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Original Research

The mediating role of sexual dysfunction knowledge in the association between sexual function and depression: a large-scale national cross-sectional study in reproductive-aged population

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Abstract

Background: Sexual dysfunction (SD) and depression are prevalent issues that significantly affect both physical and mental health.

Aim: This study aimed to explore the association between sexual function (SF) and depression in reproductive-aged population and further examine the mediating role of knowledge regarding the effect of sexual dysfunction on fertility (KSDF).

Methods: This study enrolled a total of 10 761 participants aged 20-40 from 31 regions, including 5259 males and 5502 females, with a median age of 29.0 years. Basic demographic data were collected initially, followed by clinical data acquisition.

Outcomes: The International Index of Erectile Function 5 (IIEF5), the Premature Ejaculation Diagnostic Tool (PEDT), the Female Sexual Function Index-19 (FSFI-19), the Patient Health Questionnaire-9, and the Disease Knowledge Questionnaire.

Results: The study revealed a significant bidirectional association between SF and depression among the population. Specifically, poorer SF was correlated with higher severity of depressive (IIEF5 [$\beta = -0.155$, $P < .001$], PEDT [$\beta = 0.311$, $P < .001$], and FSFI-19 [$\beta = -0.059$, $P < .001$]). Conversely, higher severity of depressive was associated with poorer SF (IIEF5 [$\beta = -0.202$, $P < .001$], PEDT [$\beta = 0.249$, $P < .001$], and FSFI-19 [$\beta = -0.191$, $P < 0.001$]). Furthermore, in males, the KSDF mediated the bidirectional associations between SF and depression. Specifically, the mediating proportions were as follows: KSDF mediated 3.00% of the association between IIEF5 and depression, and 2.20% of the association between PEDT and depression; similarly, for the association between depression and SF, KSDF mediated 2.50% of the association between depression and IIEF5 and 2.20% between depression and PEDT. However, no such mediation was observed in females.

Clinical Implications: This provides new insights for the clinical management of these issues in the male reproductive-aged population.

Strengths and Limitations: These findings suggest that enhancing this knowledge could interrupt bidirectional association between impaired SF and depression in this demographic, potentially alleviating both conditions without requiring additional interventions. However, cross-sectional study design does not allow us to draw corresponding causal conclusions.

Conclusion: The current study further demonstrated a significant bidirectional association between SF and depression among the reproductive-aged population, and importantly, the KSDF was found to mediate this association in males.

Keywords: sexual function; depression; knowledge; mediation analysis; reproductive-aged population.

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Introduction

Sexual function (SF) refers to the physiological and psychological states exhibited by an individual during sexual activity.[1] It encompasses multiple stages within the sexual response cycle, including desire, arousal, and orgasm, and is generally characterized by the absence of pain or discomfort during sexual activity and by the successful completion of each phase without physiological difficulties.[2] Additionally, according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), sexual dysfunction (SD) has a broader definition that includes not only disturbances within these stages but also distress about one's sexual experiences, adding a psychological component to its definition. This updated definition highlights the crucial role of psychological factors in SF, which is a major focus in current SD research, as these factors may be both a result of and a contributor to SD. The incidence and severity of SD increases with age,[3] thereby directing the majority of research attention toward individuals aged 40 and above. Nonetheless, the swift pace of economic development, coupled with rising social pressures, is driving a shift toward a younger demographic among SD patients. Upon deeper exploration, significant differences emerge between these groups: SD in older adults is predominantly driven by organic factors, such as aging, hormonal imbalances, and comorbidities like diabetes, whereas in younger individuals, psychological factors play a primary role, including anxiety, depression, and mood disorders. According to the DSM-5, the diagnostic criteria for depression (or major depressive disorder [MDD]) require that the patient experiences the following symptoms for at least 2 weeks: low mood, loss of interest or pleasure, changes in weight, sleep disturbances, low energy, feelings of worthlessness, impaired concentration or decision-making ability, and thoughts of death or suicide. Additionally, all symptoms must result in significant functional impairment (eg, in social, occupational, or other important areas of functioning), and these symptoms cannot be better explained by other medical conditions, such as bipolar disorder or substance use.[4]

The younger demographic increasingly affected by SD largely overlaps with individuals of reproductive age, typically defined as men and women in their peak phase of reproductive capacity and desire, generally spanning the 20-40 years age range, though slight variations exist across studies.[5-7] This population not only has active sexual needs but also essential reproductive aspirations, which heightens psychological stress for those affected and further contributes to the establishment of a vicious cycle between SD and mental health challenges. In China, influenced by traditional culture, marriage and childbirth are expected to occur sequentially, presenting reproductive-age adults with social expectations they must navigate. However, the lack of comprehensive sexual and reproductive education leaves this population unaware of the actual knowledge of SD on fertility (KSDF), leading to the misconception that SD directly affects reproductive capability. In reality, aside from a few severe SD, most affected individuals who can achieve intravaginal ejaculation experience a minimal impact on pregnancy probability. This lack of awareness causes reproductive-age adults affected by SD to experience heightened concern about its potential impact on fertility, placing them under considerable psychological stress. This situation underscores the aforementioned bidirectional relationship between depression and SD, which is particularly significant among reproductive-age adults.

Given these circumstances, cognitive education for this population may serve as a critical breakthrough in disrupting the bidirectional association between SD and depression. However, to date, no studies have specifically investigated the association between KSDF, SF, and depression. Therefore, this study focuses on the reproductive-age population in China to explore the relationship between KSDF, SF, and depression. By employing mediation analysis, we aim to clarify the role of KSDF in this association, offering new insights and approaches for clinical practice to enhance psychological health recovery and improve patients' quality of life.

Methods

Data collection

The data collection period spanned from July 2023 to August 2023, employing an anonymous survey disseminated via a widely accessed website with over 6.2 million users ("Survey Star," Changsha Ran Xing Science and Technology, Changsha, https://www.wjx.cn/). To obtain a nationally representative sample, we implemented a 2-stage quota sampling method based on gender ratios and the population distribution across the Eastern, Central, and Western regions. In the first stage, we conducted a regional quota sampling to ensure that the sample proportionally reflected the distribution of the national population. Based on data from the China Health Statistical Yearbook (https://www.yearbookchina.com), the country was divided into 3 major regions: Eastern, Central, and Western. The population distribution across these regions is approximately 4:3:3 for Eastern, Central, and Western regions, respectively. A larger sample share was allocated to the Eastern region, characterized by higher population density and greater urbanization. Specifically, the sample distribution ratio between the Central and Western regions combined and the Eastern region was approximately 6:4. Ultimately, the number of participants from the Eastern, Central, and Western regions was 5255, 3704, and 3198, respectively, which approximates the 4:3:3 ratio. In the second stage, we implemented gender-based quotas within each regional category to ensure balanced representation of male and female participants. The gender quotas were determined based on the most recent national census data, reflecting the gender distribution in the general population. The final gender ratio in the survey was approximately 1:1, with 5259 male and 5502 female participants.

An invitation letter outlining the study's objectives and providing a link to the online questionnaire was distributed to individuals across 31 provinces in China. The survey system allowed each account to submit the questionnaire only once and only after all questions were completed. Inclusion criteria for participants were as follows: (1) Married individuals, (2) Age range between 20 and 40 years old, and (3) No significant physical or psychological illnesses. Exclusion criteria are detailed in Figure S1. This research was approved by the Ethics Committee of the First Affiliated Hospital of Anhui Medical University.

Survey instrument

The questionnaire included self-reported demographic information (age, gender, body mass index [BMI], smoking status, drinking status, education level, income, etc.), Patient Health Questionnaire-9 [PHQ-9], assessment of SF (Premature Ejaculation Diagnostic Tool [PEDT], International Index of Erectile

Function [IIEF-5], Female Sexual Function Index [FSFI-19]) and questions to assess KSDF.

Patient Health Questionnaire-9 is a 9-item self-rating scale developed by Spitzer et al., measuring depression severity. The items correspond to the 9 diagnostic criteria for depression in the Fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV).[8]

International Index of Erectile Function consists of 5 items from the erectile function and sexual intercourse satisfaction domains, response options are based on a scale of 0 to 5 or 1 to 5.[9] Higher total scores indicate better erectile function and satisfaction with intercourse.

Premature Ejaculation Diagnostic Tool is a premature ejaculation diagnostic tool developed and validated by Symonds et al., which consists of 5 items: control, frequency, minimal sexual stimulation, distress, and interpersonal difficulties,[10] with higher scores indicating worse premature ejaculation symptoms.

Female Sexual Function Index evaluates female SF across 6 domains: desire, arousal, lubrication, orgasm, satisfaction, and pain,[11] with lower scores indicating worse SF.[12]

Additionally, 3 questions were designed for each of the 3 types of SD to gauge participants' KSDF (Figure S2). In order to quantitatively evaluate the KSDF, combined with our previous study, the knowledge section was scored on a 10-point scale with a total score of 30.[13] Specifically, we scored "not affected" as 10 points on the 3 questions, defining their total score as KSDF, and investigated its mediating role in the bidirectional association between SF and depression.

Covariates

Covariates were selected based on the results of primary analyses and cross-sectional studies related to SF and depression.[14-18] Information on population characteristics (age, gender, population, region, resident), socioeconomic status (income and education), unhealthy lifestyle (smoking and drinking), physical and mental condition (BMI, constitution [general condition of the body], underlying disease, personality [introverted or extroverted]), and fertility circumstance (number of pregnancies) were collected.

Statistical analysis

All statistical analyses were performed using R software, version 4.2.3. Statistical significance was set at a 2-sided P value of less than 0.05. Descriptive statistics were used for categorical variables, including frequency counts and percentages. Categorical variables were compared using the χ^2 test, and continuous variables were tested using the Mann–Whitney *U*-test. Linear regression was also used to test the association between SF and depression, with coefficient (β) and 95% CI reported. The directed acyclic graphs of SF and depression (Figure S3) were used a priori to select covariates as latent confounding factors, including age, gender, population, region, resident, income, education, smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy. The directed acyclic graph of depression and SF (Figure S4) was also used a priori to select the covariates as the latent confounding factors, including age, gender, population, region, resident, income, smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy.[14-19]

To study SF's effect on depression, 1 unadjusted model and 2 adjusted models were used. Model 1 was unadjusted. Model 2 was adjusted for age, population, region, resident, income, and education. Model 3 included those factors plus smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy. Similarly, 1 unadjusted model and 2 adjusted models were used to study depression's effect on SF. Model 1 was unadjusted. Model 2 was adjusted for age, population, region, resident, and income. Model 3, building upon Model 2, was also adjusted for smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy.

To assess the role of KSDF in the bidirectional relationship between SF and depression, the R package MEDIATION was performed. Models assessing the role of KSDF in the SF's effect on depression were adjusted for age, population, region, resident, income, education, smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy. Similarly, models evaluating how KSDF affects depression's influence on SF were adjusted for the same factors, except for education. Analyses were stratified by age, kids, and fertility desire, with modification effect of each stratification characteristic estimated based on its interaction in the model. In addition, we conducted a series of interaction analyses using regression models. Specifically, we examined whether the relationship between SF and depression varied by age, number of children, and fertility desire. Interaction terms were added to the regression models to test for significant moderating effects. The models adjusted for confounding variables, including age, population, region, resident, income, education, smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy. In the study, we did not use bootstrapping to estimate the standard errors.

Results

Sociodemographic characteristics of the participants

Out of 13 465 distributed questionnaires, we received 12 157 responses, yielding a response rate of 90.29%. To ensure data quality, surveys were excluded if they exhibited systematic attention detection errors ($n = 810$), significant inconsistencies or logical errors ($n = 531$), or if respondents took excessively long to complete the questionnaire ($n = 55$). Ultimately, 10 761 valid questionnaires were included in the analysis, including 5259 males and 5502 females. The demographic statistics are presented in Table 1. The median age of participants was 29 years old (IQR: 25.0-32.0), with males comprising 48.87% and females 51.13% of the sample. The proportion of male smokers and alcohol drinkers was higher than that of females (38.49% vs 6.62%, 57.31% vs 25.65%). Most participants were of Han ethnicity (94.24%), resided in urban areas (91.25%), and had attained a college-level education (82.22%).

Bidirectional relationship between SF and depression

Our investigation and analysis of 10 761 subjects revealed a bidirectional association between SF and depression in both men and women, as shown in Table 2 and Table 3. Specifically, poorer SF was significantly associated with more severe depressive symptoms (IIEF5: $\beta = -0.255$, $P < 0.001$; PEDT: $\beta = 0.425$, $P < .001$; FSFI-19: $\beta = -0.104$, $P < .001$). Conversely, higher levels of depression were linked to poorer SF (IIEF5: $\beta = -0.322$, $P < .001$; PEDT: $\beta = 0.307$, $P < .001$; FSFI-19: $\beta = -0.329$, $P < .001$). Moreover, the

Table 1. Demographic characteristics of the study participants ($n = 10\,761$).

Characteristic	Total, *n* (%) (*n* = 10 761)	Male, *n* (%) (*n* = 5259)	Female, *n* (%) (*n* = 5502)
Age (median [IQR])	29.00 [25.00, 32.00]	29.00 [25.00, 33.00]	28.00 [25.00, 32.00]
20-25 years	3070 (28.53)	1516 (28.83)	1554 (28.24)
26-30 years	3788 (35.20)	1760 (33.47)	2028 (36.86)
31-35 years	2883 (26.79)	1423 (27.06)	1460 (26.54)
36-40 years	1020 (9.48)	560 (10.65)	460 (8.36)
Sex			
Male	5259 (48.87)	5259 (100.00)	0 (0.00)
Female	5502 (51.13)	0 (0.00)	5502 (100.00)
BMI (kg/m^2)			
<18.5	1810 (16.82)	424 (8.06)	1386 (25.19)
18.5-24	7147 (66.42)	3519 (66.91)	3628 (65.94)
>24	1804 (16.76)	1316 (25.02)	488 (8.87)
Population			
Han Chinese	10 141 (94.24)	4959 (94.30)	5182 (94.18)
Non-Han Chinese	620 (5.76)	300 (5.70)	320 (5.82)
Smoking			
Never	7384 (68.62)	2496 (47.46)	4888 (88.84)
Former	989 (9.19)	739 (14.05)	250 (4.54)
Current	2388 (22.19)	2024 (38.49)	364 (6.62)
Drinking			
Never	5467 (50.80)	1707 (32.46)	3760 (68.34)
Former	869 (8.08)	538 (10.23)	331 (6.02)
Current	4425 (41.12)	3014 (57.31)	1411 (25.65)
Education			
High school and below	808 (7.51)	475 (9.03)	333 (6.05)
University	8848 (82.22)	4208 (80.02)	4640 (84.33)
Graduate and above	1105 (10.27)	576 (10.95)	529 (9.61)
Income (RMB)			
<5000/month	2915 (27.09)	1177 (22.38)	1738 (31.59)
5000-10 000/month	5653 (52.53)	2797 (53.19)	2856 (51.91)
>10 000/month	2193 (20.38)	1285 (24.43)	908 (16.50)
Resident			
Urban	9819 (91.25)	4815 (91.56)	5004 (90.95)
Rural	942 (8.75)	444 (8.44)	498 (9.05)
Region			
Eastern Region	4674 (43.43)	2203 (41.89)	2471 (44.91)
Central Region	3249 (30.19)	1569 (29.83)	1680 (30.53)
Western Region	2838 (26.37)	1487 (28.28)	1351 (24.55)
Personality			
Introverted	5341 (49.63)	2528 (48.07)	2813 (51.13)
Extroverted	5420 (50.37)	2731 (51.93)	2689 (48.87)
Constitution			
Poor	630 (5.85)	287 (5.46)	343 (6.23)
Moderate	6603 (61.36)	3134 (59.59)	3469 (63.05)
Good	3528 (32.79)	1838 (34.95)	1690 (30.72)
Underlying disease			
No	8594 (79.86)	4105 (78.06)	4489 (81.59)
Yes	2167 (20.14)	1154 (21.94)	1013 (18.41)
Sexual frequency			
<1/week	3678 (34.18)	1639 (31.17)	2039 (37.06)
1-2/week	5003 (46.49)	2445 (46.49)	2558 (46.49)
3-5/week	1863 (17.31)	1034 (19.66)	829 (15.07)
≥6/week	217 (2.02)	141 (2.68)	76 (1.38)
Pregnancy			
0	4300 (39.96)	2210 (42.02)	2090 (37.99)
1	4114 (38.23)	1924 (36.58)	2190 (39.80)
2	1833 (17.03)	910 (17.30)	923 (16.78)
≥3	514 (4.78)	215 (4.09)	299 (5.43)
Kids			
0	4659 (43.30)	2430 (46.21)	2229 (40.51)
1	4732 (43.97)	2216 (42.14)	2516 (45.73)
≥2	1370 (12.73)	613 (11.66)	757 (13.76)

Abbreviations: BMI, body mass index; IQR: interquartile range; RMB, Chinese Yuan.

Table 2. Relationship between sexual function and depression.

	Male ($n = 5259$)						Female ($n = 5502$)		
	IIEF5			PEDT			FSFI-19		
	β	95% CI	*P*-value	β	95% CI	*P*-value	β	95% CI	*P*-value
Model 1	−0.255	−0.278 to −0.232	<.001	0.425	0.395-0.454	<.001	−0.104	−0.119 to −0.090	<.001
Model 2	−0.242	−0.266 to −0.218	<.001	0.432	0.402-0.461	<.001	−0.087	−0.102 to −0.071	<.001
Model 3	−0.155	−0.178 to −0.131	<.001	0.311	0.282-0.340	<.001	−0.059	−0.074 to −0.045	<.001

Model 1 was not adjusted. Model 2 was adjusted for age, population, resident, region, education, income. Model 3 was adjusted for age, population, resident, region, education, income, smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy. Abbreviations: 95% CI, 95% confidence intervals; FSFI-19, Female Sexual Function Index-19; IIEF5, International Index of Erectile Function 5; PEDT, Premature Ejaculation Diagnostic Tool.

Table 3. Relationship between depression and sexual function.

	Male ($n = 5259$)						Female ($n = 5502$)		
	IIEF5			PEDT			FSFI-19		
	β	95% CI	*P*-value	β	95% CI	*P*-value	β	95% CI	*P*-value
Model 1	−0.322	−0.351 to −0.293	<.001	0.307	0.285-0.328	<.001	−0.329	−0.375 to −0.283	<.001
Model 2	−0.285	−0.313 to −0.256	<.001	0.314	0.293-0.336	<.001	−0.257	−0.303 to −0.212	<.001
Model 3	−0.202	−0.233 to −0.172	<.001	0.249	0.225-0.272	<.001	−0.191	−0.239 to −0.144	<.001

Model 1 was not adjusted. Model 2 was adjusted for age, population, resident, region, education, income. Model 3 was adjusted for age, population, resident, region, education, income, smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy. Abbreviations: 95% CI, 95% confidence intervals; FSFI-19, Female Sexual Function Index-19; IIEF5, International Index of Erectile Function 5; PEDT, Premature Ejaculation Diagnostic Tool.

association of SF with depression remained significant after adjusting for age, population, region, resident, income, education, smoking, drinking, BMI, constitution, underlying disease, personality, pregnancy was as follows: IIEF5 ($\beta = -0.155$, $P < .001$), PEDT ($\beta = 0.311$, $P < .001$), and FSFI-19 ($\beta = -0.059$, $P < .001$). The association of depression with SF also remained significant after adjusting for age, population, region, resident, income, smoking, drinking, BMI, constitution, underlying disease, personality, pregnancy: IIEF5 ($\beta = -0.202$, $P < .001$), PEDT ($\beta = 0.249$, $P < .001$), and FSFI-19 ($\beta = -0.191$, $P < .001$).

The mediating role of KSDF between SF and depression

Further mediation analysis showed that KSDF played a mediating role in the bidirectional relationship between SF and depression, with differences observed between males and females (Figures 1 and 2). For male participants, KSDF played a significant mediating role between SF and depression (IIEF5: average causal mediation effects (ACME) = −0.005, proportion mediated (Prop. Mediated) (%) = 3.00, $P < .001$; PEDT: ACME = 0.007, Prop. Mediated (%) = 2.20, $P < .001$) (Table S1); KSDF also mediated the relationship between depression and SF (IIEF5: ACME = −0.005, Prop. Mediated (%) = 2.50, $P < .001$; PEDT: ACME = 0.006, Prop. Mediated (%) = 2.20, $P < .001$) (Table S2). However, for female participants, the mediating effect of KSDF between SF and depression was not significant (ACME = 0.000, Prop. Mediated (%) = 0.000, $P = .910$); similarly, the mediating effect of KSDF between depression and SF was not significant (ACME = 0.001, Prop. Mediated (%) = −0.300, $P = .620$). The trends remained consistent after stratification (Tables S3 and S4). Furthermore, the interaction analysis revealed that age, number of children, and fertility desire moderate the bidirectional relationship between SF and depression. Detailed data can be found in Tables S5 and S6.

Discussion

Our study reveals a bidirectional relationship between SF and depression in the reproductive-aged population in China. Impaired SF has a positive association with depression, and conversely, depression has a positive association with impaired SF. Additionally, we observed that this association is partially mediated by KSDF in men, but no such mediation was observed in women. Furthermore, we conducted subgroup analyses and assessed interactions, finding no evidence of heterogeneity, which underscores the robustness of our findings. To date, this is the first large-scale study in China to validate the association between SF and depression. The mediation by KSDF may offer a potential intervention target to disrupt the bidirectional relationship between SF and depression.

The association between impaired SF and depression has been confirmed in multiple studies.[20-22] A systematic review indicated that depression increases the risk of developing SD by 50%-70%, while SD increases the risk of depression by 130%-210%.[20] Subsequently, a study by Jiang et al. found that in Western China, 46.2% of patients with untreated MDD experienced SD, with a significantly higher prevalence in female patients (50.3%) compared to males (37.5%).[21] A 2023 systematic review and meta-analysis revealed that overall, 82.75% of female and 63.26% of male depression patients experienced some form of SD, further confirming the strong association between these conditions.[22] However, the samples in the aforementioned studies did not specifically include the reproductive-aged population in China. Our study, focusing on both male and female reproductive-aged individuals in China, is consistent with previous research, demonstrating a strong bidirectional association between SF and depression. On an international scale, the underlying mechanisms of this relationship have been repeatedly discussed, including neurotransmitter imbalances, side effects of antidepressant medications, and reduced self-efficacy.[23-26] However, China is currently undergoing a period of social transformation

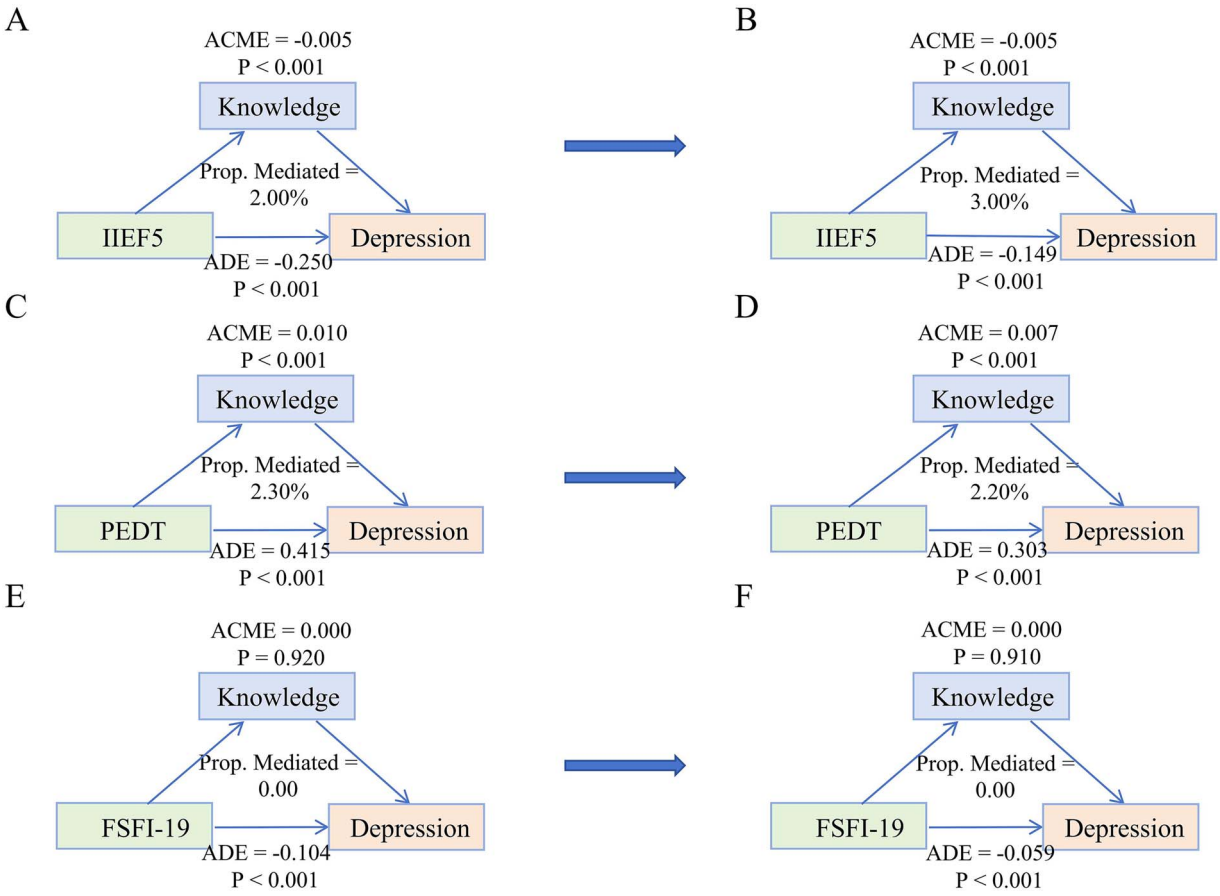

Figure 1. Assessment of the mediating effect of KSDF on the association between SF and depression among the reproductive-aged population in China (N = 10 761). (A), (C), and (E) were unadjusted and (B), (D), and (F) were adjusted for age, population, region, resident, income, education, smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy. Abbreviations: FSFI-19, female sexual function index-19; IIEF5, international index of erectile function 5; PEDT, premature ejaculation diagnostic tool.

characterized by rapid economic development and intensified urbanization. While modern attitudes toward sexuality and mental health are gradually emerging, traditional values continue to exert a significant influence. For example, the conservative perspective on sexual topics in Confucian culture often limits open discussions about SD, thereby increasing psychological stress. Additionally, the Chinese government has recently prioritized mental health, introducing policies such as the "Healthy China 2030" initiative to promote the development of mental health services. Despite these efforts, implementation remains inadequate, particularly at the primary healthcare level. Against this social backdrop, this study not only confirms the bidirectional relationship between SF and depression in China's reproductive-age population but also provides novel insights into how this relationship manifests within the context of China's unique cultural background, healthcare resource distribution, and public health strategies.

This study delves into the mediating factors underlying the association between SF and depression, identifying KSDF as a partial mediator. In Chinese culture, reproduction and sexual performance have long been regarded as significant symbols of self-worth and familial responsibility for reproductive-aged population. Although these traditional views have slightly weakened in the context of rapid modernization, they continue to affect the people's cognition and coping mechanisms regarding their SF and mental health. In contrast, certain Western societies foster a cultural environment characterized by open discussions about sexual health and early intervention. With relatively accessible medical and psychological support, the impact of KSDF is comparatively attenuated. The differing attitudes, coping strategies, and intervention approaches between cultural contexts highlight the complexity of cultural influences on the mediating mechanisms linking SF and depression.

Our research highlights that this mediating effect is more pronounced in men. This gender difference may stem from men's greater susceptibility to traditional gender role expectations and their heightened sensitivity to SF and fertility concerns.[27] When their masculinity is threatened, men tend to remain silent and avoid seeking appropriate treatment, often resorting to alternative self-treatment methods.[28] This may be related to the more significant mediating role of KSDF between SF and depression in men. In contrast, women are more likely to seek other adaptation strategies, such as emotional support, which may mitigate this mediating effect. Additionally, when facing dysfunction, men typically desire immediate solutions and are generally less receptive to long-term measures and lifestyle changes.[29] Unlike women, who commonly receive medical consultation throughout the reproductive process, men are less likely to adhere to medical advice. Therefore, straightforward and quick educational interventions may be more effective in treating men. We

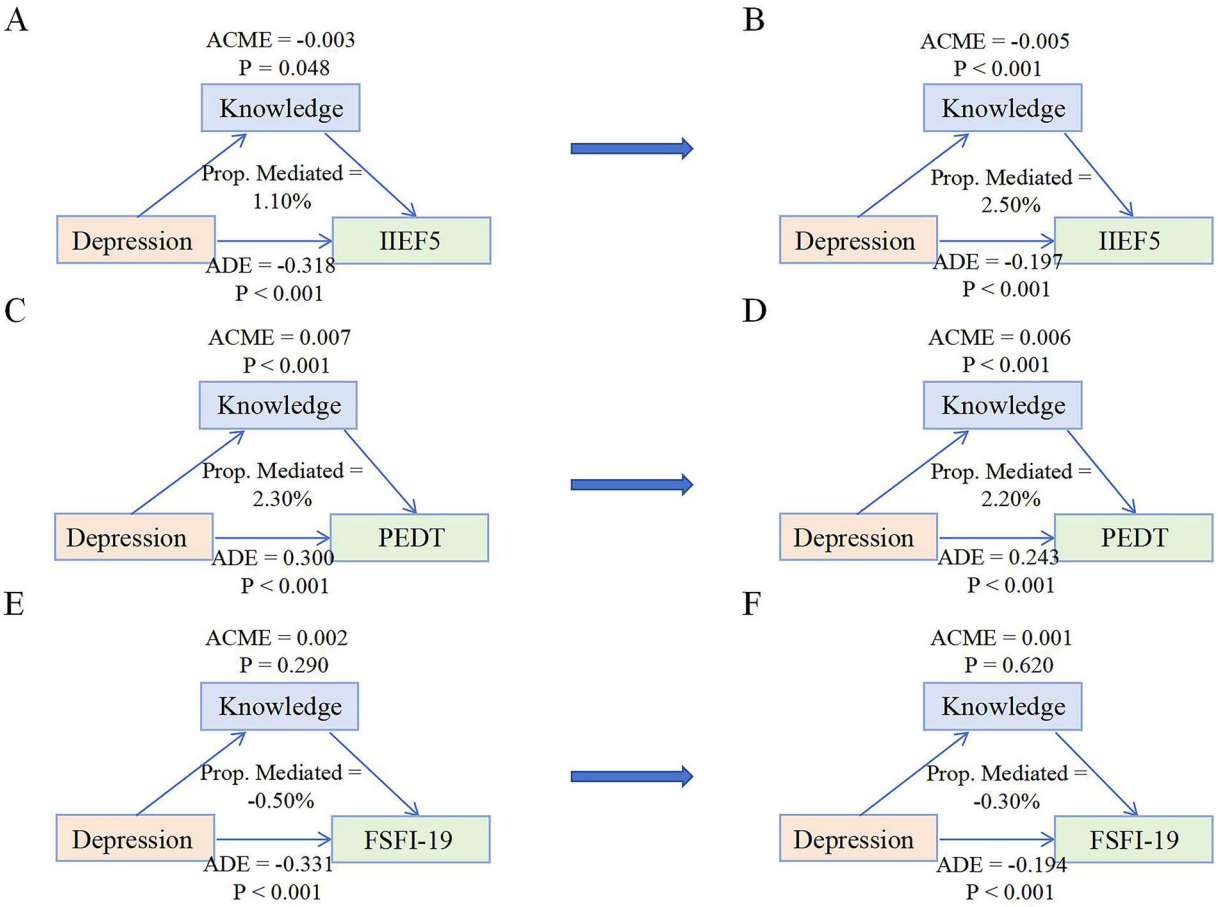

Figure 2. Assessment of the mediating effect of KSDF on the association between depression and SF among the reproductive-aged population in China ($N = 10\,761$). (A), (C), and (E) were unadjusted and (B), (D), and (F) were adjusted for age, population, region, resident, income, education, smoking, drinking, BMI, constitution, underlying disease, personality, and pregnancy. Abbreviations: FSFI-19, female sexual function index-19; IIEF5, international index of erectile function 5; PEDT, premature ejaculation diagnostic tool.

recommend that clinicians, particularly those specializing in sexual medicine and primary care prevention, consistently convey this perspective to patients during consultations on sexual and reproductive health. More importantly, in the clinical treatment of reproductive-age individuals with impaired SF and depression, it is essential to promptly address and provide support for KSDF.

Finally, our study has significant advantages in the evaluation of SF. We specifically used gender-specific SF questionnaires for evaluation and data analysis, ensuring robust statistical interpretations. Our sample, drawn from various regions and socioeconomic strata in China, strengthens the credibility and representativeness of our findings. However, our study also has certain limitations. First, the sample population was restricted to China, and the applicability of the results to other countries or different cultural groups remains to be tested. Second, the study data were primarily based on self-reported measures, which may introduce bias. In the future, we need to incorporate more objective physiological indicators or standardized assessment tools for validation. Furthermore, this study was non-experimental in nature, and we did not implement clinical interventions, such as those aimed at improving KSDF, or use experimental designs to investigate the effects. Finally, as a cross-sectional study, this research cannot establish causal relationships. We should further investigate the association between SF and depression in populations with different regions or backgrounds. Moreover, interdisciplinary collaboration, enhanced cross-cultural comparisons, and the incorporation of international standardized measurement methods will further improve the interpretability and applicability of research findings.

Conclusion

This study reveals a bidirectional association between SF and depression in Chinese reproductive-aged population, particularly in men, where this relationship is partially mediated by KSDF. The findings of this study have significant implications for clinical practice and public health strategies. By identifying the association relationship between SF and depression, healthcare providers can take a more holistic approach to treatment. For male patients, targeted improvement of KSDF may be an effective strategy to mitigate both impaired SF and depressive symptoms.

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Author contributions

L.R.: (Data curation-Equal, Formal analysis-Equal, Methodology-Equal, Supervision-Equal, Validation-Equal, Visualization-Equal,

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Supplementary material

Supplementary material is available at *The Journal of Sexual Medicine* online.

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Conflicts of interest

None declared.

Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethics statement

This research was approved by the Ethics Committee of the First Affiliated Hospital of Anhui Medical University (the ethics approval number: PJ2024-08-87). The patients/participants provided their written informed consent to participate in this study.

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