% of the participants had a family monthly income between 15,000 and 30,000 (SAR), with 29.2% earning $<15,000$ and 31.9% earning $>30,000$. The majority of participants were Saudi (93.7%) and more than half were residents of the central region (52.7%). The average Body Mass Index (BMI) was 27.0 ± 5.2 , with approximately one-quarter (25.1%) being obese (BMI ≥ 30). FSD was positively associated with increasing age ($p=0.045$), obesity ($p=0.010$), and a lower partner's education level ($p=0.007$), but negatively associated with living in the eastern region ($p=0.021$). Table 2 shows the medical, marital, and sexual histories. Approximately 12.3% of participants had comorbidities, mainly hypothyroidism (9.9%), hypertension (6.0%), and diabetes (3.8%). Approximately 39.4% of the participants used medications, mainly oral contraception (20.1%), levothyroxine (9.1%), antidepressants (6.6%), and antihypertensive medications (5.5%). The average duration of marriage was 15.6 ± 10.3 years, with 37.6% between 10 and 20 years.

The average number of deliveries was 3.0 ± 2.0 , with 48.5%

having between one and three deliveries. Approximately 38.6% of the participants had a cesarean section, either alone (21.8%) or with (16.8%) normal vaginal delivery. Approximately 15.1% of the participants were menopausal. Approximately half of the participants used lubricants either sometimes (29.8%) or always (21.3%). Of the participants, 12.7% had encountered sexual assault and 6.2% refused to answer this question. The majority (60.5%) of participants reported a good or great relationship with their partner, 21.4% had problematic relationships, and 18.1% had a stable relationship. FSD was significantly associated with taking medications, especially antidepressants ($p<0.001$), a longer duration of marriage ($p<0.001$), higher number of deliveries ($p<0.001$), menopause ($p=0.001$), need for lubricants ($p<0.001$), encountering sexual assault ($p=0.042$), and a lower rating of their relationship with their partner ($p<0.001$). Table 3 lists the total and domain scores of the FSFI. The overall mean FSFI score was 24.10 ± 7.20 points, representing $0.67\% \pm 0.20\%$ of the maximum possible score. As expected, the overall FSFI score was significantly lower in those who had FSD than in those who did not (19.35 ± 6.16 versus 30.11 ± 2.18 , $p<0.001$). The same pattern was observed in all FSFI domains ($p<0.001$). The domain with the lowest score was desire (3.47 ± 1.22), followed by arousal (3.76 ± 1.48), orgasm (4.04 ± 1.61), pain (4.24 ± 1.54), satisfaction (4.24 ± 1.60), and lubrication (4.35 ± 1.39). Table 4 shows the multivariate logistic regression model of potential predictors of FSD. Out of all variables that were associated with FSD in Tables 1 and 2, the following were independent predictors of FSD (listed in descending order according to the Odds Ratio [OR]): use of antidepressants (3.12), always need to use lubricants (2.26), undisclosed sexual assault history (2.16), both cesarean section and vaginal delivery (2.05), lower level of partner's education (1.99), menopause (1.70), sometimes need to use lubricants (1.47), and residence in the central region (1.43) (Table 5).

Table 3: Total and domain scores for the Female Sexual Function Index (FSFI) by female sexual dysfunction status (N=822).

	Overall	FSD	No FSD	P-value
FSFI points				
Desire	3.47±1.22	2.86±1.08	4.25±0.91	<0.001
Arousal	3.76±1.48	2.82±1.24	4.95±0.71	<0.001
Lubrication	4.35±1.39	3.73±1.48	5.13±0.73	<0.001
Orgasm	4.04±1.61	3.08±1.48	5.25±0.70	<0.001
Satisfaction	4.24±1.60	3.24±1.39	5.51±0.67	<0.001
Pain	4.24±1.54	3.62±1.66	5.03±0.88	<0.001
Total score	24.10±7.20	19.35±6.16	30.11±2.18	<0.001
FSFI relative score (%)				
Desire	0.58±0.20	0.48±0.18	0.71±0.15	<0.001
Arousal	0.63±0.25	0.47±0.21	0.82±0.12	<0.001
Lubrication	0.72±0.23	0.62±0.25	0.86±0.12	<0.001
Orgasm	0.67±0.27	0.51±0.25	0.87±0.12	<0.001
Satisfaction	0.71±0.27	0.54±0.23	0.92±0.11	<0.001
Pain	0.71±0.26	0.60±0.28	0.84±0.15	<0.001
Total score	0.67±0.20	0.54±0.17	0.84±0.06	<0.001

Table 4: Multivariate logistic regression model* of potential predictors of female sexual dysfunction (N=822).

Potential predictors	Reference group	Odds ratio	95% confidence		P-value
			Lower	Upper	
Partner's education: High school or less	Postgraduate	1.99	1.23	3.2	0.005
Residence in central region	Other residence	1.43	1.05	1.96	0.024
Cesarean section (CS)	Vaginal delivery	1.64	1	2.7	0.05
Both CS and vaginal delivery	Vaginal delivery	2.05	1.21	3.48	0.007
Menopause	No menopause	1.7	1.06	2.72	0.028
Use of antidepressants	No use	3.12	1.42	6.85	0.005
Always need of lubricants	No need	2.26	1.48	3.44	0
Sometimes need of lubricants	No need	1.47	1.03	2.09	0.034
Undisclosed sexual assault history	No assault	2.16	1.1	4.23	0.025

* Adjusted for variables associated with female sexual dysfunction in Tables 1 and 2 (p<0.10). Backward elimination was used to allow non-significant variables to leave the model. R-square = 0.257.

Table 5: Supplementary Table 1: Responses to the questions of the Female Sexual Function Index (N=822).

1- How often did you feel sexual desire or interest?		11- When you had sexual stimulation or intercourse, how often did you reach orgasm (climax)?	
Almost never or never	78 (9.5%)	No sexual activity	45 (5.5%)
A few times (less than half the time)	208 (25.3%)	Almost never or never	91 (11.1%)
Sometimes (about half the time)	301 (36.6%)	A few times (less than half the time)	141 (17.2%)
Most times (more than half the time)	164 (20.0%)	Sometimes (about half the time)	175 (21.3%)
Almost always or always	71 (8.6%)	Most times (more than half the time)	231 (28.1%)
		Almost always or always	139 (16.9%)
2- How would you rate your level (degree) of sexual desire or interest?		12- When you had sexual stimulation or intercourse, how difficult was it for you to reach orgasm (climax)?	

Very low or none at all	99 (12.0%)	No sexual activity	45 (5.5%)
Low	183 (22.3%)	Extremely difficult or impossible	44 (5.4%)
Moderate	329 (40.0%)	Very difficult	55 (6.7%)
High	158 (19.2%)	Difficult	98 (11.9%)
Very high	53 (6.4%)	Slightly difficult	308 (37.5%)
		Not difficult	272 (33.1%)
3- How often did you feel sexually aroused ("turned on") during sexual activity or intercourse?		13- How satisfied were you with your ability to reach orgasm (climax) during sexual activity or intercourse?	
No sexual activity	36 (4.4%)	No sexual activity	49 (6.0%)
Almost never or never	51 (6.2%)	Very dissatisfied	95 (11.6%)
A few times (less than half the time)	121 (14.7%)	Moderately dissatisfied	114 (13.9%)
Sometimes (about half the time)	225 (27.4%)	About equally satisfied and dissatisfied	99 (12.0%)
Most times (more than half the time)	233 (28.3%)	Moderately satisfied	211 (25.7%)
Almost always or always	156 (19.0%)	Very satisfied	254 (30.9%)
4- How would you rate your level of sexual arousal ("turn on") during sexual activity or intercourse?		14- How satisfied have you been with the amount of emotional closeness during sexual activity between you and your partner?	
No sexual activity	42 (5.1%)	No sexual activity	47 (5.7%)
Very low or none at all	63 (7.7%)	Very dissatisfied	62 (7.5%)
Low	133 (16.2%)	Moderately dissatisfied	95 (11.6%)
Moderate	258 (31.4%)	About equally satisfied and dissatisfied	74 (9.0%)
High	240 (29.2%)	Moderately satisfied	206 (25.1%)
Very high	86 (10.5%)	Very satisfied	338 (41.1%)
5- How confident were you about becoming sexually aroused during sexual activity or intercourse?		15- How satisfied have you been with your sexual relationship with your partner?	
No sexual activity	38 (4.6%)	Very dissatisfied	102 (12.4%)
Very low or no confidence	75 (9.1%)	Moderately dissatisfied	118 (14.4%)
Low confidence	136 (16.5%)	About equally satisfied and dissatisfied	100 (12.2%)
Moderate confidence	248 (30.2%)	Moderately satisfied	243 (29.6%)
High confidence	221 (26.9%)	Very satisfied	259 (31.5%)
Very high confidence	104 (12.7%)		
6- How often have you been satisfied with your arousal (excitement) during sexual activity or intercourse?		16- How satisfied have you been with your overall sexual life?	
No sexual activity	36 (4.4%)	Very dissatisfied	114 (13.9%)
Almost never or never	66 (8.0%)	Moderately dissatisfied	137 (16.7%)
A few times (less than half the time)	140 (17.0%)	About equally satisfied and dissatisfied	94 (11.4%)
Sometimes (about half the time)	198 (24.1%)	Moderately satisfied	234 (28.5%)
Most times (more than half the time)	222 (27.0%)	Very satisfied	243 (29.6%)
Almost always or always	160 (19.5%)		
7- How often did you become lubricated ("wet") during sexual activity or intercourse?		17- How often did you experience discomfort or pain during vaginal penetration?	
No sexual activity	37 (4.5%)	Did not attempt intercourse	45 (5.5%)
Almost never or never	43 (5.2%)	Almost always or always	46 (5.6%)
A few times (less than half the time)	93 (11.3%)	Most times (more than half the time)	74 (9.0%)
Sometimes (about half the time)	197 (24.0%)	Sometimes (about half the time)	221 (26.9%)

Most times (more than half the time)	247 (30.0%)	A few times (less than half the time)	255 (31.0%)
Almost always or always	205 (24.9%)	Almost never or never	181 (22.0%)
8- How difficult was it to become lubricated ("wet") during sexual activity or intercourse?		18- How often did you experience discomfort or pain following vaginal penetration?	
No sexual activity	44 (5.4%)	Did not attempt intercourse	45 (5.5%)
Extremely difficult or impossible	28 (3.4%)	Almost always or always	37 (4.5%)
Very difficult	34 (4.1%)	Most times (more than half the time)	72 (8.8%)
Difficult	80 (9.7%)	Sometimes (about half the time)	194 (23.6%)
Slightly difficult	279 (33.9%)	A few times (less than half the time)	244 (29.7%)
Not difficult	357 (43.4%)	Almost never or never	230 (28.0%)
9- How often did you maintain your lubrication ("wetness") until completion of sexual activity or intercourse?		19- How would you rate your level (degree) of discomfort or pain during or following vaginal penetration?	
No sexual activity	45 (5.5%)	Did not attempt intercourse	49 (6.0%)
Almost never or never	47 (5.7%)	Very high	19 (2.3%)
A few times (less than half the time)	111 (13.5%)	High	45 (5.5%)
Sometimes (about half the time)	231 (28.1%)	Moderate	174 (21.2%)
Most times (more than half the time)	251 (30.5%)	Low	257 (31.3%)
Almost always or always	137 (16.7%)	Very low or none at all	278 (33.8%)
10- How difficult was it to maintain your lubrication ("wetness") until completion of sexual activity or intercourse?			
No sexual activity	52 (6.3%)		
Extremely difficult or impossible	23 (2.8%)		
Very difficult	28 (3.4%)		
Difficult	106 (12.9%)		
Slightly difficult	267 (32.5%)		
Not difficult	346 (42.1%)		

Discussion

In this study, we collected and analyzed epidemiological data on the prevalence and predictors of FSD in a sample of Saudi women. Of the 822 participants who were included, 459 (55.8%) had FSD (FSFI ≤ 26.55). This high prevalence is consistent with reports from China [3], Japan[10], Egypt[11], and Jordan[12]. Its prevalence was lower in the USA [7], Austria[13], and Turkey[14, 15]. Fluctuations in prevalence among different regions are often due to multiple reasons. For example, FSD can be associated with age; socioeconomic status; degree of education; employment; biological, medical, and psychological factors; the clinical definition used for each dysfunction; and the criteria of samples examined (general population vs. hospitals or specialized clinics)[3, 6]. The total and domain scores of the FSFI are shown in Table 3. The overall FSFI score was 24.10 ± 7.20 points, representing $0.67\% \pm 0.20\%$ of the maximum possible score. As expected, the overall FSFI was significantly lower in those who had FSD than in those who did not (19.35 ± 6.16 versus 30.11 ± 2.18 , $p < 0.001$). The same pattern was observed in all FSFI domains ($p < 0.001$). The domain with the lowest score was desire (3.47 ± 1.22), followed

by arousal (3.76 ± 1.48), orgasm (4.04 ± 1.61), pain (4.24 ± 1.54), satisfaction (4.24 ± 1.60), and lubrication (4.35 ± 1.39). This was expected, as most literature reported desire and arousal disorders to be the most frequently reported female sexual disorders[1, 5, 7, 13, 16]. Similar results were reported by Madbouly et al. in a study that included 200 Saudi women [5] and by Aslan et al. in a study that included 1,009 Turkish women[15]. Laumann et al. reported sexual desire problems in 22% of women, arousal problems in 14%, and sexual pain in 7% [7]. Moreover, a study by Oberg et al.[16] showed that 45% of Swedish women had a reduced desire. Studies have highlighted that the risk factors for FSD are age, medical history of sexually transmitted diseases, pelvic floor disorders and pelvic surgeries, depression, history of sexual abuse, lower educational attainment, socioeconomic status, physical health, lifestyle, and sexual experience[5, 7, 12]. In our study, FSD was associated with increasing age ($p = 0.045$), menopause ($p = 0.001$), obesity ($p = 0.010$), lower level of partner's education ($p = 0.007$), duration of marriage ($p = 0.001$), number of deliveries ($p < 0.001$), and partner relationship status ($p = 0.001$) (Tables 1 & 2). Out of all variables that were associated with FSD, there were independent

predictors of FSD, such as use of antidepressants (OR 3.12), always need to use lubricants (OR 2.26), undisclosed sexual assault history (OR 2.16), both cesarean section and vaginal delivery (OR 2.05),

lower level of partner's education (OR 1.99), menopause (OR 1.70), sometimes need to use lubricants (OR 1.47), and residence in the central region (OR 1.43).

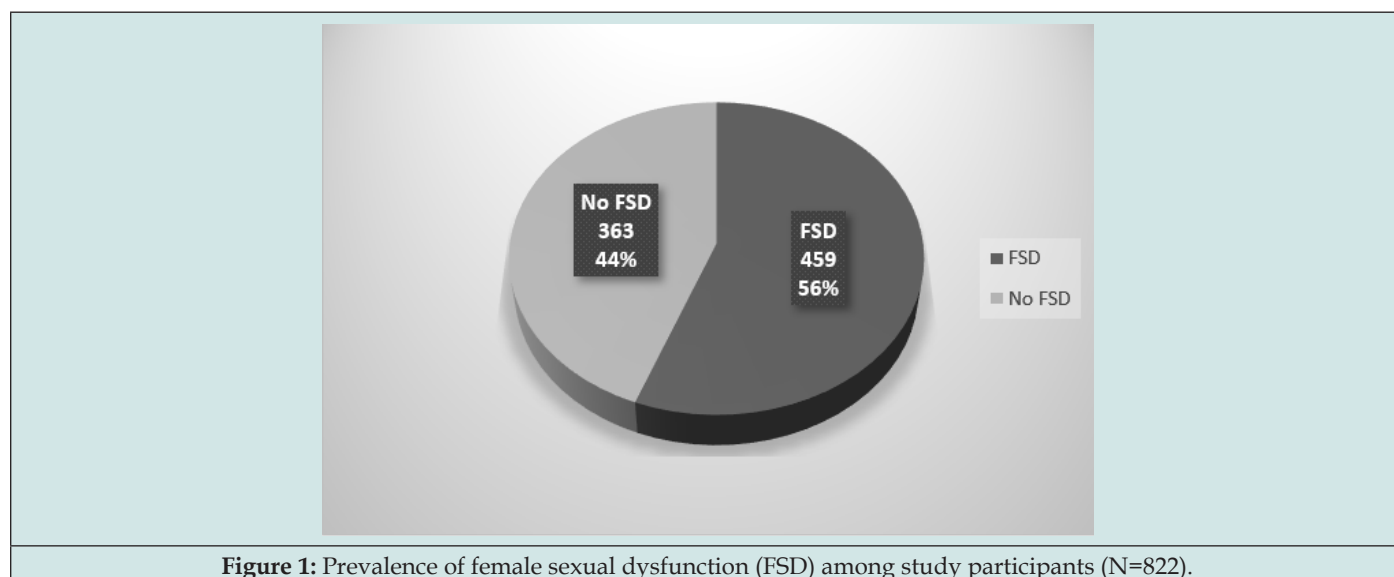


Figure 1: Prevalence of female sexual dysfunction (FSD) among study participants (N=822).

Madbouly et al. showed that being > 40 years of age increases the FSD risk by approximately 5 times [5]. The International Women's Survey on Health and Sexuality studied participants from the United States and different regions of Europe (France, Germany, Italy, and the United Kingdom) aged between 20 and 70 years and reported that sexual activity decreased with age and the proportion of women with low sexual function, specifically low desire, increased with age [17, 18]. Likewise, Abduljabbar et al. reported a significantly greater risk of FSD in patients aged >40 years in a group of 194 Saudi women using an abridged 6-item version of the FSFI [19]. Similarly, a study conducted in Turkey by Oksuz et al. reported that at ages 31 to 45 years, sexual dysfunction increased with an OR of 2.1; further, menopause was associated with a 2-fold higher risk of sexual dysfunction, and even the OR was 1.7-fold higher [14]. This study showed that menopause was associated with a higher risk of sexual dysfunction (odds ratio [OR] = 1.70). Lower sexual function with age can be explained by age-associated physiological changes in hormones, psychosocial factors, medication use, and associated comorbidities [20]. In addition, Avis et al. noticed that menopause is related to lower sexual desire but not all aspects of sexual functioning [21]. In contrast, Gonzalez et al. stated that menopause slightly decreased all stages of sexual function, but this association was significant only for the lubrication and pain domains [22]. The results of studies investigating education level as a risk factor varied. Some reports have found no relationship [5,8,11], while others have shown that a lower educational level is associated with a higher risk of FSD [7,23]. Laumann et al. reported that low socioeconomic status and a low level of education were risk factors for FSD [7]. Our findings showed that lower sexual function was more common with a lower level of partner education (OR 1.99). The female educational level was not significantly related to FSD

risk in our participants ($p = 0.452$) or low socioeconomic status ($p = 0.248$). Unfavorable social conditions and economic stress were among the aggravating factors for sexual problems in 28.1% of respondents in a study conducted in lower Egypt [24]. Madbouly et al. showed that low sexual function is more common in women with a lower family income (OR 6.06), and they attributed this to the associated female stress, anxiety, and depression [5]. In our study, a longer duration of marriage was significantly associated with a higher risk of FSD ($p < 0.001$), as well as the number of deliveries ($p < 0.001$). No significant differences were detected owing to the duration of marriage in a study by Madbouly et al. [5]; Aslan et al. [15] found similar results in a study of 1,009 Turkish women. Depression and antidepressants are major risk factors for FSD [25]. A substantial percentage of patients experience some disturbance in sexual function while taking antidepressants. A meta-analysis that assessed rates of adverse sexual effects concluded that the rate of sexual dysfunction attributable to antidepressants was approximately 40% and the rate of sexual dysfunction associated with placebo was approximately 14% [26]. In our study, antidepressants were significantly associated with a higher risk of FSD ($p < 0.001$). FSD is an under investigated health challenge. As mentioned earlier, many women in Saudi culture are shy or hesitant to discuss their sexual health concerns with healthcare providers. Published reports on the risk of FSD in Saudi Arabia are limited. This study has the advantages of including a large community-based sample size and the use of the validated ArFSFI. Other studies used either a non-validated Arabic version [27,28], an abridged 6-item version of the FSFI [19], or surveyed special populations with a smaller number such as Saudi women with type 2 diabetes [29], health care providers [30], or Saudi women attending primary care and gynecology clinics at a teaching hospital in a specific region [5].

Thus, our results can be generalized to the entire community with relative confidence. However, male partners were not evaluated regarding their sexual performance, and data on their sexual abilities were not obtained from their female partners because it might be biased or inaccurate (Figure 1).

Conclusion

In this study, we estimated the prevalence of FSD in Saudi women using a validated instrument (the FSFI). The prevalence of FSD in Saudi Arabia is 56%. Desire and arousal were the most significantly affected domains, followed by orgasmic problems. The most significant risk factors for FSD are the use of antidepressants, older age, menopause, obesity, and marriage duration. More studies with structured interviews with both partners regarding risk factors and predictors are strongly warranted. Overall, this study addressed a critical health problem that has not been adequately studied in the community. The high prevalence of FSD deserves attention as it is a major public health concern. We need to increase the knowledge and experience of physicians regarding FSD so that they can approach women with such problems professionally. The use of the full-version ArFSFI for assessing women in clinical settings by family physicians, obstetricians, and gynecologists, or psychologists and research settings is strongly recommended for better standardization and comparison.

Author Contributions:

Maysoon AlHaizan contributed to project development, data collection, and manuscript writing/ editing. Ghada AlGudairi contributed to questionnaire building, data collection, data analysis, and results writing/editing. Dana Aldabeeb contributed to data collection, manuscript review and editing. Maha Alhainiah contributed to data collection, manuscript review and editing. Rahaf AlHarthi data collection. Saleh Binsaleh contributed to manuscript review and editing. Ghadeer AlShaikh contributed to protocol/ project development, data collection, and manuscript review and editing.

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Conflict of Interest:

The authors declare no conflict of interest.

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Data Availability Statement:

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