

The impact of COVID-19 pandemic-related quarantine on female sexual behavior—A cross-sectional study in Chinese

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Abstract

Aim: To investigate the impact and factors of home quarantine life on women's sexual life and behavior in different areas of China, and analyze the prevalence of female sexual dysfunction (FSD) during the COVID-19 epidemic. **Methods:** We selected adult women (over 18 years old) who have regular sexual life (including regular masturbation) and had been isolated at home for at least one month during the COVID-19 outbreak. We use online questionnaires to survey respondents, the content of this questionnaire includes three parts: general demographic information, the impact of the epidemic on sexual life, and the Female Sexual Dysfunction Scale. **Results:** After screening, a total of 678 complete questionnaires were recovered in this study. The results showed that during the epidemic, the overall score of female sexual dysfunction (FSFI) was 21.98 ± 6.38 , the incidence of FSD was 61.9%, the incidence of FSD in Shanghai, Nanjing, and Ningxia were 60.6%, 75.2%, and 52.2%, respectively. The differences in the incidence of FSFI score and other specific items (Desire, Arousal, Lubrication, Orgasm, Satisfaction, and Pain) are in the three regions were statistically significant ($P < 0.05$). In a separate analysis of women who used masturbation for sex, we found that the incidence of FSD was 34.4%, which was lower than paired sexual intercourse 60.1% ($p < 0.05$). Further analysis we found that the occurrence of FSD during the epidemic was related to different age stages, menopause, mode of delivery, degree of anxiety and depression, and different sexual lifestyles. **Conclusion:** The COVID-19 epidemic has had a great impact on people's spiritual life and sexual life. This impact has a negative impact on mental health, but for sex life it has both negative and positive effects, which is mainly caused by it is determined by the characteristics of this life mode of home isolation. In addition, we comparatively analyzed the sexual health status and influencing factors of sexual intercourse and masturbation groups during the epidemic, which helps us to care about the sexual health of masturbation population. Finally, we also found that sex knowledge and education are lacking in many women, which may be the root cause of sex unhealthy. And we should pay attention to the importance of sexual health in epidemic, and having a harmonious and stable sex life will help us get through the boring life of isolation.

Introduction

It has been more than two years since the global outbreak of the COVID-19 epidemic in March 2020. During this period, people's lives have been affected to varying degrees, they have to live a pandemic-related quarantine life and are not allowed to go anywhere. Compared with the previous free social life, the homing-isolation has not only affected our activities, but also influence mental health mostly, and sexual health is one of the most affected and overlooked issues, especially women's sexual health¹. Sexual health is an important part of women's physical and mental health², it not only affects women's normal life, fertility and social interaction, but also affects and threatens the sexual health of male partner³. Female sexual function is a complex psychosomatic syndrome mediated by neurological, vascular, endocrine and psychological factors⁴. At the same time, it is also greatly affected by the surrounding environment and psychological factors⁵, especially when it encounters some major changes, such as the current global epidemic of COVID-19.

At present, the situation of epidemic prevention in China is still very grimly, the government requires residents who live in high-risk areas to be quarantined at home for 4 weeks in order to prevent a large-scale outbreak, this has had an unprecedented impact on people's routine life. Previous related studies have shown that pandemic-related quarantine may have varying degrees of impact on women's sexual health. This has been reported in Italy⁶, Turkey⁷ and other countries⁸, but has hardly any reported in China. Therefore, this investigation aims to analyze the impact of the epidemic on women's sexual life and sexual behavior in three regions of China (ie, Shanghai, Nanjing, and Ningxia), and to understand the current situation of women's sexual life and the prevalence of FSD during the COVID-19 pandemic-related quarantine. Furthermore, we hope this research can provide guidance and reference for women's sexual health during the epidemic.

1. Objects & Methods

1.1 Objects

We selected women who had regular sexual life (including regular masturbation) in home isolation at least 1 month since the outbreak of the COVID-19 pandemic-related quarantine. Inclusion criteria: 1) Aged over 18 years; 2) Lived in the local area for more than 5 years; 3) Regular sexual life during the quarantine period, including paired sexual intercourse and masturbation; 4) Have an appropriate level of education who can understand the content of the questionnaire and voluntarily cooperate with the survey. Exclusion criteria: 1) Have no sexual lives; 2) Have mental illness and do not cooperate with the investigation; 3) Have forbidden sex for nearly one month due to pregnancy, breastfeeding, gynecological inflammation, etc. 4) A history of long-term psychiatric or hormonal drug treatment; 5) Those with special diseases such as genital tract malformations and malignant tumors; 6) Women with sexual dysfunction due to spinal cord or cauda equina injury.

The survey follows the principle of voluntary participation. Before the investigated, we fully informed the respondents of the purpose of the study and the details of the questionnaire, and marked the purpose of the study and informed consent prominently in the questionnaire. This study was approved by the Ethics Committee of the General Hospital of Ningxia Medical University (ethics number: 2022-23)

1.2 Methods

In order to protect the privacy of participants, we distribute electronic questionnaires (<https://www.wjx.cn/vj/YOpC6HW.aspx>) through the social software (Weibo, WeChat, QQ and e-mail), and to ensure the quality of the questionnaire, we set the shortest completion time and other precautions to ensure the authenticity and reliability of the data. The questionnaire consists of three parts: The first part is basic information, including age, occupation, education, marital status (menstrual status, marital status, mode of production, number of births), etc. Second part is the impact of the epidemic on sexual life, including the degree of impact of the epidemic isolation on surname life, psychological changes (anxiety, depression) during the isolation period, changes in sexual desire and reasons, forms of sexual activity, sexual knowledge reserves, etc. And the last part we use the Female Sexual Function Inventory (FSFI) to assess

the status of women's sexual function during this period⁹. FSFI is assesses sexual dysfunction in women six separate titles: cravings, arousal, lubrication, orgasm, sexual success, and pain. A high score means better function.

2. Statistical Analysis

SPSS 23.0 software was used for data analysis. Means and standard deviations were used to describe continuous variables; counts and proportions were used to describe categorical variables. using the Student's t-test for continuous variables and the chi-square test for categorical variables. logistic regression analysis was used for factor analysis. $P < 0.05$ was regarded as a statistically significant difference.

3. Results

3.1 The characteristics of the study population

Since the questionnaires in this investigation were granted and collected through the Internet, it is not possible to calculate the exact recovery rate, we eliminated the clearly unqualified questionnaires (completed too fast and/or all questions selected the same option), finally, 678 questionnaires were receipted, among them, 221 were in Shanghai, 206 in Nanjing, and 251 in Ningxia. The characteristics of the study population are given in Table 1. Among the all respondents, the age distribution is mainly concentrated in 18–40 years old (81.3%), fortunately, these women are in the sexually active period. The marital status of all respondents in the survey is married (65.2%), and the unmarried (including divorced or widowed) accounts for a minority (34.8%); the most representative education level is bachelor education (67.4%); in terms of menstruation, almost 9 out of 10 participants had a normal and regular menstrual cycle (87.9%); among all investigators, only 12.1% had menopause, in childbirth, 267 (39.3%) participants had no history of parturition, in delivery methods, 50.1% had vaginal delivery, 14.9% had caesarean section, and 35% had no delivery.

Table 1
The characteristics of the study population (n = 678)

Items	Total (n = 678)	Shanghai (221)	Nanjing (206)	Ningxia (251)
Age(year), n (%)				
18–25	159(23.5)	46(20.8)	32(15.5)	81(32.3)
26–30	204(30.1)	43(19.5)	90(43.7)	71(28.3)
31–40	188(27.7)	82(37.1)	63(30.6)	43(17.1)
41–50	100(14.7)	39(17.6)	21(10.2)	40(15.9)
51–60	22(3.2)	10(4.5)	0	12(4.8)
> 60	5(0.7)	1(0.5)	0	4(1.6)
Job, n (%)				
students	119(17.6)	32(14.5)	26(12.6)	61(24.3)
Production and sales staff	221(32.6)	59(26.7)	89(43.2)	73(29.1)
administrative staff	127(18.7)	66(29.9)	32(15.5)	29(11.6)
service personnel	79(11.7)	19(8.6)	7(3.3)	53(21.1)
Professional skill worker	132(19.5)	45(20.4)	52(25.2)	35(13.9)
Educational level, n (%)				
primary school	14(2.1)	0	2(1.0)	12(4.8)
junior high school	54(8.0)	8(3.6)	11(5.3)	35(14.0)
high school or secondary	153(22.6)	29(13.1)	21(10.2)	103(41.0)
college and above	457(67.4)	184(83.3)	172(83.5)	101(40.2)
Marital status, n (%)				
unmarried	196(28.9)	88(40.0)	51(24.8)	57(22.7)
married	442(65.2)	124(56.1)	141(68.4)	177(70.5)
divorced or widowed	40(5.9)	9(4.1)	14(6.8)	17(6.8)
Menstruation, n (%)				
Yes	82(12.1)	18(8.1)	26(12.6)	38(15.1)
No	596(87.9)	203(91.9)	180(87.4)	213(84.9)
Reproductive history, n (%)				
not pregnant or giving birth	267(39.3)	76(28.5)	71(34.1)	100(37.5)
1 birth	278(41.0)	79(28.4)	69(35.6)	68(24.5)
2 babies	106(15.6)	61(57.5)	45(42.5)	52(49.1)
3 births and above	27(4.0)	5(18.5)	21(77.8)	31(87.1)
Mode of delivery, n (%)				
Not giving birth	237(35.0)	71(32.1)	86(41.7)	80(31.9)
vaginal delivery	340(50.1)	113(51.1)	72(35.0)	155(61.8)
cesarean section	101(14.9)	37(16.7)	48(23.3)	16(6.4)

3.2. The impact of the theCOVID-19 pandemic on the sexual behavior

In general, the forced pandemic-related quarantine life caused a great impact on women's mental health and sexual life. As presented in Table 2, among them, 63.6% of the respondents experienced anxiety during this period, and 58.8% suffered from depression. In the part of sexual life, 68.4% of the respondents reported that the quarantine at home caused a great (more than half of the time) impact on their sexual life, 29.4% respondents said their sexual desire was lower than before, 32.1% indicated their sexual desire had increased, and only a small part (38.5%) said their sexual desire had not been affected by epidemic. We found that the impact of the pandemic on sex is bidirectional, with both positive and negative effects. By analyzing the factors, we found that the increase in sexual desire was mainly because of sufficient time to spend with sexual partners during home isolation (35.1%) and the pressure from life and work were

less than before (38.9%). Other reasons include sufficient recuperation produces plenty of energy, in addition, the excellent performance of sexual partners is also a relatively important reason; For participants with lower desire, the huge psychological pressure (43.4%) and the heavy study(housework) tasks (32.9%) were the main reasons for this phenomenon, and other reasons included gradually lost interest in facing same-sex partners for a long time (6.2%) and the reasons for the sexual partners themselves (18.6%). Apart from this, to our surprise, 53.1% of women used masturbation to meet their sexual needs, and 29.1% through the sex products during the quarantine period. In this study, we also found that 13.7% of the respondents indicated that they had little knowledge about sex, almost nothing, 74.2% of the respondents had a small amount of knowledge about sex, and only 12.1% of women said their knowledge is very sufficient. Among the all respondents, 71.7% believe that their knowledge of sexuality is lacking and want to further study, only 28.2% of women said they have sufficient sexual knowledge and do not need to study anymore.

Table 2
The impact of the COVID-19 pandemic on the sexual behavior(n = 678)

Item	Total (678)	Shanghai (221)	Nanjing (206)	Ningxia (251)
The extent of the impact of home isolation on sexual life, n%				
< 50%	214(31.6)	67(30.3)	81(39.3)	66(26.3)
> 50%	464(68.4)	154(69.7)	125(60.7)	185(73.7)
The extent of the impact of home isolation on sexual behavior, n%				
no impact	199(29.4)	63(28.5)	35(17.0)	101(40.2)
less than before	261(38.5)	64(29.0)	89(43.2)	108(43.0)
more than before	218(32.1)	94(52.5)	82(39.8)	42(16.7)
Reasons for increased sexual behavior during quarantine at home, n%				
spend a lot of time together	238(35.1)	75(34.0)	62(30.1)	101(40.2)
less mental stress	264(38.9)	76(34.4)	80(38.8)	108(43.0)
better energy	105(15.9)	46(20.8)	32(15.5)	27(10.8)
Sexual partner behaves well	71(10.5)	24(10.9)	32(15.5)	15(6.0)
Reasons for decreased sexual behavior during quarantine at home, n%				
great pressure about epidemic	294(43.4)	84(38.0)	72(35.0)	138(55.0)
Heavy study/housework/work tasks	201(29.6)	73(33.0)	68(33.0)	60(24.0)
Losing interest in same-sex partners	88(13.0)	22(10.0)	35(17.0)	31(12.4)
Sexual partner's own factors	95(14.0)	42(19.0)	31(15.0)	22(8.8)
Style of sexuality, n%				
masturbation	163(24.0)	64(29.0)	40(19.4)	59(23.5)
sex products	197(29.1)	56(25.3)	58(28.2)	83(33.1)
paired sexual intercourse	318(46.9)	101(45.7)	108(52.4)	109(43.4)
Sexual Knowledge Reserve, n%				
hardly any	93(13.7)	19(20.4)	26(28.0)	48(51.6)
< 50%, Need further learning	433(74.2)	159(31.6)	103(20.5)	171(47.9)
> 50%, no need to learning	152(12.1)	43(42.7)	77(25.6)	32(31.7)
Do you want to learn more about sexual knowledge and skills ,n%				
Yes	486(71.7)	163(73.8)	139(67.5)	184(73.3)
No	192(28.3)	58(26.2)	67(32.5)	67(26.7)
Anxiety occurs during the epidemic, n%				
Yes	431(63.6)	161(72.9)	129(62.6)	141(56.2)
No	247(36.4)	60(27.1)	77(37.4)	110(43.8)
Depression occurs during the epidemic, n%				
Yes	492(72.6)	173(78.3)	151(73.3)	168(67.0)
No	186(27.4)	48(21.7)	55(26.7)	83(33.0)

3.3 The mean scores of the female sexual function index and prevalence of FSD in different regions

The mean scores of the female sexual function index (FSFI) score and other specific items (desire, arousal, lubrication, orgasm, satisfaction, and pain) are given in Table 3. Analysis of the scores of the female sexual function, measured with the FSFI, showed that, as expected, there are differences in the FSFI total score and each dimension score in the three regions ($P < 0.05$), and Ningxia region scored lower than the other two regions (FSFI: 15.24 ± 4.58 vs 23.38 ± 1.30 & 28.33 ± 2.37 , respectively, and other items as show in Table 3). Further, we conducted statistics on the incidence of FSD and other items in three regions, which, fortunately, were consistent with above scores: we found that there were statistically significant differences in the incidence of various types of sexual dysfunction in the three regions ($P < 0.05$). the overall incidence of FSD was 61.9%, and the incidence in Shanghai, Nanjing, and Ningxia were 60.6%, 75.2%,

and 52.2% respectively (Table 4). Among different types of sexual dysfunction, low sexual satisfaction was the highest (43.8%), sexual arousal difficulty was the second (35.1%), and the incidence of pain during intercourse was the lowest (21.8%), and the incidence of various types of sexual dysfunction in three different regions is shown in Table 4.

Table 3
The mean scores of the female sexual function index (FSFI) score (mean \pm SD)

	Total	Shanghai	Nanjing	Ningxia	F	P
Desire	3.58 \pm 1.22	4.66 \pm 0.74	3.83 \pm 0.6	2.44 \pm 0.60	482.20	0.032
Arousal	3.65 \pm 1.82	4.77 \pm 0.56	3.85 \pm 0.49	2.50 \pm 0.91	638.47	< 0.001
Lubrication	3.76 \pm 1.21	4.82 \pm 0.59	4.00 \pm 0.61	2.63 \pm 1.01	473.38	< 0.001
Orgasm	3.63 \pm 1.20	4.74 \pm 0.61	3.88 \pm 0.56	2.45 \pm 0.87	638.96	0.011
Satisfaction	3.80 \pm 1.21	4.85 \pm 0.59	4.08 \pm 0.59	2.65 \pm 0.99	509.66	0.029
Pain	3.56 \pm 1.15	4.50 \pm 0.86	3.75 \pm 0.63	2.58 \pm 0.93	328.63	< 0.001
FSFI	21.98 \pm 6.38	28.33 \pm 2.37	23.38 \pm 1.30	15.24 \pm 4.58	1024.85	< 0.001
FSFI: Female Sexual Function Index.						

Table 4
Prevalence of different types of sexual dysfunction in different regions(n%)

	Total (678)	Shanghai (221)	Nanjing (206)	Ningxia (251)	F	P
Desire(<3.6)	226(33.3)	97(42.1)	41(19.9)	88(35.1)	141.25	< 0.001
Arousal(<3.6)	238(35.1)	65(29.4)	82(39.8)	91(36.3)	184.37	0.031
Lubrication(<3.9)	171(25.2)	44(19.9)	59(28.6)	68(27.1)	103.24	< 0.001
Orgasm(<4.0)	188(27.7)	56(25.3)	61(29.6)	71(28.3)	99.23	< 0.001
Satisfaction(<4.4)	297(43.8)	104(47.1)	92(44.7)	101(40.2)	83.24	< 0.001
Pain(<4.5)	148(21.8)	51(23.1)	33(16.1)	64(25.5)	142.24	0.026
FSD(FSFI < 26.55)	420(61.9)	134(60.6)	155(75.2)	131(52.2)	95.13	< 0.001
FSD: female sexual dysfunction; FSFI: Female Sexual Function Index.						

3.4 Correlation analysis of the FSD

To assess the risk of FSD, correlation analysis to assess the relationship between variables was performed. After the cause analysis, it was found that the occurrence of FSD was mainly related to marital status ($\beta=-0.633$, $p=0.015$), menopause ($\beta=-0.086$, $p=0.024$), route of delivery ($\beta=-0.087$, $p=0.026$), Childbirth history ($\beta=-0.056$, $p=0.011$), degree of depression ($\beta=-0.942$, $p=0.012$) and anxiety ($\beta=-0.342$, $p=0.038$). Regrettably, job, age stages, education level, and childbirth history are no significant correlation.

Table 5
Correlation analysis of FSD occurrence by logistic regression.

Variable	β	SE	χ^2	p	OR (95%CI)
Job	0.282	0.082	11.810	0.396	1.325(1.12,1.56)
Age stages	-0.001	0.129	0.000	0.996	0.999(0.77,1.29)
Marital status	-0.633	0.261	5.900	0.015	0.531(0.31,0.89)
Education level	-0.215	0.154	1.944	0.163	0.806(0.59,1.09)
whether menopause	-0.086	0.328	0.069	0.024	1.090(0.57,2.04)
Childbirth history	-0.056	0.140	0.160	0.011	1.057(0.80,1.39)
route of delivery	-0.087	0.206	0.180	0.026	0.916(0.61,1.32)
Depression	-0.942	0.513	3.377	0.012	0.361(0.21,0.76)
Anxiety	-0.342	0.438	4.867	0.038	0.534(0.32,0.81)

CI: confidence interval; OR: odds ratio; β : standardized coefficients. S_{β} : standard deviation of the population mean.

3.5 The prevalence of FSD between masturbation and paired sexual in different regions and correlation analysis.

We conducted a separate analysis of this group of women who use masturbation to satisfy their sexual needs, so we divide the participants into masturbation group and paired sexual group. A statistically significant difference was observed between the 2 study groups in three region regard to the prevalence of different types of sexual dysfunction: We found the incidence of desire lower in masturbation group is higher than paired sexual group (Total: 36.9 VS 30.2; Shanghai: 47.1 VS 42.2; Nanjing: 27.6 VS 26.9; Ningxia: 34.4 VS 51.4). Conversely, apart from this, in other items (including Arousal, Lubrication, Orgasm, Satisfaction, Pain and FSFI) masturbation group is lower than paired sexual group ($p < 0.05$). (as shown in Table 6). Through further correlation analysis, we found the same and different risks of FSD between masturbation and paired sexual: age stages, educational level, depression and anxiety are the same reasons to influence the occurrence of FSD, besides, in masturbation participants, style of Sexuality and sexual knowledge reserve are important factors of FSD. Similarly, reproductive history, route of delivery and educational level are independent risk factors in the paired sexual population (all $P < 0.05$ (Table 7).

Table 6
Prevalence of different types of sexual dysfunction about masturbation and paired sexual in different regions(n%)

Item	Total (678)		Shanghai (221)		Nanjing (206)		Ningxia (251)		F	P
	Masturbation (360)	paired sexual (318)	Masturbation (119)	paired sexual (102)	Masturbation (87)	paired sexual (119)	Masturbation (154)	paired sexual (97)		
Desire(<3.6)	133(36.9)	96(30.2)	56(47.1)	43(42.2)	24(27.6)	32(26.9)	53(34.4)	50(51.4)	71.25	0.011
Arousal(<3.6)	99(27.5)	114(35.8)	39(32.8)	33(32.4)	19(21.8)	22(18.5)	41(26.6)	62(63.9)	66.24	0.045
Lubrication(<3.9)	129(35.8)	186(58.5)	31(26.1)	52(51.0)	59(25.3)	71(59.6)	39(25.3)	34(35.1)	112.14	< 0.001
Orgasm(<4.0)	70(19.4)	144(45.3)	19(20.0)	58(56.9)	21(24.1)	84(70.6)	30(19.5)	61(62.9)	38.92	< 0.001
Satisfaction(<4.4)	112(31.1)	166(52.2)	51(42.9)	77(75.5)	17(19.5)	65(54.6)	44(28.6)	59(60.8)	63.27	0.029
Pain(<4.5)	75(20.8)	143(45.0)	18(15.1)	41(40.2)	9(10.3)	35(29.4)	48(31.2)	56(57.7)	66.78	< 0.001
FSD(FSFI < 26.55)	124(34.4)	191(60.1)	34(28.6)	66(64.7)	39(44.8)	86(72.3)	51(33.1)	71(73.2)	295.44	< 0.001

paired sexual in different regions(n%)

FSFI: Female Sexual Function Index.

Table 7
Correlation analysis of FSD occurrence about masturbation and paired sexual by logistic regression.

masturbation					paired sexual								
Variable		β	SE	χ^2	p	OR (95%CI)	Variable		β	SE	χ^2	p	OR (95%CI)
Age stages		-0.290	0.121	5.788	0.016	0.748 (0.59,0.95)	Age stages		-0.163	0.094	2.919	0.031	1.136 (0.13,0.0)
Depression	Yes	-0.479	0.713	1.335	0.022	0.434 (0.33,1.87)	Childbirth history	≥ 1	-0.277	0.466	1.467	0.012	0.565 (0.43,0)
Anxiety	Yes	-0.913	0.662	0.972	0.031	1.626 (0.13,1.24)	Route of delivery	Caesarean section	-0.336	0.412	1.072	0.031	0.224 (0.96,1)
Style of sexuality	masturbation	-0.413	0.135	9.277	0.002	0.662 (0.50,0.86)	Educational level		-0.833	0.220	3.188	0.022	0.551 (0.31,0)
Educational level		-0.147	0.192	0.589	0.043	0.863 (0.59,1.26)	Anxiety	Yes	-0.099	0.219	0.997	0.003	0.461 (0.22,0)
Sexual Knowledge Reserve	> 50%, need to further learning	-0.663	0.112	1.232	0.009	1.681 (0.31,2.12)	Depression	Yes	-0.535	0.339	0.675	0.001	0.868 (0.44,1)

Discussion

During the COVID-19 breakout and after social isolation, several aspects of daily life have dramatically changed. This has had an unprecedented impact on our spiritual lives, including sexual health which we often overlooked. Sexual health is an important part of physical and mental health, with the acceleration of the rhythm of life and the increase of pressure, women's sexual health is faced with many potential threats, which not only causes women physical distress¹⁰, but also imposes a significant psychological burden on them, even threatens the sexual function of male partners³. To date, we found hardly studies from China on female sexual dysfunction have been reported during the COVID-19 epidemic, in addition to this, no one depended masturbation as an independent population to study the incidence of FSD and analyze risk factors.

In this cross-sectional study, we selected the three most representative regions in terms of economy, culture, and educational level in China (ie, Shanghai/Nanjing/Ningxia) for investigation, which can best represent the characteristics of the Chinese population in this regard. We found that the overall incidence of FSD during the new crown epidemic is 61.9%, which is much higher than before the epidemic in China(29.7%)¹¹, and there was a significant difference in the incidence among the three regions ($p < 0.05$), this is because there are regional differences in the occurrence of FSD, and it is closely related to the economic and the education level of residents¹². For example, both Shanghai and Nanjing, the scores or incidence in terms of different types of sexual dysfunction are significantly higher than Ningxia($P < 0.05$), this is because Shanghai and Nanjing are developed regions in China, including economic and educational. Further, we analyzed the factors that may affect the occurrence of FSD and found that the marital status, menopause, mode of production, degree of depression and anxiety are mainly related ($P < 0.05$), which is similar to the results of previous studies¹³, that is, psychological factors are an important cause of FSD. In addition, there are some other factors that are organic lesions of the external genitalia, such as mechanical damage to the pelvic floor¹⁴ and sexual organs caused by prolonged labor during childbirth¹⁵, and the sexual organs such as vagina loss of nutrition and atrophy caused by the decline of sex hormones caused by menopause¹⁶, these causes damage to the normal structure of the vagina, which in turn causes vaginal dysfunction.

The COVID-19 epidemic has had a huge impact on our original family models and relationships^{17,18}. This is mainly due to the panic brought about by the epidemic and the fear of being infected. In our survey, overall, home isolation during the epidemic has brought unprecedented impact on people's lives, and almost more than half of the people reported experiencing anxiety (63.6%) and depression (58.8%) experience during the epidemic, however, a stressful lifestyle is a factor affecting female libido and frequency of sexual intercourse¹⁹. Deng analyzed 31 studies and found that the comprehensive prevalence of depression during the epidemic was 45%, anxiety was 47%, and 34% of people suffered from sleep disorders during this period²⁰. This indicates that mental health during the pandemic is something we should care about broadly, including policy makers and psychologists.

Nevertheless, in the tense atmosphere of the COVID-19 epidemic, the sexual lifestyle has inevitably changed. Through the survey, we found that only a small number (38.5%) of people said that home isolation had no effect on their sexual desire, while most of the respondents (68.4%) said it had a great impact on their sexual life, this effect is more than half of the time, of course, this effect includes both positive and negative. Among the affected people, 29.4% indicated that their sexual desire was lower than before, the reasons for the decrease including the huge psychological pressure by the epidemic, the heavy study and housework tasks during the quarantine period, facing the same sex partner for a long time and sexual partner patient's own factors, which is consistent with Cito's research⁶; 44% of participants reported a decrease in the number of sexual partners and about 37% of participants reported a decrease in sexual frequency²¹; 32.1% of the participants indicated that their sexual desire has increased compared with before, the main reasons are sufficient closely interaction with their sexual partners during the quarantine at home, the pressure from life and work during the quarantine period was less than before, and

other reasons included isolation periods had a high energy and excellent performance of sexual partners. Previous studies have also analyzed the impact of natural and man-made disasters on women sexual behavior.

Before the arrival of the epidemic, most partners were busy with work, people spend very little time getting along and communicating with their partner, and the relationship and emotional communication decreased significantly. Of course, the number of partnered sexual activities also decreased²². When the arrival of the epidemic forced us to isolate at home, it gave them more contact time, which helped them to re-establish intimacy and improve their sexuality¹⁸. A study investigated the impact of the Wenchuan earthquake on women reproductive health and found that the frequency of sexual intercourse, sexual life satisfaction, and desire for children decreased after the earthquake²³. Compared with the earthquake, the psychological trauma caused by the epidemic is a moderate and acceptable process, and it is not as large as the impact of the earthquake. Therefore, in our study, people with increased libido were more than decreased, which indicates that home isolation during the epidemic may promote sexual behavior. However, several similar studies have come to the opposite conclusion: a study on the quality of sexual life of Polish women during the pandemic showed that the sexual dysfunction scores and sexual intercourse frequency were both lower than before²⁴, and another study also examined the impact of the COVID-19 pandemic on female sexuality in Turkish women, and the results also showed the epidemic had a negative attitude on sexual life⁷. In the survey, we found that home isolation makes them no longer tired from their busy work, making them more energetic, which is undoubtedly a better way to promote sexual life. By contrast, this is not entirely the case. 29.4% of the participants indicated that their sexual desire and sexual behavior were lower due to the long-term home isolation made them feel anxious and depressed, besides, they are busier than before, they needed to take care of children, housework, etc., and in addition to facing sexual partners for a long time, these reasons come together made them lost libido. Therefore, during the epidemic, we should properly adjust the law of life and actively intervene in the emotion between husband and wife as much as possible, which will help them better overcome the epidemic and promote family harmony and stability.

For a long time, due to the influence of traditional culture, religious and incorrect sexual guidance, masturbation has been regarded as undeserved and sinful. This phenomenon is more common in countries with relatively backward economic and educational levels²⁵. Because of this, most previous studies have tended to focus on people who have regular paired sexual intercourse, few population-based surveys have included measures of masturbation in their studies. But in real life, masturbation is an important way to meet our sexual needs and is an integral part of normal sexual development²⁶, more seriously, the pandemic is affecting teens' physical, emotional and sexual activity which ignored by us²⁷. A British study found that 86% of men and 57% of women aged 16–44 had masturbate regularly in the past year²⁸. Therefore, in this study, we classified the divorced, widowed or unmarried people who used masturbation for a long time as a single subgroup to observe the impact of the epidemic. We found that among all the respondents, more than half (53.1%) of the participants used masturbation to satisfy their sexual needs, and their masturbation methods included self-stimulation (24.0%) and sexual products (29.1%).

By comparing with sexual intercourse, we found that the incidence of FSD in masturbation people was only 28.6%, apart from desire lower in masturbation group is higher than paired sexual group, conversely, in other items (including Arousal, Lubrication, Orgasm, Satisfaction, Pain and FSFI) masturbation group is lower than paired sexual group (as shown in Table 6). We guessed that compared to masturbation (including the use of sexual products), emotional and attractive sexual partners are more easier to arouse our libido; On the contrary, masturbation can reduce discomfort, and women can easily adjust by themselves, this could be caused by masturbation is more likely to improve the sexual satisfaction of women²⁹. A similar studies also found that women who are satisfied with their sex life seem to be more likely to use masturbation as a complement to perfect sex³⁰. This was also confirmed in our study: the incidence of FSD was lower in the masturbation group than in the paired sexual intercourse ($p < 0.05$), 36.2% of women who have regular paired sexual intercourse also experience masturbation, which further shows that masturbation is not only a compensatory behavior, but an important way to pursue a more perfect sexual experience³⁰. David L has also confirmed that women who combine masturbation stimulation with paired sexual intercourse are more likely to experience orgasm and enhance orgasmic pleasure³¹. In this part, we also found that masturbation and sexual intercourse not only have the same risk factors, but also have their own unique risk factors: age stages, depression and anxiety are the same reasons to influence the occurrence of FSD, these factors appear to be present in all FSD patients^{24,32}, that means ageing and mental health should be closely concerned by us, which may be are effective way to prevent FSD in advance. Besides, in masturbation participants, style of sexuality, job and sexual knowledge reserve are important factors of FSD. Without a doubt, women have more sexual knowledge, they can know how to meet their sexual needs. Similarly, childbirth history, route of delivery and educational level are independent risk factors in the paired sexual population.

Sex education and popularization of sex knowledge are relatively insufficient in developing countries, which may be the biggest potential risk of FSD³³. The present study also demonstrated that among all the respondents, 74.2% of the respondents indicated that they had only a little sexual knowledge and needed further study, 13.7% of the respondents even said that they had no sexual knowledge at all, it means people's sexual knowledge is generally very lack. This is an important factor leading to the prevalence of FSD and affecting the quality of sexual life³⁴. Among the all factors about FSD, the knowledge about sex is probably the mostly worthy of the attention of doctors and the general public, so we should strengthen the publicity and popularization of sexual knowledge in daily life, it may be the most effective way to prevent FSD.

Conclusion

To our research, the COVID-19 epidemic has had a great impact on people's spiritual life and sexual life. This impact has a negative impact on mental health, but for sex life it has both negative and positive effects, which is mainly caused by it is determined by the characteristics of this life mode of home isolation. In addition, we comparatively analyzed the sexual health status and influencing factors of sexual intercourse and masturbation groups during the epidemic, which helps us to care about the sexual health of masturbation population. Finally, we also found that sex knowledge and education are lacking in many women, which may be the root cause of sex unhealthy. And we should pay attention to the importance of sexual health in epidemic, and having a harmonious and stable sex life will help us get through the boring life of isolation.

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Declarations

Author contributions statement

Guangyong Li and Rui He conceived the original idea and funding secured by; Puguang Yu conducted research design, data analysis, and writing the first draft of the paper; Fen Zhang, Yanlong Xu and Gaiyan Zhou undertook the tasks of questionnaire distribution and data recovery; Xuekang Zhan, Shuai Ren, Jiajin Feng and Keming Chen mainly responsible for data collection, Yu Gao worked as data analysis and constructive coaching. Co-first authors of Guangyong Li and Puguang Yu are contributed equally to this work. All authors reviewed the manuscript.

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Competing interests

The authors have no conflicts of interest to declare.

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Data availability statement

The data used to support the findings of this study are included within the article.

Figures

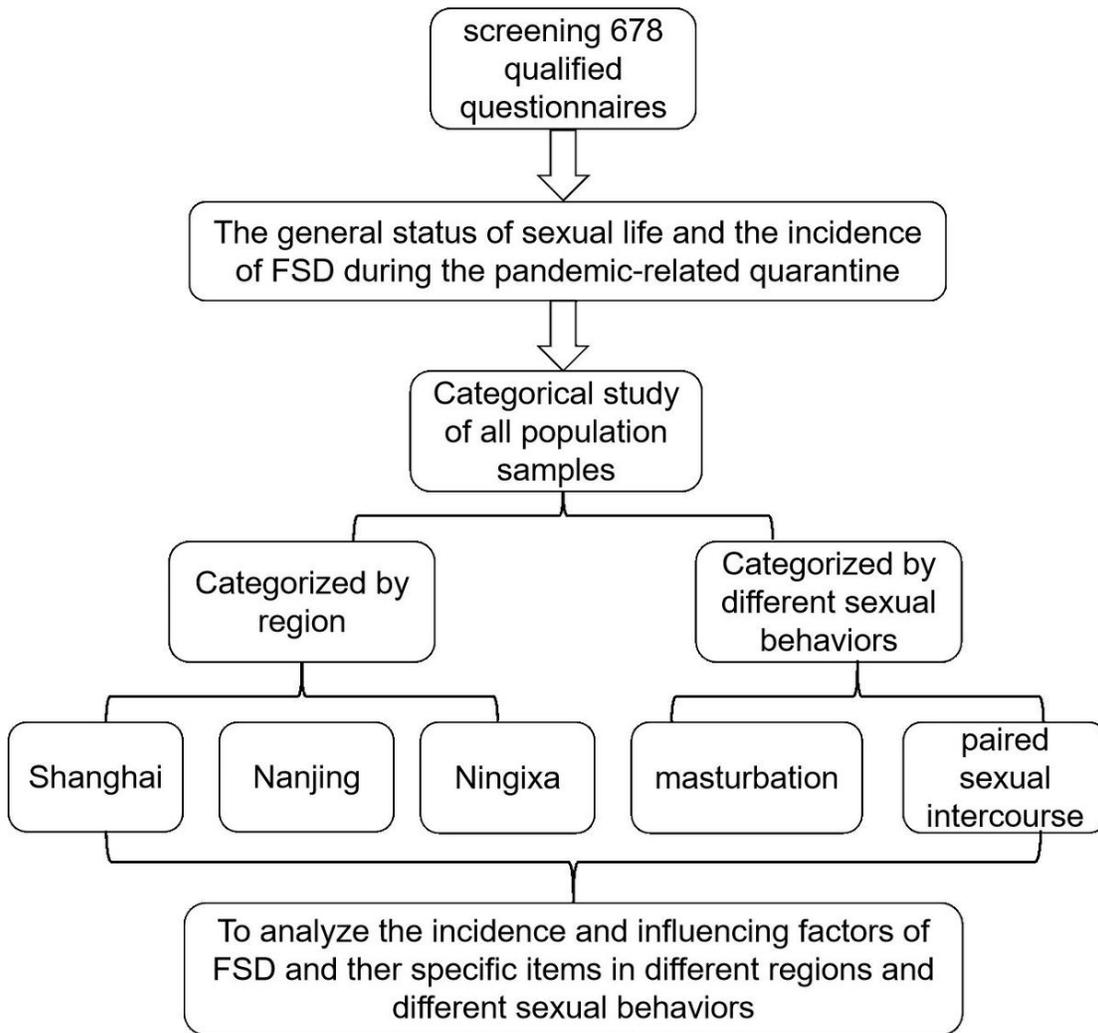


Figure 1

Flowchart from the creation of the process and overview of the investigation. FSD: Female sexual dysfunction