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# The 6-item Female Sexual Function Index (FSFI-6): factor structure, reliability, and demographic correlates among infertile women in Iran

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## Abstract

**Background:** The 6-item Female Sexual Function Index (FSFI) is a short form of the original 19-item FSFI that measures sexual function in women. The aim of this study was to examine the factor structure and reliability of the FSFI-6 and to determine the demographic correlates of sexual dysfunction among infertile women in Iran.

**Results:** In total, 250 infertile women participated in this study. The mean total FSFI-6 score was  $20.71 \pm 5.09$ . Internal consistency of the FSFI-6 was high (Cronbach's alpha = 0.856). All inter-item correlations and item-total correlations were in acceptable range. The results of confirmatory factor analysis provided support for a unidimensional model of the FSFI-6. Among demographic and infertility variables, higher women's age, low education, unwanted marriage, short infertility duration, and low frequency of intercourse were associated with sexual dysfunction.

**Conclusions:** The FSFI-6 demonstrated sound reliability and validity in this study, supporting its continued use for measuring sexual dysfunction among infertile women. Its brevity and comprehensiveness allow a quick assessment both in clinical and research settings.

**Keywords:** Female Sexual Function Index, Sexual Dysfunction, Reliability, Validity, Infertility

## Background

Infertility is defined as “the failure to establish a clinical pregnancy after 12 months of regular, unprotected sexual intercourse or due to an impairment of a person's capacity to reproduce either as an individual or with his/her partner.” [1] and affects 9% of reproductive-age couples globally [2]. It is a worldwide health problem that is associated with adverse psychological and social consequences [3–7]. Researchers have shown that negative feelings, such as depression, stress, and anxiety, are often mental disorders after experiencing infertility [4, 8, 9]. As most couples consider childbirth as one of the most significant outcomes of sexual intercourse, infertile couples are more prone to experience psychological and

emotional stress [10]. Infertility profoundly impacts the sexual enjoyment of a couple about scheduling programs for childbirth and fertility interventions [11, 12]. It has been shown that infertile couples have significantly more sexual issues than fertile couples [13]. The belief of sexual orientation is considerably affected by infertility-related pressure and depression and the region where infertility has the most adverse effect [14, 15].

Sexual behavior is a function of physiologic, anatomic, and psychosocial characteristics of a person [16]. Female sexual dysfunction has been introduced as disorders of sexual functioning, desire, and pain, which is followed by adverse consequences such as negative psychological outcomes [17]. Sexual function is a major element of women's quality of life, which affects several dimensions of peri- and post-menopausal characteristics [18]. Previous studies have shown that on average, 64% of women suffer from desire difficulty, 35% of orgasm difficulty,

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31% have complications with arousal conditions, and 26% with sexual pain [19]. Based on a systematic review of literature conducted in Iranian infertile women, the overall prevalence of female sexual dysfunction was 64.3% [20]. It has been argued that female sexual function is associated with age, body physics, hormonal condition, neurologic and vascular processes, and psychological health items [21].

A variety of instruments have been developed to measure female sexual function. Among these instruments, the 19-item Female Sexual Function Index (FSFI-19) is one of the main instruments for assessing female sexual function [18]. The FSFI-19 is a self-reported instrument, consisting of 6 separate domains of female sexual function, namely desire, arousal, lubrication, orgasm, satisfaction, and pain. This scale has been validated in many languages and widely used in clinical and research settings [22]. Despite being frequently used, psychometrically sound, and clinically interpretable, the FSFI-19 may be too long for use in studies with multiple outcome measures, especially when measuring sexual dysfunction is not a primary aim of a study. Because of this reason, recently, Isidori et al. developed a shorter version of the scale (i.e., FSFI-6) using receiver operating curves [18, 23]. The FSFI-6 is a brief and easy to use measure containing 6 of the original 19 items. This scale is useful for settings with a limited time frame (e.g., survey research).

The FSFI-6 has been validated in Italy, the USA, Brazil, Korea, Portugal, and Ecuador, mainly in the general population [18, 23–27]; however, they have not been validated in infertile women. Hence, this study aims to evaluate the validity and reliability of the FSFI-6 among a sample of women with infertility. A secondary aim was to determine the demographic correlates of sexual dysfunction among infertile women in Iran.

## Methods

### Participants and study design

The sample of this cross-sectional study consisted of infertile women referring to infertility treatment center of Royan Institute, Tehran, Iran. The data were collected between January and April 2017. The sample size was determined using the rule of thumb recommended by Guilford [28] and Cattell [29] for factor analysis studies. They offered researchers to obtain samples of 200 (or 250) subjects whenever possible. To be eligible for this study, subjects had to fulfill the following criteria: (1) women with infertility problem, (2) age between 18 and 45 years, and (3) ability to read and write in Persian. Participants were asked to complete the questionnaire privately and return it. A total of 250 infertile women agreed to take part and fill out the questionnaire completely.

**Table 1** Demographic/fertility characteristics of the infertile women ( $n = 250$ )

	Mean $\pm$ SD or $n$ (%)
Age (years)	29.74 $\pm$ 5.29
Education	
Primary	1 (0.4)
Secondary	36 (14.4)
Diploma	91 (36.4)
Associate	29 (11.6)
Bachelor	68 (27.2)
Master/Doctoral	25 (10.0)
Husband's age (years)	33.99 $\pm$ 5.29
Husband's education	
Primary	13 (5.2)
Secondary	43 (17.2)
Diploma	91 (36.4)
Associate	22 (8.8)
Bachelor	53 (21.2)
Master/Doctoral	28 (11.2)
Occupation	
Unemployed	197 (78.8)
Employed	53 (21.2)
BMI (kg/m <sup>2</sup> )	25.68 $\pm$ 3.74
Duration of marriage (years)	7.12 $\pm$ 3.91
Type of marriage	
Wanted	242 (96.8)
Unwanted	8 (3.2)
Duration of infertility (years)	5.54 $\pm$ 3.87
Cause of infertility	
Female factor	54 (21.6)
Other factors	196 (78.4)
Private room	
No	28 (11.2)
Yes	222 (88.8)
Living with others	
No	218 (87.2)
Yes	32 (12.8)
Frequency of intercourse per month	8.56 $\pm$ 4.50
Masturbation	
No	212 (84.8)
Yes	38 (15.2)

SD standard deviation

## Questionnaires

### Demographic variables

Participants provided demographic/infertility information including age, education, husband's age, husband's education, occupation, type of marriage, body mass index (BMI), cause of infertility, infertility duration, frequency of intercourse per month, frequency of

**Table 2** Item wording and descriptive statistics and internal consistency of the FSFI-6

	Possible range	Mean	SD	Corrected item-total correlation	Alpha if item deleted	Alpha
1. Desire: level	1–5	3.09	0.65	0.423	0.867	
2. Arousal: level	0–5	3.09	1.02	0.799	0.805	
3. Lubrication: frequency	0–5	3.38	1.28	0.682	0.826	
4. Orgasm: frequency	0–5	3.45	1.31	0.778	0.804	
5. Satisfaction: with overall sex life	1–5	3.96	1.05	0.697	0.823	
6. Pain: frequency during vaginal penetration	0–5	3.74	1.23	0.542	0.853	
FSFI-6 total score	2–30	20.71	5.09			0.856

SD standard deviation

masturbation per month, and having private room, life in home with other family members or people.

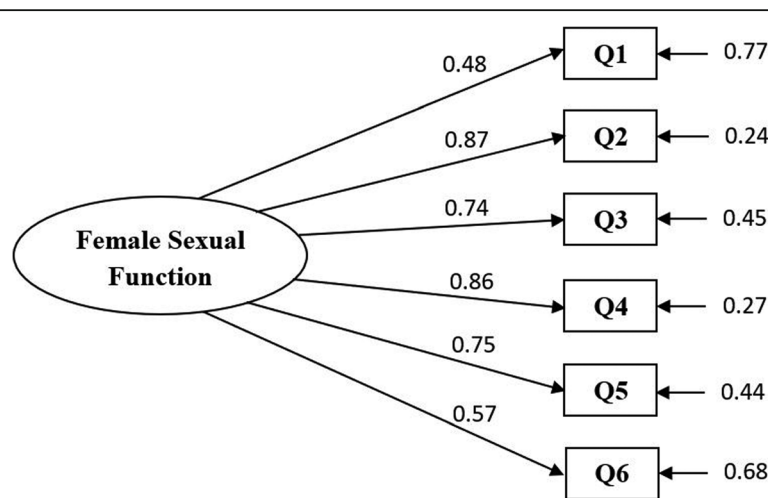
**The 6-item Female Sexual Function Index (FSFI-6)**

The FSFI-6 is a 6-item, brief, and self-administered instrument derived from the original 19-item FSFI that measures female sexual function [23]. It comprises six domains: desire, arousal, lubrication, orgasm, satisfaction, and pain. Desire and satisfaction items are rated on a 5-point Likert scale, ranging from 1 to 5, and the other items are rated on a 6-point Likert scale, ranging from 0 to 5. Total scores range from 2 to 30, with lower scores indicating worse sexual functioning.

**Statistical analysis**

The factor structure of the FSFI-6 was examined with confirmatory factor analysis (CFA) using maximum likelihood estimation. Overall model fit was examined using multiple fit criteria, as suggested in the literature. Specifically, six goodness-of-fit indices were used, including chi-square/degree of freedom ( $\chi^2/df$ ), comparative fit index (CFI), normalized fit index (NFI), incremental fit index (IFI), root mean square

error of approximation (RMSEA), and standardized root mean square residual (SRMR). Values of  $\chi^2/df < 3$ , CFI, NFI, and IFI  $> 0.95$ , and RMSEA and SRMR  $< 0.08$  are indicative of a good fit with the data [30–33]. To evaluate the internal consistency of the FSFI-6, Cronbach’s alpha, inter-item correlation, and corrected-item total correlation were calculated. Cronbach’s alpha value of 0.7 or greater indicates that the internal consistency is satisfactory [34]. Inter-item correlations examine the extent to which scores on one item are related to scores on all other items in a scale. The corrected item-total correlation is the correlation between each item and the total scale score based on the other items. Smaller values (i.e., less than 0.3) indicate that the given item is not well correlated with the others [35]. To examine the relationship of female sexual function (i.e., FSFI-6 scores) with demographic/infertility characteristics, stepwise backward regression analysis was done. Goodness of fit of the regression model was evaluated using the coefficient of determination ( $R^2$ ), which is the proportion of variation in the dependent variable explained by the regression model. Data analyses were carried



**Fig. 1** The unidimensional factor model of FSFI-6 in a sample of infertile women

out using SPSS for Windows, version 16.0 (SPSS Inc., Chicago, IL, USA) and LISREL 8.80 (Scientific Software International, Inc., Lincolnwood, IL, USA).

## Results

### Participant characteristics

Table 1 outlines the demographic characteristics of infertile women. The mean age of the participants was  $29.74 \pm 5.29$  years. The majority of participants were unemployed (78.8%), had a private room at home (88.8%), and did not live with others (87.2%). The mean BMI was  $25.68 \pm 3.74$  kg/m<sup>2</sup>.

### Descriptive statistics and internal consistency of the FSFI-6

The descriptive statistics and internal consistency of the FSFI-6 are displayed in Table 2. The mean FSFI-6 total score was  $20.71 \pm 5.09$ . The FSFI-6 showed high internal consistency with Cronbach's alpha coefficient of 0.856. As seen in Table 2, Cronbach's alpha did not considerably increase as a consequence of an item deletion. The corrected item-total correlations and the inter-item correlations ranged 0.423–0.799 and 0.216–0.738, respectively.

### Factor structure of the FSFI-6

To examine the factor structure of the FSFI-6, the CFA was carried out. The result of CFA confirmed the unidimensional factor structure of the FSFI-6 ( $\chi^2/df = 2.96$ ; CFI = 0.98; NFI = 0.97; IFI = 0.98; RMSEA = 0.089 and SRMR = 0.035). As can be seen in Fig. 1, all factor loadings were significant and greater than 0.50, except for item 1.

### Demographic correlates of the FSFI-6 scores

Stepwise backward regression analysis was used to investigate the relationships between FSFI-6 scores and demographic/infertility characteristics. According to the results (see Table 3), higher women's age ( $b = -0.206$ ,  $P = 0.004$ ), low education ( $b = 0.718$ ,  $P = 0.012$ ), unwanted marriage ( $b = -4.765$ ,  $P = 0.008$ ), short infertility duration ( $b = 0.200$ ,  $P = 0.037$ ), and low frequency of intercourse ( $b = 0.250$ ,  $P < 0.001$ ) were associated with sexual dysfunction. The model  $R^2$  when demographics and infertility variables were in the model was equal to 0.12, suggesting that these variables explained 12.0% of the variance in FSFI-6 scores. Other variables were not related to FSFI-6 scores.

## Discussion

To our knowledge, this is the first study to evaluate the reliability and validity of the FSFI-6 in a sample of infertile women. The FSFI-6 is a quick and easy to administer instrument and considered a parsimonious alternative to

**Table 3** Relationship of FSFI-6 scores with demographic and infertility variables in infertile women using stepwise backward regression analysis

Variable	<i>b</i>	SE	$\beta$	<i>P</i>
Age	-0.206	0.070	-0.214	0.004
Education	0.718	0.285	0.179	0.012
Unwanted marriage	-4.765	1.779	-0.165	0.008
Infertility duration	0.200	0.095	0.152	0.037
Frequency of intercourse	0.250	0.070	0.221	< 0.001

*b* unstandardized coefficient, *SE* standard error,  $\beta$  standardized coefficient

the long form of the FSFI. This scale incorporates one item of each of the six domains of the original FSFI, thus allowing rapid screening of these domains.

The FSFI-6 demonstrated satisfactory internal consistency ( $\alpha = 0.856$ ), and the alpha value did not increase substantially when each item was removed. All inter-item correlations and corrected item-total correlations were also within an acceptable range, confirming good internal consistency. This result is consistent with what was reported in the original study ( $\alpha = 0.789$ ) [23], Korean version ( $\alpha = 0.888$ ) [24], middle-aged Brazilian and Portuguese women ( $\alpha = 0.840$  and  $\alpha = 0.890$ , respectively) [25, 26], and Ecuadorian sample ( $\alpha = 0.91$ ) [36].

The findings of CFA provided support for a unidimensional model of FSFI-6. This finding was also reported in two studies conducted in middle-aged Brazilian and Portuguese women [25, 26].

Among demographic and fertility factors, higher women's age, low education, unwanted marriage, short infertility duration, and low frequency of intercourse were associated with sexual dysfunction. In a study conducted among mid-aged Ecuadorian women [36], total FSFI-6 scores positively correlated with coital frequency and female and partner educational level and inversely with female age, waist circumference, hot flush intensity, and partner age. In another study performed among mid-aged sexually active Spanish women, total FSFI-6 scores displayed a positive correlation with female and partner education and negative correlation with female age [36]. Contrary to our findings, Iris et al. [15] showed that a long infertility duration was associated with the likelihood of sexual dysfunction in women.

In the present study, several limitations should be pointed out. First, the sample was drawn from a single center and included only infertile women in Iran. Therefore, the generalizability of the present findings may be limited. Second, because of the cross-sectional nature of this study, causal inference between FSFI-6 scores and demographic characteristics of women cannot be drawn. Third, the test-retest reliability of the FSFI-6 was not assessed in this study. Fourth, although the cutoff point is available for the original, Korean, and Ecuadorian

versions, further research is required to determine the cutoff point for the Iranian population.

## Conclusions

In sum, the FSFI-6 is a reliable and valid instrument that can be used to assess female sexual function in infertile women. Its brevity and comprehensiveness allow a quick assessment both in clinical and research settings.

## Abbreviations

CFA: Confirmatory factor analysis; CFI: Comparative fit index; FSFI-6: 6-Item Female Sexual Function Index; IFI: Incremental fit index; NFI: Normalized fit index; RMSEA: Root mean square error of approximation; SRMR: Standardized root mean square residual

## Acknowledgements

We thank the infertile women who participated in this research and the Royan Institute, Tehran, Iran, for cooperation in data acquisition.

## Authors' contributions

SM contributed to the conception and design, analysis and interpretation of the data, and drafting of the article. PA contributed to the conception and design, interpretation of the data, and drafting of the article. HR, ROS, and HL contributed to the conception and design, collection and assembly of data, and drafting of the article. All authors approved the final version of the article for submission.

## Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Ethics approval and consent to participate

The Ethics Committee of Royan Institute, Tehran, Iran, approved this study (registration number: IR.ACECR.ROYAN.REC.1395.140). Agreement to participate and written informed consent were obtained from all infertile women before data collection.

## Consent for publication

Not applicable.

## Competing interests

The authors declare that they have no competing interests.

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Received: 4 July 2019 Accepted: 11 November 2019

Published online: 11 December 2019

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