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Determinants of sexual self-efficacy among Iranian married women: a path analysis using the WHO framework

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Abstract

Background Sexual self-efficacy is a critical factor in promoting protected and satisfying sexual health.

Objective This study aimed to examine the relationship between structural/intermediary health determinants (socioeconomic status, social support, stress, intimate partner violence) and sexual self-efficacy among Iranian women of reproductive age, using path analysis.

Method In this cross-sectional study, 424 reproductive-aged women completed validated questionnaires that assessed socio-demographics, socioeconomic status, perceived social support, perceived stress, intimate partner violence, and sexual self-efficacy. Data were analyzed using SPSS 27 for descriptive statistics and AMOS 24 for path analysis.

Results According to the path analysis, perceived social support and socioeconomic status were positively associated with sexual self-efficacy, while perceived stress and intimate partner violence were negatively associated with sexual self-efficacy. Therefore, intimate partner violence, perceived stress and social support play a mediating role between age, socioeconomic status and sexual self-efficacy. The model demonstrated a strong fit, with RMSEA = 0.05, GFI = 0.99, CFI = 0.99, NFI = 0.96, and χ^2/df = 1.56, confirming its strength.

Conclusion Based on the results of this study, it is crucial to focus more on the sexual self-efficacy of women, particularly those with low socioeconomic status. Furthermore, it is advisable to implement specialized programs to alleviate stress and reduce domestic violence, as well as to increase social support for women facing sexual issues.

Keywords Sexual self-efficacy, Sexual health, Social support, Perceived stress, Socioeconomic status, Path analysis

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Background

Sexual self-efficacy (SSE) is a multifaceted construct that reflects an individual's confidence in their ability to engage in effective sexual functioning. It encompasses their desire for a sexual partner, their self-assessment of sexual capabilities, and their overall assurance in their sexual performance [1]. SSE plays a crucial role in achieving practical sexual function [2]. In addition, SSE directly impacts the social and mental aspects essential for achieving sexual satisfaction [3]. Sexually self-sufficient individuals demonstrate a strong sense of confidence and comfort in their sexuality, which is reflected in their ability to openly communicate about sexual matters, such as condom use, with their partners. They are assertive in expressing their needs and boundaries, and may choose to withhold sexual activity if their expectations for safe sex practices are not respected. This assertiveness and self-assurance are key components of a positive sexual self-concept, which is associated with greater sexual satisfaction, healthier sexual behaviors, and improved relationship quality [4]. Research has shown that insisting on condom use, even in the face of unwilling partners, can be an effective strategy for negotiation [5]. On the other hand, Low SSE significantly influences the development of sexual function disorders [6, 7]. Typically, women with low sexual self-efficacy may experience reduced sexual engagement or satisfaction [8]. People who have low sexual self-efficacy struggle to refuse unprotected sex, which consequently puts them at greater risk [9].

Recent studies on sexual health in Iran revealed that both Iranian men and women experience a notable prevalence of sexual dysfunction, with the women involved in the survey reporting poor sexual function [10, 11]. Enhanced self-efficacy is associated with a greater capacity for women to challenge passive or traditional portrayals of female sexuality and to advocate for their sexual pleasure and desires actively. Research indicates that women with higher sexual self-efficacy are more likely to identify, communicate, and pursue their sexual needs, demonstrating increased sexual agency and assertiveness [12]. SSE is a crucial concept in sexual health, shaped by various factors, including socio-demographic background, physical health issues, marital situation, sexual history, and psychological influences [3]. The Social Determinants of Health refers to "the circumstances in which individuals are born, develop, reside, engage in employment, and grow older," as well as "the key influences that shape these circumstances" [13]. In 2010, the World Health Organization's Commission on Social Determinants of Health (CSDH) presented a framework for comprehending the influence of social factors on health. This framework divides social determinants of health into two groups: 1- Structural social determinants and 2- Intermediate social determinants. These factors interact with each other and subsequently affect health outcomes [14]. Therefore, enhancing sexual self-efficacy can be a method to enhance the quality of sexual life. Due to the high prevalence of sexual disorders among married Iranian women [10] and the role of sexual self-efficacy in marital satisfaction [15], identifying the factors associated with sexual self-efficacy is important in the Iranian context. In this regard, sexual self-efficacy is the health outcome that is affected by structural and intermediary determinants of health.

Methods

Study design and participants

This cross-sectional study was performed in 2025 on 424 eligible women presenting to the selected health centers in Tehran, Iran.

The minimum sample size requirement of the path analysis 200 [16]. Based on the results of previous studies [17] and according to the following formula, the minimum sample size was 384 people. Accounting for a 10% dropout rate, the final sample size was 424. (Z = 1.96, σ = 6, d = 0.6)

$$n=\frac{z^{\tau}\ \sigma^{\tau}}{d^{\tau}}$$

The study population was chosen utilizing a multistage sampling technique. Given the different socio-economic status of people in different parts of Tehran, initially, all Health Centers associated with Shahid Beheshti University of Medical Sciences were grouped into 5 clusters according to geographic regions: Center, North, South, East, and West. Subsequently, 10 centers were randomly selected using a random number table, with 2 centers designated from each region, and we picked up the individuals randomly from those centers.

Inclusion and exclusion criteria

Inclusion criteria required participants to hold Iranian nationality, being aged 18–45 years (reproductive-aged women), demonstrate literacy in reading and writing, and be married, aligning with the study's focus on marital sexual health dynamics. Exclusion criteria encompassed unwillingness to participate in the study and failure to provide adequate or appropriate responses to the administered questionnaires, using medications affecting sexual function (e.g., SSRIs), having mental or physical conditions impacting sexual health (e.g., depression, diabetes) as documented in their health records, being pregnant and being in postpartum, period, or having a history of gynecological surgeries with potential effects on sexual function (e.g., oophorectomy) ensuring data reliability and participant engagement. These parameters ensured a controlled sample, minimizing confounding variables and

enhancing the validity of findings related to sexual health outcomes. These criteria were implemented to safeguard the integrity of the research by excluding individuals who either declined involvement or demonstrated insufficient commitment to the data collection process.

Data collection

Data were collected by a sociodemographic checklist and the Sexual Self-Efficacy Questionnaire (SSEQ), the Multidimensional Scale of Perceived Social Support (MSPSS), the WHO Intimate Partner Violence Questionnaire, the Perceived Stress Scale, and Ghodratnama Socioeconomic Status (SES) questionnaire.

Sexual Self-Efficacy Questionnaire (SSEQ)

Vaziri and Lotfi Kashani created the SSEQ. This tool is composed of 10 questions rated on a 4-point Likert scale (from 0 to 3). Scores on the questionnaire can range from a minimum of 0 to a maximum of 30. The score intervals of 0–10, 11–20, and 21–30 indicate low, moderate, and high levels of self-efficacy, respectively. The reliability of this questionnaire was determined using Cronbach's alpha ($r = 0.86$), Spearman-Brown multiplication ($r = 0.811$), and the Gutmann method ($r = 0.811$). Furthermore, the validity of the instrument has been confirmed through the content validity method in Iran [18].

Multidimensional Scale of Perceived Social Support (MSPSS)

The 12-item Multidimensional Scale of Perceived Social Support (MSPSS) created by Zimet and colleagues assesses the support received from friends, family, and significant others using a five-point Likert scale, which ranges from "strongly disagree" to "strongly agree" [19]. The lowest and highest scores obtained from this questionnaire are 12 and 60, respectively, with a higher score indicating higher perceived social support. Salimi et al. presented Cronbach's alpha values of 0.89, 0.86, and 0.82 for the three aspects of social support, specifically support from family, friends, and significant individuals in one's life [20].

WHO Intimate Partner Violence Questionnaire

The World Health Organization (WHO) has created a questionnaire to assess the levels of physical, psychological, or sexual violence, which are evaluated using a 5-point Likert scale. The survey consists of 10, 5, and 11 questions that address physical, sexual, and emotional violence, respectively. Individuals who respond positively to any question in the survey are classified as experiencing violence. The minimum and maximum scores obtained from this questionnaire are 26 and 130, with a higher score indicating higher levels of intimate partner violence. The Cronbach's alpha coefficient for this tool in Iran has been determined to be 0.92, 0.89, and 0.88 for the categories of physical, psychological, and sexual violence [21].

Perceived Stress Scale

This self-report assessment, consisting of 14 questions, measures how frequently individuals experienced unpredictability, lack of control, and feelings of being overwhelmed in the past month. Each question provides five possible responses on a 5-point Likert scale, ranging from never to very often. Among the 14 responses in the Perceived Stress Scale (PSS), seven were classified as "negative" and assigned the following numerical values: never = 0; rarely = 1; sometimes = 2; fairly often = 3; and very often = 4. The other seven positive items in the PSS were scored in a reversed format as per standard methods (i.e., never = 4, very often = 0). The total perceived stress score for participants was calculated by summing all 14 response values; scores can range from 0 to 56, with higher scores reflecting greater perceived stress levels. Validity assessments of this tool in Iran were conducted by Safaei and Shokri, revealing internal consistency coefficients for perceived self-efficacy, perceived helplessness, and overall perceived stress of 0.80, 0.60, and 0.76, respectively [22].

Ghodratnama Socioeconomic Status (SES) questionnaire

The socioeconomic status questionnaire consisted of 12 items, including five on demographics and seven addressing economic class, personal income, the individual's education level, their parent's education level, and their housing circumstances. Greater scores reflected a higher socioeconomic status. One study reported a Cronbach's alpha of 0.82 for this survey [23].

Ethical consideration

The study commenced after receiving approval from the appropriate authorities and obtaining an ethics code from the Ethics Committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.PHARMACY.REC.1403.285). Initially, the researcher visited the chosen medical centers to identify eligible women and provided them with an explanation of the study's objectives. If the women agreed to participate, they signed a written consent form. The designated questionnaires were then distributed for them to complete. Additionally, the women were assured that their information would remain confidential, that participation was voluntary, and that opting out of the study would not result in any disadvantages or issues.

Data analysis

Data were analyzed in SPSS-21 software using descriptive statistics (frequency, mean, standard deviation, and percentage). All variables were quantitatively included

in the path analysis; for example, to examine the relationship between SES and sexual self-efficacy, the mean of SES was included in the path analysis instead of the degree obtained. This study assessed the fit of a conceptual model for examining the concurrent effect of social determinants of health on sexual self-efficacy. First, the normal distribution of the quantitative variables was assessed using the skewness and kurtosis test, and then the data were analyzed in SPSS-21 and AMOS 24 [24, 25]. All variables were quantitatively represented in the path analysis. The outcomes of the correlation were shown as Pearson's (for quantitative variables) and Spearman's (for ordinal variables) correlation coefficient, while the results of the Path analysis were displayed as regression coefficients and Standardized Beta, with a significance threshold of P-value < 0.05.

According to the WHO model, Sexual self-efficacy is the health outcome which is impacted by structural and intermediate determinants:

Structural determinants in this study: Socioeconomic status, Spouse' education, and age.

Intermediate determinants in this study: Intimate partner violence, Perceived stress, and Percieved social support (Fig. 1).

Results

Demographic and midwifery characteristics

The mean age of the participants and their husbands was 35.59 ± 7.75 and 39.85 ± 8.72, respectively. Almost half of the women were employed (%50.2) and the other half were housewives (%49.8). %51.2 had Fars ethnicity, and others were of other ethnicities (%48.8). The demographic and obstetric characteristics of women are presented in Table 1.

Correlation between variables

Table 2 displays the correlation matrix for the variables in the study. The results from the Pearson correlation analysis reveal that socioeconomic status ($r = 0.115$), spouse educational level ($r = 0.135$), and perceived social support ($r = 0.293$) show a significant positive correlation with sexual self-efficacy, while intimate partner violence ($r = -0.162$) and perceived stress ($r = 0.224$) demonstrate a significant negative correlation.

Path analysis

The results of the skewness/kurtosis tests regarding the normal distribution of the data are presented in Table 3, which indicates the normal distribution of the data. The final model in this study is presented in Fig. 2. Most of the paths were statistically significant (Table 4 and 5). According to the path analysis results, perceived stress (B=−0.11) had a negative causal relationship with SSE only through one direct path, and socioeconomic status was the only variable that was positively related to SSE through three indirect paths (B = 0.11). Intimate partner violence (B= −0.066) and perceived social support (B = 0.29) were the variables that had a causal association with SSE through both direct and two indirect paths. (Fig. 2)

In other words, with an increase of one unit in the IPV and perceived stress score, the SSE score decreases by

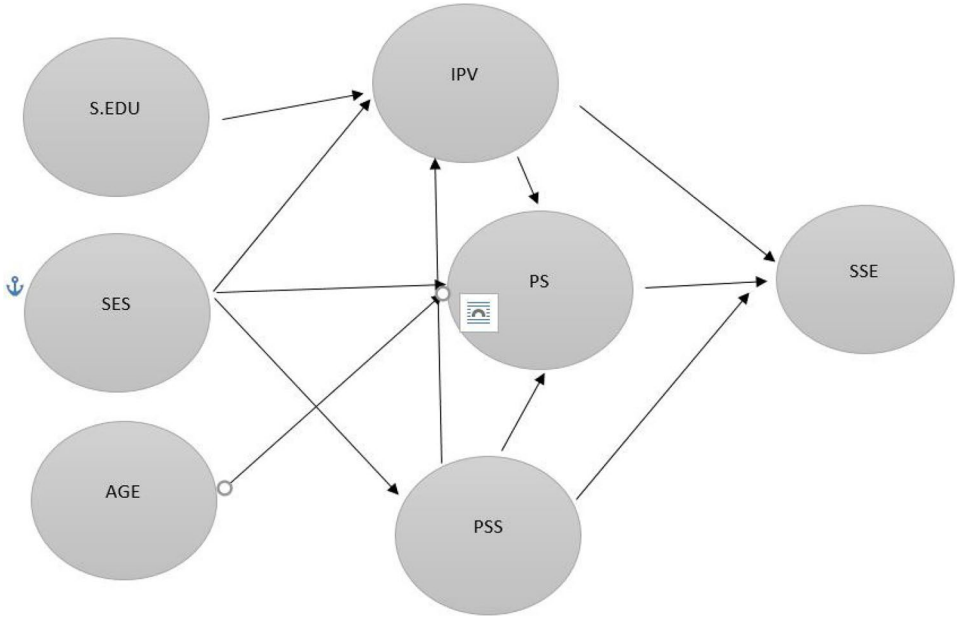

Fig. 1 Conceptual model of the relationship between social determinants of health and sexual self-efficacy. S.EDU: Spouse's Education, SES: Socioeconomic Status, IPV: Intimate Partner Violence, P.S: Perceived Stress, SSE: Sexual Self-Efficacy

Table 1 Demographic and obstetric characteristics of women participating in the study

Quantitative variables	Mean and standard deviation
women' age	35.59 ± 7.75
Husbands' (or partners') age	39.85 ± 8.72
Gravidity	1.68 ± 1.2.4
Parity	1.34 ± 1.03
Sexual self-efficacy	19.07 ± 5.66
Socioeconomic status	14.0 ± 3.56
Perceived social support	45.47 ± 8.2
Intimate partner violence	34.67 ± 13.12
Perceived stress	25.85 ± 8.94
Women's education level	
Diploma and lower	100 (%23.6)
Associate Degree	28 (%6.6)
Bachelor degree	197 (%46.5)
Master and above	99(%23.3)
Husbands' (or partners') education level	
Diploma and lower	127 (%30)
Associate Degree	34 (%8)
Bachelor degree	152 (%35.8)
Master and above	111 (%26.2)
Women's job	
Housewives	258 (%43)
Employed	342 (%57)
Ethnicity	
Fars	217 (%51.2)
Others	207 (%48.8)

0.066 and 0.11, respectively. In addition, with an increase of one unit in the score of SES and perceived social support, SSE scores increase by 0.11 and 0.29, respectively (Table 4 and 5).

Durbin Watson statistic is 2.04 that close to 2 indicates no autocorrelation. For multivariate normality, Doornik-Hansen test is Chi2 [12] = 18.31 ($p = 0.105$), that leads to acceptance of multivariate normality. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) is 0.796 is higher than 0.7 and Bartlett's Test of Sphericity is Chi2 [15] = 284.81 ($p < 0.001$) indicates that the variables are not independent and multivariate analysis is appropriate.

The indices for model fitness indicate that the model performs well and aligns closely, while the adjusted connections among the variables, based on the proposed conceptual framework, are logical. Therefore, there was no notable difference between the fitted and conceptual models (Table 6).

Discussion

This study aimed to determine the relationship between sexual self-efficacy, spouse education, SSE, perceived stress, intimate partner violence, and perceived social support within the WHO framework. This framework has three key components: Structural Determinants, which include politics, economics, and social structures such as class, gender, and ethnicity; Intermediary Determinants, which refer to material and psychological living conditions such as housing, nutrition, and stress; and Health Inequities, which involve inequitable and avoidable differences in health outcomes.

The analysis showed that socioeconomic status is positively associated SSE through affecting IPV, PS, and PSS, which is in line with the results of previous studies from Iran [26–28] and other countries [29]. It appears that there is an association between socioeconomic status and sexual functioning in women of reproductive age [30]. For instance, the income of women may enhance their ability to access health services, contributing to an improvement in their sexual health [31].

Another finding of this study was the positive relationship between age and sexual self-efficacy, mediated by the effect of age on reducing perceived stress, which

Table 2 The relationship between social determinants of health and sexual Self-Efficacy among study participants

Variables	Sexual self-efficacy	Age	Socioeconomic status	Spouse Education	Social support	Intimate partner violence	Perceived stress
Sexual self-efficacy	1						
Age	−0.057	1					
Socioeconomic status	0.115*	−0.041	1				
Spouse Education	0.135*	−0.049	0.412*	1			
Social support	0.293*	0.042	0.186	0.070	1		
Intimate partner violence	−0.162*	−0.051	−0.103*	−0.104*	−0.355*	1	
Perceived stress	−0.224*	−0.151*	−0.193	−0.043	−0.431*	0.462*	1

*P value< 0.05

Table 3 The results of skewness/kurtosis tests

	Age	SES	IPV	*P.S*	PSS	SSE
Skewness	0.483	0.225	0.322	0.464	−0.505	−0.322
Kurtosis	0.437	0.283	0.565	−0.070	0.298	0.674

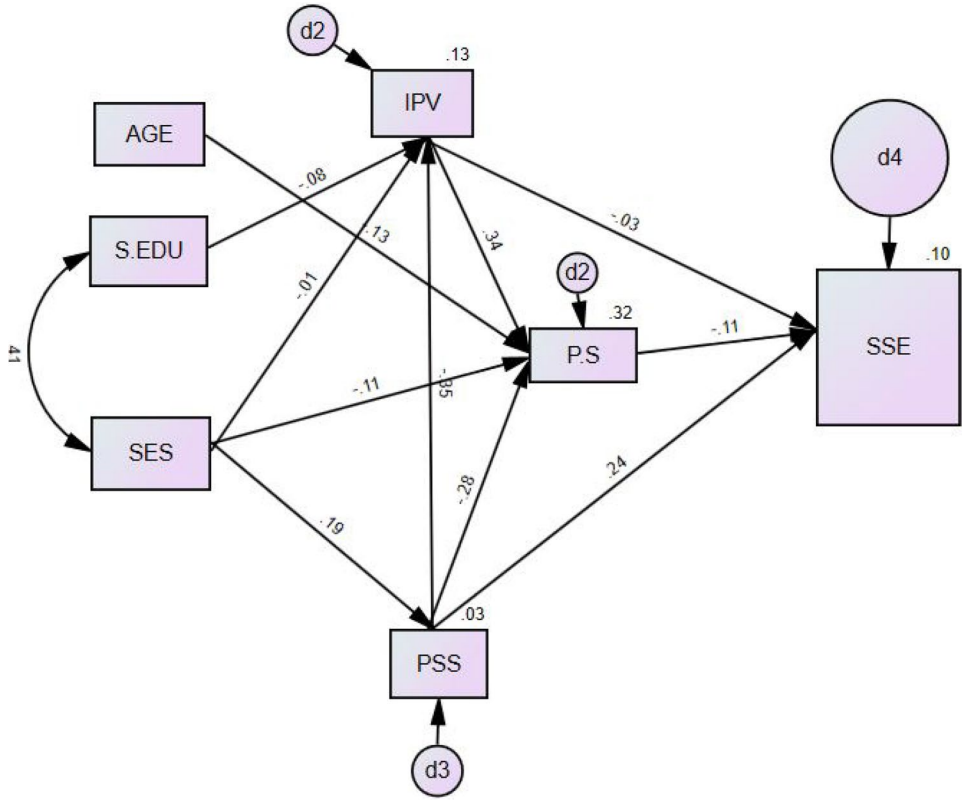

Fig. 2 Full Empirical Path Model between Social Determinants of Health and Sexual Self-Efficacy. The single-headed arrow represents the regression coefficient, Also Known as the Standardized Beta. The two-headed arrow means correlation

Table 4 Direct path effects of social determinants on sexual Self-Efficacy

Predictor Variable	Path to SSE	Standardized β	*P*-value
Intimate Partner Violence	IPV → SSE	−0.03	0.012
Perceived Social Support	PSS → SSE	0.24	< 0.001
Perceived Stress	PS → SSE	−0.11	< 0.001
Socioeconomic Status	SES → SSE	Not significant	--
Age	Age → SSE	Not significant	--
Spouse Education	S.Edu → SSE	Not significant	--

SSE Sexual Self-Efficacy, *PSS* Perceived Social Support, *PS* Perceived Stress, *SES* Socioeconomic Status, *IPV* Intimate Partner Violence

*P value< 0.05

Table 5 Indirect path effects of social determinants on sexual Self-Efficacy

Predictor Variable	Mediator(s)	Indirect Effect (β)	*P*-value
Socioeconomic Status	via IPV, PSS, PS	0.11	< 0.001
Age	via Perceived Stress	0.014	0.046
Spouse Education	via SES or PSS	0.02	0.32
Intimate Partner Violence	via PS or PSS	−0.038	0.012
Perceived Social Support	via IPV and PS	0.054	< 0.001

SSE Sexual Self-Efficacy, *PSS* Perceived Social Support, *PS* Perceived Stress, *SES* Socioeconomic Status, *IPV* Intimate Partner Violence

*P value< 0.05

Table 6 Model fitting indicators

Indicator	Value	Acceptable value
X2/df	1.56	< 3
Degrees of Freedom	4	-
Root Mean Square Error of Approximation (RMSEA)	0.037	< 0.06
Tucker-Lewis Index (TLI)	0.97	> 0.9
Goodness of Fit Index (GFI)	0.99	> 0.9
Adjusted Goodness of Fit Index (AGFI)	0.97	> 0.9
Normed Fit Index (NFI)	0.96	> 0.9
Relative Fit Index (RFI)	0.91	> 0.9
Comparative Fit Index (CFI)	0.99	> 0.9
Incremental Fit Index (IFI)	0.99	> 0.9

aligns with the findings of previous studies [32]. Older age is associated with greater resilience in women, which can influence their level of perceived stress [33].

The current study found a negative association between IPV and SSE, which aligns with the findings of previous studies [34, 35]. IPV is associated through a direct path and by affecting perceived stress. Conversely, women who have experienced violence often face sexual dysfunction and encounter difficulties initiating intimate

relationships. The consequences of domestic violence include fear of intimacy, reduced sexual desire, difficulties with sexual preference and arousal, and the inability to achieve orgasm [36]. As stated by WHO (2013), Women in violent relationships often experience intimidation driven by fear, which can undermine their ability to make autonomous decisions about their sexual functioning [37]. A recent systematic review indicates that intimate partner violence (IPV) is linked to poorer sexual functioning (such as partner-oriented dyadic and overall sexual desire, sexual arousal, and ability to reach orgasm), reduced sexual satisfaction, and diminished relationship satisfaction [38].

According to the results of this study, there is a negative relationship between perceived stress and SSE. This finding is consistent with the results of earlier studies [39–42]. To support these conclusions, it is important to note that individuals experiencing mental health challenges often exhibit reduced engagement in sexual activity. Furthermore, when individuals with mental health challenges do engage in sexual activity, they may experience heightened levels of sexual pain, contributing to decreased relationship satisfaction. Mental health conditions are also frequently associated with sexual dysfunctions, including reduced libido, difficulty achieving orgasm, and an overall decline in sexual satisfaction [41].

Our study highlighted that perceived social support is positively associated with SSE through a direct and two indirect paths by affecting IPV and PS. Additionally, various studies in Iran and other countries have shown that sexual function is significantly influenced by social support [27, 39, 40]. As social beings, individuals exist within environments that offer varying degrees of support and resources. Social support can significantly influence a person's health literacy by shaping access to information, facilitating the exchange of knowledge, and strengthening the roles of family and friends in seeking medical care, following treatment recommendations, and acquiring relevant health information. Additionally, emotional support from family members plays a crucial role in enhancing health literacy [43]. Individuals with strong literacy skills and self-confidence are more likely to actively apply these skills and effectively navigate challenges [44]. Previous research indicates that family, friends, and colleagues comprise the most significant social networks. It appears that social support is directly related to relationship health by improving both the physical and mental health of individuals and mitigating the negative effects of stressors on mental and sexual health [45].

The WHO (2010) framework was chosen as the theoretical basis for this study because of its ability to identify structural and mediating factors influencing health inequalities. The WHO (2010) conceptual framework for action on social determinants of health explains health inequalities by examining structural and mediating factors. The framework emphasizes the importance of social contexts and intersectoral collaboration to reduce health inequalities. The framework helped identify key variables such as income level, education, etc. as determinants of health. Our data showed that it is consistent with the WHO framework's emphasis on the role of structural and mediating factors in creating health inequalities.

Limitations and strengths

Our study had some limitations that should be acknowledged. One notable limitation is the absence of data on husbands' sexual self-efficacy, which may influence women's sexual functioning; therefore, further research in this area is recommended. Additionally, the cross-sectional design of the study limited our ability to assess the temporal relationship between exposures and outcomes. A larger sample size is also needed to enhance the representativeness and generalizability of the findings.In addition to the limitations noted, several potential biases may have influenced the study's findings. Selection bias could have occurred if the participants who chose to participate differed systematically from those who did not, particularly concerning their sexual health, mental health, or willingness to disclose personal experiences. Recall bias is another concern, as participants may have had difficulty accurately remembering or reporting past experiences related to sexual functioning or exposure to violence. Social desirability bias may also have played a role, with participants possibly underreporting stigmatized experiences, such as sexual dysfunction or intimate partner violence, due to cultural norms or discomfort. Furthermore, measurement bias may have been introduced if the tools used were not fully validated in the specific cultural context or population, potentially affecting the accuracy of responses. Finally, confounding variables—such as relationship quality, cultural attitudes, or underlying health conditions—may not have been fully accounted for, which could influence the observed associations between variables. Addressing these biases in future studies through longitudinal designs, culturally validated instruments, and more comprehensive data collection would help strengthen the validity of the findings.

Conclusion

The public health implications of this study are significant, as it underscores the importance of addressing sexual health as an integral component of overall well-being for women of reproductive age. The findings suggest that socioeconomic disparities, mental health challenges, and experiences of violence can substantially impact sexual functioning, highlighting the need for comprehensive, multisectoral public health strategies. These may include integrating sexual and mental health services, promoting

health literacy, and implementing community-based interventions to prevent intimate partner violence. Additionally, the study calls for policies that ensure equitable access to reproductive health care, psychosocial support, and education, particularly for vulnerable populations. By addressing these social determinants of health, public health systems can play a critical role in reducing health disparities and improving quality of life for women across diverse communities.

Clinical importance

Despite these limitations, the study offers clinically important insights into the complex interplay between socioeconomic factors, mental health, and women's sexual functioning. Understanding these relationships is crucial for healthcare providers, as it highlights the need for a holistic approach in addressing sexual health concerns. Clinicians should consider not only biological factors but also the psychological and social determinants that may impact a woman's sexual well-being. By recognizing the role of intimate partner violence, mental health status, and social support, healthcare professionals can better tailor interventions, offer appropriate referrals, and foster a supportive environment that empowers women to discuss and manage their sexual health openly and confidently.

Recommendations for researchersThis study suggests that future research should examine the effects of other social and psychological factors on sexual empowerment. Also, the use of longitudinal research designs is recommended to better understand the cause-and-effect relationships between these variables. Similar studies can provide more precise solutions for designing effective health interventions to improve women's sexual health.

Recommendations for policymakers

Policymakers should design programs to promote social and psychological support for women, especially in low-income groups. In addition, educational and support programs to reduce domestic violence and psychological stress can help improve women's sexual empowerment and the quality of their marital relationships.

Authors' contributions

Alamolhoda.SH supervised the study. Asadi. F and Keshavarz. Z prepared the proposal. Vakili. F conducted sampling. Nasiri. M and Jahanfar. Sh analyzed the data. Hamzehgardeshi. Z prepared the figures and tables. Vakili. F and Hamzehgardeshi. Z and Masoumi. M prepared the article text. All authors read and approved the final manuscript.

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Data availability

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

Declarations

Ethics approval and consent to participate

All methods were carried out following relevant guidelines and regulations or declaration of Helsinki.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

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