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Relationship between Female Sexual Function and Depression or Anxiety in Japan

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Abstract

Background: Sexual dysfunction is sexual complaints or disorders. There are various causes, but the onset leads to deterioration of relationships and quality of life with partners. There is still a deep-rooted awareness that sexuality is a secret in Japan. **Aim:** This study aims to clarify the relationship between female sexual function and depression or anxiety. **Method:** Four hundred and fifty-eight Japanese healthy women who worked in four randomly selected medical institutions in Okinawa Prefecture in Japan from March to May 2012 were asked to agree to a consent form of their own free will and participate in self-reported questionnaires. For their evaluation, the Female Sexual Function Index (FSFI; Rosen *et al.* 2000, which includes the six domains of desire, arousal, lubrication, orgasm, pain, and satisfaction) and the Kessler Psychological Distress Scale (K6; Kessler, 2002, which includes the following six items: felt nervous, hopeless, restless or fidgety, worthless, depressed, and felt that everything was an effort) was used. Moreover, participants' characteristics showed age, marriage, menopause, annual income, and drinking. In addition, JMP16.2 and R 4.2.0 was used to perform Pearson's chi-square test, Fisher's exact test, Mann-Whitney U test, Kruskal-Wallis test, Steel-Dwass test, Spearman's Rank-Order Correlation, and Cronbach's alpha. This study was approved by the university and the medical institutional review board (IRB). **Results:** 178 women were included in the final analysis, and the median (IQR, interquartile range) was 39 (32 - 48) years old, and the mean ± SD (standard deviation) was 40.2 ± 10.4 years old. The median (IQR) and mean ± SD of FSFI Total Score were 22.0 (9.3 - 26.6) and 19.2 ± 9.6. The median (IQR) and the mean ± SD of K6 Total Score were 3 (0 - 7) and 4.2 ± 4.5. 16% of all women with a K6 Total Score of 10 and more, and 5% of all women with a K6 Total Score of 13 and more considered a serious mental illness. There was no clear association between female sexual function and depression or anxiety in all health worker participants between FSFI Total

Score and K6 Total Score by Spearman's Rank-Order Correlation Coefficient (ρ). However, there was a moderate correlation between the K6 Total Score and the FSFI Total Score in health worker participants with a K6 Total Score of 11 or more (n =19, $\rho = -0.62$, P = 0.005). Moreover, there was a weak correlation between them in both married and drinking women or married and non-menopausal women. In the Mann-Whitney U test where few participants had morbid depression, significant relationships were found in the association between a sexual function with high depression or anxiety, whereas the low group had a K6 cut-off value of 11. **Conclusion:** Female sexual morbidity for high depression or anxiety should be managed with interventions. Especially, the intervention for decreasing female sexual function in the K6 Total Score of 11 or more will be needed, and a randomized study is required for more evidence.

Keywords

Female Sexual Dysfunction (FSD), Female Sexual Function Index (FSFI), Depression, Anxiety, Kessler Psychological Distress Scale (K6)

1. Introduction

Female sexual dysfunction (FSD) is subclassified into disorders of libido, arousal, orgasm, or pain that cause personal distress [1]. It has a detrimental effect on a woman's quality of life and includes a range of disorders; therefore, adequate screening and diagnosis of patients are necessary before appropriate treatment can be commenced [2]. Worldwide, sexual problems are reported by approximately 40 percent of females, and approximately 12 percent (one in every eight females) have a sexual problem associated with personal or interpersonal distress [3]-[8]. However, in the Japanese cultural environment, sexual topics are rarely taken up daily, and there is not much research on the issue of female sexual function. Therefore, even if there are sexual problems in the clinical setting of obstetrics and gynecology, it is difficult for women to express the current situation after childbirth and gynecological surgery.

Depression (major depressive disorder or clinical depression) is a common but serious mood disorder. It causes severe symptoms that affect how they feel, think, and handle daily activities, such as sleeping, eating, or working [9]. The survey found that the prevalence of depression or symptoms of depression in Japan was 7.9% in the pre-pandemic period, based on a 2013 survey, while the rate more than doubled to 17.3% in 2020. As for other countries, depression or symptoms of depression became 3.6 times more prevalent in the United States, rising from 6.6% in 2019 to 23.5% in 2020. Over the same period in Britain, the figure approximately doubled from 9.7% to 19.2%. It is said that depression is especially prevalent among young people, the unemployed, and those with lower economic status [10]. For sexual medicine the relationship between depression and sexual functioning is of major importance since both affective and sexual dis-

orders are highly prevalent, are thought to exhibit a marked co-morbidity, and might even share a common etiology. Furthermore, many men and women suffering from mild, moderate, or severe forms of depression experience sexual dysfunction [11] [12]. Therefore, to improve the QOL of depressed patients, it is desirable to screen for sexual function, and if there is a tendency for sexual dysfunction, treatment, care, and guidance are desired.

In this study, in cooperation with adult women in a privacy-protected environment, we conduct a questionnaire survey to examine the relationship between the sexual function of women by Female Sexual Function Index (FSFI) [13] [14] and depressive disorder or anxiety disorder by Kessler Psychological Distress Scale (K6) [15] [16] [17] [18]. Those questionnaires were developed in Europe and the United States, and reliability and validity are verified worldwide. Finding evidence of a link between decreased sexual function and depression or anxiety can improve relationships with partners and women's quality of life (QOL) after childbirth and after gynecological surgery and in healthy women. Therefore, this study aims to clarify the relationship between female sexual function and depression or anxiety.

2. Methods

2.1. Participants

Eligible participants were health workers (women who look physically healthy), such as nurses, nurses' aides, medical technologists, doctors, and office workers in Japan. Four hundred and fifty-eight workers were identified in four randomly selected medical institutions in Okinawa Prefecture in Japan from March to May 2012. Participants' inclusion criteria were 20 years or older Japanese women with a partner. Moreover, the participant is a person who has received sufficient explanation in participating in this study and, after sufficient understanding, consented to the participants of their own free will. In addition, exclusion criteria for participants were physical or psychological handicaps that might interfere with questionnaire responses, women with a history of diabetes mellitus, hypertension, heart disease, antidepressant, hormone, and replacement therapy.

2.2. Procedure

This study was approved by the Ethics Review Board of the University of the Ryukyus, Chukyo Gakuin University, and medical institutions. Following the Declaration of Helsinki, the study was conducted. The methodology of this study is observational and cross-sectional methods. The self-report questionnaire was distributed to participants. Sexual functions were evaluated with the Female Sexual Function Index (FSFI). Moreover, depression or anxiety was evaluated with the Kessler Psychological Distress Scale (K6).

First, the person in charge of research asked each facility manager/affiliation manager to explain the following. Then, from March to May 2012, the ethics committee approved a consent explanation document and self-administered ques-

tionnaire in advance, and they were distributed by each facility director/affiliation director to the participants in a tightly sealed envelope.

The participants read the consent explanation document, and if they participated in this study, they were asked to fill out the questionnaire after checking the box on the cover of the questionnaire to agree to participate anonymously. If there was no desire to participate in the research, a checkmark was added to disagree, and the questionnaire was not filled in. Instead, the questionnaire was placed in a designated envelope, tightly sealed, and submitted to the set collection bag.

By answering the questionnaire, it is assumed that the participant has consented to participate in the research voluntarily. The consent form stated that it takes about 15 minutes to answer the questionnaire, and the questionnaire was placed in an envelope, sealed, and collected by the facility representative using a two-week retention method. Moreover, envelopes containing anonymous questionnaires would be opened by researchers at the University of the Ryukyus, Obstetrics and Gynecology Laboratory, and the privacy would be protected, and no individual would be identified. Moreover, there would be no disadvantage, even if they did not participate in the research.

Sexual functions were evaluated with the Female Sexual Function Index (FSFI). Depression or anxiety was evaluated with the Kessler Psychological Distress Scale (K6). The FSFI (Rosen *et al.* 2000) has received validity and reliability [13] [14]. The Japanese version of FSFI, translated and verified by the Department of Urology, School of Medicine, Sapporo Medical University was used with permission. The FSFI asks women about their sexual activity during the past month. FSFI provides scores on six domains of sexual function and a total score. The six domains are desire, arousal, lubrication, orgasm, satisfaction, and pain. The scale's total score was obtained by adding up the scores of each domain. The FSFI Total Score range was a minimum of 2 and a maximum of 36, and the higher the score, the higher the sexual function.

The K6 by Kessler, 2002 has received validity and reliability [15] [16] [17] [18]. The Japanese version of K6, which was posted on the website of Harvard Medical School and verified by Furukawa TA, was used. The K6 asks people about their state of mind during the past month. The K6 Psychological Distress Scale provides scores on six items of depression or anxiety and a total score. The six items are feeling nervous, hopeless, restless or fidgety, so depressed that nothing could cheer you up, that everything was an effort, and worthless. The scale's total score was obtained by adding up the scores of each item. The K6 Total Score range was a minimum of 0 and a maximum of 24 using a five-category, and the higher the score, the more depressed and anxious they are. In addition, we asked about age, marriage, menopause, annual income, and drinking as the participant characteristics.

2.3. Analysis

Data were analyzed using JMP (ver. 16.2; SAS Institute Inc., Cary, NC, U.S.). R

(ver.4.2.0) was also used for Fisher's exact test. In Eligible participant characteristics, the observation number and the percentage of all participants are shown by category in each characteristic of age, marriage, menopause, annual income, and drinking. The age presented results are in the median (IQR: interquartile range), range, and mean ± SD (standard deviation). The age variable is also categorized into median age or more and less than the median age. Furthermore, the marriage variable is categorized into married, unmarried, and divorced. In all univariate analyses, the normality test by Shapiro-Wilk was performed, and if the distribution was not normal, a nonparametric analysis method was used. The Kruskal-Wallis tests (rank-sum) were used to compare median ages in these three groups categorized by the marriage variable. Furthermore, the Steel-Dwass test was used to compare median ages in all pairs. Moreover, the menopause variable is classified with or without menopause, and the annual income variable is categorized into incomes of five or more million yen and less than five million yen. Finally, the drinking variable is classified with or without drinking.

The median (IQR) and mean ± SD of FSFI Total Score and K6 Total Score with their Domain or Item Score were revealed in all participants. The Cronbach's alpha coefficient as internal consistency reliability for the FSFI Total Score and the K6 Total Score showed the value of the standardized Cronbach's alpha coefficient when the variance of each item was different. A Cronbach's alpha > 0.70 was considered acceptable, and an alpha > 0.80 was preferred and was considered good reliability. In the category in each characteristic of the age, marriage, menopause, annual income, and drinking, all medians and some mean values for FSFI Total Score and K6 Total Score were revealed. Moreover, Mann-Whitney U tests were analyzed on nonparametric comparisons between FSFI Total Scores or K6 Total Scores in each category in age groups categorized by the median years, menopause, annual income, and drinking. The Kruskal-Wallis tests (rank-sum) were used to compare median FSFI Total Score or K6 Total Scores in three married, unmarried, and divorced groups categorized by the marriage variable. Furthermore, the Steel-Dwass test was used to compare median FSFI Total Score or K6 Total Score in all pairs. The median (IQR) and mean ± SD of FSFI by age were also shown in the text.

Next, in the correlation analysis between the FSFI Total Score and the K6 Total Score, a normality test by Shapiro-Wilk was performed first. Then the relationships between K6 and FSFI in all participants and each group of women with a K6 Total Score of 5 or more were examined using Spearman's rank-order correlation coefficient, as well as the relationship between FSFI Total Score and K6 Total Score in married and drinking or married and non-menopausal women were examined. Regarding the correlation coefficient, with reference to the standards of the Japan Epidemiological Association, the correlation coefficient is always between −1 and 1, and the closer the absolute value of the correlation coefficient is to 1, the stronger the correlation. The correlation coefficient or Spearman's rank correlation coefficient of 0.8 to 1.0 was regarded as a strong correlation, 0.5 to 0.8 was regarded as a moderate correlation, and 0.2 to 0.5 was

regarded as a weak correlation.

Concerning each K6 Total Score in the high and low FSFI groups categorized by the median in FSFI Total Score as the cut-off value, the Mann-Whitney U test was used to determine if differences were significant. In addition, the Mann-Whitney U test and Pearson's chi-square test were used to determine differences in the number of participants in each characteristic between the high and low FSFI groups.

The Mann-Whitney U test was used to determine if differences were significant for each FSFI Total and Domain Score in the high and low K6 groups categorized by the cut-off values in the K6 Total Score. The Mann-Whitney U test and Pearson's chi-square test or Fisher's exact test were used to determine differences in the number of participants in each characteristic between the high and low K6 groups. Furthermore, in each FSFI Total and Domain Score in the high, medium, and low K6 groups categorized by the cut-off values in the K6 Total Score, the Kruskal-Wallis tests (rank-sum) in the three groups and then the Steel-Dwass test on nonparametric in all pairs were used to determine if differences were significant. Fisher's exact were used to determine differences in the number of participants in the characteristics of the three groups. The K6 Total Score cut-off values used above are based on the median, and K6 Total Score cut-off values predicted or diagnosed as depression in previous studies.

Sample size calculation used the EPI-INFO 7.0 statistical package. In planning this research, we estimated that at least 43% of women (by analysis of data from the National Health and Social Life Survey, a probability sample study of sexual behavior in a demographically representative 1992 cohort of US adults) [5] would demonstrate female sexual dysfunction at enrollment. A sample size of at least 168 participants was defined as sufficient for a 43% incidence rate with a statistical power of 80% and a confidence level of 95%. P values < 0.05 were considered significant.

3. Results

3.1. Flowchart of Participant Eligibility

A process of participant data collection is illustrated in **Figure 1**. The final number of eligible participants was 178 (39%) among 458 identified participants who met the inclusion criteria.

3.2. Eligible All Participant Characteristics and the Score of FSFI and K6

The eligible participant characteristics are listed in **Table 1**. All 178 participants' median (IQR, interquartile range) was 39 (32 - 48) years old, and the mean ± SD was 40.2 ± 10.4 years old. Ninety-three (52%) of 178 participants were 39 and over years old, and 85 (48%) were less than 39 years old. One hundred (57%) of 176 participants were married, 47 (27%) were unmarried, and 29 (16%) were divorced. Though there is no list in the table, the median (IQR) and mean ± SD of age in marriage characteristics were 42 (36 - 51) years and 43.4 ± 0.9 in married women, 29 (25 - 38) and 31.6 ± 1.3 in unmarried women, 41 (36.5 - 48) and

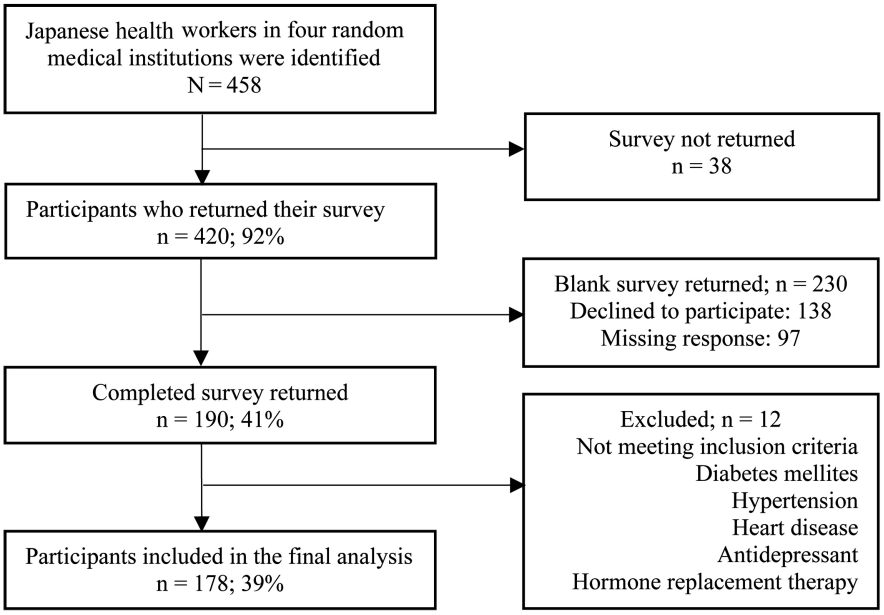

Figure 1. Flowchart of participant eligibility.

Table 1. Eligible participant characteristics and the score of FSFI and K6.

Characteristics		n (%)	FSFI Total Score	*P* value	K6 Total Score	*P* value
Age, y	Median	39	-	-	-	-
	IQR	32 - 48	-	-	-	-
	Range	20 - 66				
	Mean ± SD	40.2 ± 10.4	-	-	-	-
Age*, y	≥39	93 (52)	20.6 (4.7 - 25.7)	0.02	3 (0 - 5.5)	0.10
	<39	85 (48)	23.3 (18.0 - 27.3)		3 (0 - 5)	
Marriage†	Married	100 (57)	20.6 (5.5 - 26)	0.09	3 (0 - 6.8)	0.27
	Unmarried	47 (27)	22.6 (6 - 27.6)		3 (1 - 8)	
	Divorced	29 (16)	23.5 (21.2 - 27.3)		3 (1 - 8.5)	
Menopause*	–	145 (83)	22.4 (13.9 - 27.3)	0.02	3 (0 - 7)	0.69
	+	30 (17)	18.1 (3.6 - 24.1)		3.5 (0 - 8.5)	
Annual income*, yen	<5 million	130 (76)	21.8 (9.3 - 25.7)	0.16	3 (0 - 7)	0.37
	≥5 million	41 (24)	23.2 (13.8 - 28.8)		2 (0 - 7)	
Drinking*	–	76 (43)	21.7 (5.6 - 26)	0.36	2 (0 - 4.8)	0.004
	+	102 (57)	22.1 (15.0 - 27.6)		4 (1 - 8)	

FSFI, Female Sexual Function Index. K6, Kessler Psychological Distress Scale. FSFI Total Score and K6 Total Score show median (IQR). IQR, Inter Quartile Range. SD, Standard Deviation. **P* values are from the Mann-Whitney U test analyzed on nonparametric comparisons between FSFI Total Scores or K6 Total Scores in each category in the variables of age, menopause, annual income, and drinking. †*P* values are from the Kruskal-Wallis tests (rank-sum) analyzed on nonparametric comparisons between FSFI Total Score or K6 Total Score in each category in the variables of marriage.

42.3 ± 1.7 in divorced women (P < 0.01). The median age of unmarried women was significantly lower than the median age of divorced women (P < 0.01) or married women (P < 0.01); however, there was no significant difference in the median age between divorced women and married women (P = 0.63). Regarding menopause, 145 (83%) of 175 participants had menstruation, and 30 (17%) participants were undergoing menopause. Concerning annual income, 130 (76%) of 171 participants had an income of under 5 million yen, and 41 (24%) participants had an income of over 5 million yen. In drinking, 102 (57%) of 178 participants had drunk, and 76 (43%) participants had not.

The FSFI (Female Sexual Index Scale) Total and Domain Scores of all participants are listed in Table 2. The median (IQR) and mean ± SD of the FSFI Total Score of all participants were 22.0 (9.3 - 26.6) and 19.2 ± 9.6. The median (IQR) and mean ± SD of FSFI each Domain Score of all participants were 2.4 (1.8 - 3.6), 2.8 ± 1.1 in desire, 3 (1.2 - 3.9), 2.6 ± 1.8 in arousal, 3.9 (0 - 5.4), 3.5 ± 2.3 in lubrication, 3.6 (0 - 4.4), 3.0 ± 2.1 in orgasm, 3.6 (2.4 - 4.8), 3.7 ± 1.4 in satisfaction, and 4.8 (0 - 6), 3.7 ± 2.5 in pain. The Cronbach's alpha coefficient for the Total FSFI Score was 0.92.

In Table 1, about FSFI Total Score represented for each characteristic of participants, though not listed in the table about mean ± SD except that of all women's age, the median (IQR) and mean ± SD of FSFI Total Score in the high age group of 39 and over or in the low age group of less than 39 were 20.6 (4.7 - 25.7) and 17.7 ± 1.0 or 23.3 (18.0 - 27.3) and 20.9 ± 1.0. Women over 39 years had significantly reduced sexual function (P = 0.02). The median (IQR) and mean ± SD of FSFI Total Score in the menopausal group or the non-menopausal group were 18.1 (3.6 - 24.1) and 15.6 ± 1.7 or 22.4 (13.9 - 27.3) and 19.9 ± 0.80. Menopausal women had significantly reduced sexual function (P = 0.02). Moreover, though not listed in the table, the median FSFI Total Score of married women was significantly lower than the median FSFI Total Score of divorced women (P = 0.02); however, there was no significant difference in the median FSFI Total Score between unmarried women and married women (P = 0.39) or between unmarried women and divorced women (P = 0.32).

Though, not listed in the table also, the median (IQR) and mean ± SD of FSFI Total Score was 24.1 (19.4 - 27.8) and 21.0 ± 9.3 (n = 31) for those in their 20s, 22.4 (17.3 - 26.2) and 20.6 ± 8.3 (n = 60) for those in 30s, 21.8 (5.6 - 27.3) and

Table 2. FSFI (Female Sexual Function Index) Total and Domain Score.

	FSFI Total Score N = 178	FSFI Domain Score N = 178					
		Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain
Median, IQR	22.0, 9.3 - 26.6	2.4, 1.8 - 3.6	3, 1.2 - 3.9	3.9, 0 - 5.4	3.6, 0 - 4.4	3.6, 2.4 - 4.8	4.8, 0 - 6
Mean ± SD	19.2 ± 9.6	2.8 ± 1.1	2.6 ± 1.8	3.5 ± 2.3	3.0 ± 2.1	3.7 ± 1.4	3.7 ± 2.5

FSFI, Female Sexual Function Index. FSFI Total and Domain Score show median, IQR and mean ± SD. IQR, Inter Quartile Range. SD, Standard Deviation. The Cronbach's alpha coefficient for the FSFI Total Score was 0.92.

18.5 ± 10.4 (n = 53) for those in their 40s, 20.3 (4.8 - 26.1) and 17.8 ± 10.3 (n = 27) for those in their 50s, 3.6 (3.6 - 18.4) and 10 ± 8.1 (n = 7) for those in their 60s.

The K6 (Kessler Psychological Distress Scale) Total and Item Score are listed in Table 3. The median (IQR) and the mean ± SD of the K6 Total Score of all participants were 3 (0 - 7) and 4.2 ± 4.5. The median (IQR) and mean ± SD of the K6 each Item Score of all participants were 1 (0 - 2), 1 ± 1.1 in nervous, 0 (0 - 1), 0.4 ± 0.8 in hopeless, 0 (0 - 1), 0.7 ± 0.9 in restless or fidgety, 0 (0 - 2), 0.8 ± 1.0 in so depressed that nothing could cheer you up, 0 (0 - 1), 0.7 ± 0.9 in that everything was an effort, and 0 (0 - 1), 0.5 ± 0.8 in worthless. The Cronbach's alpha coefficient for the Total K6 Score was 0.89.

In Table 1, about K6 Total Score represented for each characteristic of all participants, though not listed in the table about mean ± SD except that of all women's age, the median (IQR) and mean ± SD of K6 Total Score in the drinking group or the non-drinking group were 4 (1 - 8) and 5.1 ± 0.4 or 2 (0 - 4.8) and 3.1 ± 0.5. K6 Total Score was significantly higher in drinking women (P = 0.01).

3.3. Correlation between FSFI Total Score and K6 Total Score

The Spearman's rank-order correlation coefficient (ρ) between FSFI Total Score and K6 Total Score in all participants was −0.08 (P = 0.29) in Table 4. Hence a

Table 3. K6 (Kessler Psychological Distress Scale) Total and Item Score.

	K6 Total Score N = 178	K6 Item Score N = 178					
		Nervous	Hopeless	Restless or fidgety	So depressed that nothing could cheer you up	That everything was an effort	Worthless
Median, IQR	3, 0 - 7	1, 0 - 2	0, 0 - 1	0, 0 - 1	0, 0 - 2	0, 0 - 1	0, 0 - 1
Mean ± SD	4.2 ± 4.5	1 ± 1.1	0.4 ± 0.8	0.7 ± 0.9	0.8 ± 1.0	0.7 ± 0.9	0.5 ± 0.8

K6, Kessler Psychological Distress Scale. K6 Total and Item Score show median, IQR and mean ± SD. IQR, Inter Quartile Range. SD, Standard Deviation. The Cronbach's alpha coefficient for the K6 Total Score was 0.89.

Table 4. Spearman's Rank-Order Correlation Coefficient between FSFI Total Score and K6 Total Score.

	K6 Total Score						
	Total	≥5	≥9	≥10	≥11	≥12	≥13
	n = 178	n = 37	n = 32	n = 28	n = 19	n = 13	n = 9
Spearman's Rank-Order Correlation Coefficient (ρ) with FSFI Total Score	−0.08	−0.26	−0.46	−0.38	−0.62	−0.61	−0.56
*P value	0.29	0.04	0.01	0.046	0.005	0.03	0.12

Female Sexual Function Index. K6, Kessler Psychological Distress Scale. *P values are from Spearman's Rank-Order Correlation Coefficient analyzed on nonparametric comparisons between FSFI Total Score and K6 Total Score.

clear correlation was not observed. However, a weak to moderate correlation was found in the relationship between K6 and FSFI in women with a K6 Total Score of 5, 9, 10, 11, 12 or more. A weak correlation was found in the relationship between K6 and FSFI in women with a K6 Total Score of 5 or more (n = 37, $\rho = -0.26$, P = 0.04), and a moderate correlation was found in women with the K6 Total Score of 11 or more (n = 19, $\rho = -0.62$, P = 0.005). Moreover, the relationship between FSFI Total Score and K6 Total Score of married and drinking or married and non-menopausal women is shown in Table 5.

3.4. K6 Total Score among Two Groups Categorized by the Median in the FSFI Total Score

Each eligible participant was classified as the high group of FSFI Total Score of 22 or more (50%, n = 89) and the low group of FSFI Total Score of less than 22 (50%, n = 89) by the cut-off value of the median FSFI Total Score in Table 6. The results of comparing the characteristics of the participants belonging to each of the two groups were as follows. The median (IQR) age was 37 (30 - 46) years in the high FSFI Total Score group and 42 (34.5 - 51) years in the low FSFI Total Score group. Fifty-four (61%) of 89 participants in the low FSFI Total Score group were 39 years old and over, as were 39 (44%) of 89 participants in the high FSFI Total Score group. In marriage, 57 (65%) of 88 participants in the low FSFI Total Score group were married, as were 43 (49%) of 88 participants in the high FSFI Total Score group. Regarding menopause, seventy-seven (89%) of 87 participants in the high FSFI Total Score group had menstruation, as were 68 (77%) in the low K6 Total Score group. Concerning annual income, sixty-seven (80%) of 84 participants in the Low FSFI Total Score group had less than 5 million yen, as were 63 (72%) in the high FSFI Total Score group. In drinking, 52 (58%) of 89 participants in the high K6 Total Score group had, as were 50 (56%) of 89 participants in the Low FSFI Total Score group. Hence, there was no significant difference in the characteristics of marriage, menopause, annual income, and drinking in the two groups, categorized by the cut-off value of 22 of the median FSFI Total Score except for median age (P = 0.004) and age categorized by median 39 years (P = 0.02).

According to comparing the K6 Total Scores among two groups categorized by a cut-off value of 22 of the median FSFI Total Score, the median (IQR) of K6

Table 5. Spearman's Rank-Order Correlation Coefficient between FSFI Total Score and K6 Total Score in married and drinking or married and non-menopausal women.

Charactaristic	n	FSFI Total Score Mean ± SD	K6 Total Score Mean ± SD	Correlation Coefficient	*P value
Married and Drinking +	53	19.4 ± 9.6	5.6 ± 5.5	−0.36	0.01
Married and Menopose −	79	19.7 ± 9.3	3.6 ± 4.4	−0.25	0.03

FSFI, Female Sexual Function Index. K6, Kessler Psychological Distress Scale. SD, Standard Deviation. *P values are from Spearman's Rank-Order Correlation Coefficient analyzed on nonparametric comparisons between FSFI Total Score and K6 Total Score.

Table 6. K6 Total Score among two groups categorized by the median of the FSFI Total Score n (%).

Characteristics/ K6 Total Score		FSFI Total Score		
		High	Low	
		≥22 n = 89 (50)	22> n = 89 (50)	*P* value
Age†, y	Median IQR	37 30 - 46	42 34.5 - 51	0.004
Age*, y	≥39	39 (44)	54 (61)	0.02
	<39	50 (56)	35 (39)	
Marriage*	Married	43 (49)	57 (65)	0.10
	Unmarried	27 (31)	20 (23)	
	Divorced	18 (20)	11 (13)	
Menopause*	−	77 (89)	68 (77)	0.05
	+	10 (11)	20 (23)	
Annual income*, yen	<5 million	63 (72)	67 (80)	0.26
	≥5 million	24 (28)	17 (20)	
Drinking*	−	37 (42)	39 (44)	0.76
	+	52 (58)	50 (56)	
K6Total Score†	Median IQR	3 0 - 7	3 0 - 8	0.73

FSFI, Female Sexual Function Index; K6, K6 Psychological Distress Scale, IQR, Inter Quartile Range. **P* values are from Pearson's chi-square test analyzed on nonparametric comparisons between the high group of FSFI Total Score of 22 or more and the low group of FSFI Total Score of less than 22 by the cut-off value 22 of the median FSFI Total Score. †*P* values are from the Mann-Whitney U test analyzed on nonparametric comparisons between the high group of FSFI Total Score of 22 or more and the low group of FSFI Total Score of less than 22 by the cut-off value 22 of the median FSFI Total Score.

Total Score was 3 (0 - 7) in the high K6 Total Score group and 3 (0 - 8) in the low K6 Total Score group. Hence, a clear association between female sexual function and depression or anxiety in most health women was not found in the K6 Total Score (P = 0.73). Furthermore, though there is no list in the table, a clear association between female sexual function and depression or anxiety in all K6 per-Item Scores was not found either.

3.5. FSFI Total and Domain Score among Two Groups Categorized by the Cut-Off Value of the K6 Total Score

Each eligible participant was classified as the high group of K6 Total Score of three or more (56%, n = 99) and the low group of K6 Total Score of less than three (44%, n = 79) by the cut-off value of the median K6 Total Score in Table 7.

The results of comparing the characteristics of the participants belonging to

Table 7. FSFI Total and Domain Score among each of two groups by the cut-off value median 3 or 5 of the K6 Total Score n (%).

Characteristics/ FSFI Total Score		K6 Total Score					
		High	Low		High	Low	
		≥3 n = 99 (56)	3> n = 79 (44)	*P* Value	≥5 n = 65 (37)	5> n = 113 (63)	*P* Value
Age†, y	Median IQR	38 30 - 48	41 34 - 48	0.13	36 27.5 - 44.5	41 34 - 49	0.01
Age*, y	≥39	49 (49)	44 (56)	0.41	28 (43)	65 (58)	0.06
	<39	50 (51)	35 (44)		37 (57)	48 (42)	
Marriage*	Married	51 (52)	49 (63)	0.31	31 (48)	69 (62)	0.23
	Unmarried	28 (29)	19 (24)		21 (33)	26 (23)	
	Divorced	19 (19)	10 (13)		12 (19)	17 (15)	
Menopause*	−	79 (81)	66 (85)	0.58	52 (81)	93 (84)	0.67
	+	18 (19)	12 (15)		12 (19)	18 (16)	
Annual income*, yen	<5 million	76 (80)	54 (71)	0.17	48 (79)	82 (75)	0.54
	≥5 million	19 (20)	22 (29)		13 (21)	28 (25)	
Drinking*	−	34 (34)	42 (53)	0.01	19 (29)	57 (50)	0.01
	+	65 (66)	37 (47)		46 (71)	56 (50)	
FSFI Total Score†	Median IQR	21.9 5.4 - 26.5	22.0 14.2 - 27.1	0.51	22.2 5.4 - 27.0	21.8 13.4 - 26.4	0.91

FSFI, Female Sexual Function Index. K6, K6 Psychological Distress Scale. IQR, Inter Quartile Range. **P* values are from Pearson's chi-square test analyzed on nonparametric comparisons between the high group of K6 Total Score of 3 (or 5) or more and the low group of K6 Total Score of less than 3 (or 5) by the cut-off value of the K6 Total Score. †*P* values are from the Mann-Whitney U test analyzed on nonparametric comparisons between the high group of K6 Total Score of 3 (or 5) or more and the low group of K6 Total Score of less than 3 (or 5) by the cut-off value of the K6 Total Score.

each of the two groups are as follows. The median (IQR) age was 38 (30 - 48) years in the high K6 Total Score group and 41 (34 - 48) years in the low K6 Total Score group. Fifty (51%) of 99 participants in the high K6 Total Score group were less than 39 years old, as were 35 (44%) of 79 participants in the low K6 Total Score group. In marriage, 51 (52%) participants in the low K6 Total Score group were married, as were 49 (63%) of 78 participants in the low K6 Total Score group. Regarding menopause, seventy-nine (81%) of 97 participants in the high K6 Total Score group had menstruation, as were 66 (85%) in the low K6 Total Score group.

Concerning annual income, seventy-six (80%) of 95 participants in the high FSFI Total Score group had less than 5 million yen, as were 54 (71%) in the low FSFI Total Score group. In drinking, there was a more significant proportion of participants in the high K6 Total Score group (66%) than in the low K6 Total Score group. Furthermore, there was no significant difference in the characteristics of median age, age divided by median 39 years, marriage, menopause, and

annual income in the two groups, divided by the cut-off value 3 of the median K6 Total Score except for drinking (P = 0.01).

According to comparing the FSFI Total Scores among two groups with a K6 score of 3 or more and less than 3, divided by a cut-off value of the median K6 Total Score, there was no significant difference in the median (IQR) FSFI Total Score of 21.9 (5.4 - 26.5) in the high K6 Total Score group and 22.0 (14.2 - 27.1) in the low K6 Total Score group (P = 0.51). Furthermore, though there is no list in the table, a clear association between female sexual function and depression or anxiety in all FSFI per-Domain Score was not found either.

Each eligible participant was also classified in the high K6 Total Score group and the low K6 Total Score group by a cut-off value of 5 of the K6 Total Score in Table 7. Again, in the result of a comparison of the characteristics of the participants belonging to each of the two groups, there was no significant difference in the characteristics of the age in the two groups divided by median age of 39 years old, marriage, menopause, and annual income in the two groups, categorized by the cut-off value 5 of the K6 Total Score except the median age (P = 0.01) and drinking (P = 0.01).

Furthermore, according to the FSFI Total Scores among two groups with a K6 Score of 5 or more and less than 5, categorized by a cut-off value of the median K6 Total Score, there was no significant difference in median (IQR) FSFI Total Score of 22.2 (5.4 - 27.0) in the high K6 Total Score group and 21.8 (13.4 - 26.4) in the low K6 total score group (P = 0.91). Furthermore, though there is no list in the table, a clear association between female sexual function and depression or anxiety in all FSFI per-Domain Score was not found either.

Moreover, each eligible participant was classified as the high K6 Total Score group and the low K6 Total Score group by the cut-off values 10, 11, 12, and 13 of the K6 Total Score. FSFI Total Score and Domain Scores for each of the two groups categorized by cut-off values with a K6 Total Score of 10, 11, 12, and 13 are shown in Table 8. The proportion of people in the high K6 Total Score group by the cut-off value of 10 was 28 (16%), and only 9 (5%) in the high K6 Total Score group by 13. However, there was no significant difference in the characteristics of age, marriage, menopause, annual income, and drinking in the two groups divided by a cut-off value with a K6 Total Score of 10, 11, 12, and 13. The FSFI Total Score (IQR) with a K6 Total Score of 11 or more was 16 (4.8 - 23.5) instead of 22.2 (14.2 - 27.1) with a K6 Total Score of less than 11. Among participants with a K6 Total Score of 11, 12, 13, or more, a decrease in female sexual function was significantly revealed.

In FSFI Domain Scores for each of the two groups divided by cut-off values with a K6 Total Score of 10, 11, 12, and 13, some of the FSFI Domain Score in the high K6 Total Score group, the decrease in female sexual function was significantly revealed. The decrease in female sexual function in orgasm (P = 0.03) and pain (P = 0.01) was significantly revealed in the high K6 Total Score group by the cut-off value of 10. The decrease in female sexual function in orgasm, satisfaction, and pain was significantly revealed in the high K6 Total Score group

Table 8. FSFI Total and Domain Score in each of the two groups by cut-off value 10, 11, 12, or 13 of the K6 Total Score n (%).

Characteristics/ FSFI Scores		K6 Total Score											
		High	Low	*P* Value	High	Low	*P* Value	High	Low	*P* Value	High	Low	*P* Value
		≥10 n = 28 (16)	10> n = 150 (84)		≥11 n = 19 (11)	11> n = 159 (89)		≥12 n = 13 (7)	12> n = 165 (93)		≥13 n = 9 (5)	13> n = 169 (95)	
Age†, y	Median IQR	39.5 30.5 - 46.3	39 32 - 48	0.72	38 28 - 47	39 32 - 48	0.50	41 34 - 47.5	39 32 - 48	0.70	41 33 - 45.5	39 32 - 48	0.96
Age*, y	≥39	14 (50)	79 (53)	0.84	9 (47)	84 (53)	0.80	7 (54)	86 (52)	1.00	5 (56)	88 (52)	1.00
	<39	14 (50)	71 (47)		10 (53)	75 (47)		6 (46)	79 (48)		4 (44)	81 (48)	
Marriage‡	Married	14 (50)	86 (58)	0.58	9 (47)	91 (58)	0.62	9 (69.2)	91 (55.8)	0.67	7(78)	93 (56)	0.41
	Unmarried	8 (29)	39 (26)		6 (32)	41 (26)		2 (15.4)	45 (27.6)		2 (22)	45 (27)	
	Divorced	6 (21)	23 (16)		4 (21)	25 (16)		2 (15.4)	27 (16.6)		0 (0)	29 (17)	
Menopause*	–	21 (75)	124 (84)	0.27	14 (74)	131 (84)	0.33	10 (77)	135 (83)	0.47	7 (78)	138 (83)	0.65
	+	7 (25)	23 (16)		5 (26)	25 (16)		3 (23)	27 (17)		2 (22)	28 (17)	
Annual income*, yen	<5 million	21 (84)	109 (75)	0.45	12 (75)	118 (76)	1.00	7 (70)	123 (76)	0.70	4 (57)	126 (77)	0.36
	≥5 million	4 (16)	37 (25)		4 (25)	37 (24)		3 (30)	38 (24)		3 (43)	38 (23)	
Drinking*	–	9 (32)	67 (45)	0.30	7 (37)	69 (43)	0.63	4 (31)	72 (44)	0.40	1 (11)	75 (44)	0.08
	+	19 (68)	83 (55)		12 (63)	90 (57)		9 (69)	93 (56)		8 (89)	94 (56)	
FSFI Total Score†	Median IQR	16.3 4.2 - 25.9	22.3 15.9 - 27.0	0.08	16 4.8 - 23.5	22.2 14.2 - 27.1	0.04	5.4 3.6 - 21.1	22.3 13.9 - 27.2	0.004	5.4 3.6 - 18.4	22.3 13.9 - 27	0.002
FSFI Domain Score†	Desire	2.7 1.2 - 3.6	2.4 2.3 - 3.6	0.63	3 1.2 - 3.6	2.4 1.8 - 3.6	0.71	2.4 1.2 - 3.3	2.4 1.8 - 3.6	0.19	2.4 1.2 - 3.3	2.4 1.8 - 3.6	0.19
	Arousal	2.1 0 - 3.8	3 1.4 - 3.9	0.22	1.5 0 - 3.6	3.0 1.2 - 3.9	0.14	0 0 - 3.2	3.0 1.2 - 3.9	0.01	0 0 - 3	3.0 1.2 - 3.9	0.01
	Lubrication	3.5 0 - 5.4	4.2 2.4 - 5.4	0.13	3.3 0 - 4.5	4.2 2.1 - 5.4	0.07	0 0 - 4.5	4.2 2.0 - 5.4	0.02	0 0 - 3.9	4.2 2.0 - 5.4	0.01
	Orgasm	0.6 0 - 4.4	3.6 2 - 4.4	0.03	0 0 - 3.6	3.6 1.2 - 4.4	0.01	0 0 - 3.0	3.6 1.2 - 4.4	0.002	0 0 - 1	3.6 1.2 - 4.4	0.001
	Satisfaction	2.4 2.4 - 4.2	3.6 2.4 - 4.8	0.051	2.4 2.4 - 3.6	3.6 2.4 - 4.8	0.01	2.4 2.4 - 3.6	3.6 2.4 - 4.8	0.004	2.4 2.4 - 3	3.6 2.4 - 4.8	0.007
	Pain	3.6 0 - 4.8	4.8 1.2 - 6	0.01	3.6 0 - 4.8	4.8 0 - 6	0.01	0 0 - 4.6	4.8 0 - 6	0.02	0 0 - 3.6	4.8 0 - 6	0.003

FSFI, Female Sexual Function Index. K6, K6 Psychological Distress Scale. IQR, Inter Quartile Range. **P* values are from Fisher's exact test analyzed on nonparametric comparisons between the high group of K6 Total Score of 10 (or 11, 12, and 13) or more and the low group of K6 Total Score of less than 10 (or 11, 12, and 13) by the cut-off value 10 (or 11, 12, and 13) of the median K6 Total Score. †*P* values are from the Mann-Whitney U test analyzed on nonparametric comparisons between the high group of K6 Total Score of 10 (or 11, 12, and 13) or more and the low group of K6 Total Score of less than 10 (or 11, 12, and 13) by the cut-off value 10 (or 11, 12, and 13) of the median K6 Total Score.

by the cut-off values 11, 12, and 13 of the K6 Total Score.

3.6. FSFI Total and Domain Score among Three Groups Categorized by the Cut-Off Value of the K6 Total Score

Furthermore, each eligible participant has classified as the high K6 Total Score

group, the medium K6 Total Score group, and the low K6 Total Score group by the cut-off value 5, 13 of the high K6 Total Score: K6 Total Score 13 and more (n = 9, 5%), the medium K6 Total Score group: less than 13 and 5 and more (n = 56, 31%), and the low K6 Total Score group: less than 5 (n = 113, 63%). The FSFI Total Score and Domain Scores for each of the three groups divided by cut-off values with a K6 Total Score of 5 and 13 were shown in Table 9.

There was no significant difference in the characteristics of the age in the two groups divided by median age of 39 years old, marriage, menopause, and annual income in either of the three groups except for the median age (P = 0.03) and drinking (P = 0.01).

Furthermore, though there is no list in the table, the breakdown of the age groups of participants with a K6 Total Score of 13 or more was 1 in the 20s, 3 in 30s, 4 in 40s, and 1 in 60s, for a total of 9 participants. Of these, one in the 30s and one in the 60s were menopausal women, while the other seven had not reached menopause.

In the high K6 Total Score group of 13 and over, the medium K6 Total Score group of less than 13 and 5 or more, and the low K6 Total Score group of less than five, the decrease of female sexual function in Total and Domain Score except for desire (P = 0.20) were revealed to be significant among the three groups. However, according comparing the K6 Total Scores among two groups with the medium K6 Total Score group of less than 13 and 5 or more and the low K6 Total Score group of less than 5, there was no significant difference in median (IQR) FSFI Total Score (P = 0.63), and all per- Domain Score were not also significant between them.

4. Discussion

Our study evaluated female sexual function using a validated questionnaire (FSFI) and depression or anxiety using a validated questionnaire (K6) to clarify the relationship between female sexual function and depression or anxiety for healthy workers of medical institutions. A clear association was not seen between female sexual function and depression or anxiety by correlation coefficient in all participants. However, there was a moderate correlation between the K6 Total Score and the FSFI Total Score in healthcare worker participants with a Total K6 Score of 11 or more by Spearman's Rank-Order Correlation Coefficient. Furthermore, significant relationships were found in the association between a sexual function with high depression or anxiety, whereas the low group had a K6 cut-off value of 11 in the Mann-Whitney U test.

In the eligible participant characteristics, the median and mean of age and the FSFI Total Score by all participants was 40.2 years and 22.0, and the mean was 19.2 in this study. According to a study by Rosen R *et al.* 2000, the mean (±SD) ages of the female sexual arousal disorder (FSAD) group (N = 128) and control group (N = 131) were 40.5 ± 12.98 years and 39.7 ± 13.15 years and the mean of the FSFI Total Score was 19.2 ± 6.63 (n = 126) in FSAD group, and 30.5 ± 5.29

Table 9. FSFI Total and Domain Score in each of the three groups by cut-off value 5 and 13 of the K6 Total Score n (%).

Characteristics/ FSFI Scores		K6 Total Score						
		High	Medium	Low	*P* value			
		[a]≥13 n = 9 (5)	[b]13>, ≥5 n = 56 (31)	[c]5> n = 113 (63)	a vs b	a vs c	b vs c	*P* value
Age‡†, y	Median	41	35.5	41	0.38	0.59	0.01	0.03
	IQR	33 - 45.5	27 - 44.5	34 - 49				
Age*, y	≥39	5 (56)	23 (41)	65 (58)	0.48	1.00	0.051	0.13
	<39	4 (44)	33 (59)	48 (43)				
Marriage*	Married	7 (78)	24 (43.6)	69 (62)	0.13	0.53	0.09	0.13
	Unmarried	2 (22)	19 (34.6)	26 (23)				
	Divorced	0 (0)	12 (21.8)	17 (15)				
Menopause*	−	7 (78)	45 (82)	93 (84)	0.67	0.64	0.82	0.74
	+	2 (22)	10 (18)	18 (16)				
Annual income*, yen	<5 million	4 (57)	44 (81)	82 (75)	0.16	0.38	0.43	0.27
	≥5 million	3 (43)	10 (19)	28 (25)				
Drinking*	−	1 (11)	18 (32)	57 (50)	0.26	0.03	0.03	0.01
	+	8 (89)	38 (68)	56 (50)				
FSFI Total Score‡†	Median IQR	5.4 3.6 - 18.4	23.7 16.0 - 27.7	21.8 13.4 - 26.4	0.01	0.01	0.63	0.01
FSFI Domain Score‡†	Desire	2.4 1.2 - 3.3	3.0 2.0 - 4.2	2.4 1.8 - 3.6	0.27	0.50	0.43	0.20
	Arousal	0 0 - 3	3.3 1.3 - 4.5	3.0 1.2 - 3.6	0.03	0.04	0.38	0.02
	Lubrication	0 0 - 3.9	4.5 3.1 - 5.7	3.9 1.5 - 5.4	0.01	0.03	0.48	0.01
	Orgasm	0 0 - 1	3.6 1.4 - 4.4	3.6 1.2 - 4.4	0.005	0.004	1.00	0.005
	Satisfaction	2.4 2.4 - 3	3.6 2.4 - 4.8	3.6 2.4 - 4.8	0.02	0.02	0.97	0.02
	Pain	0 0 - 3.6	4.8 0 - 5.9	4.8 0 - 6	0.02	0.01	0.61	0.01

FSFI, Female Sexual Function Index. K6, K6 Psychological Distress Scale. IQR, Inter Quartile Range. **P* values are from Fisher's exact test analyzed on nonparametric comparisons among [a]the high group of K6 Total Score of 13 or more, [b]the medium group of K6 Total Score of less than 13 and 5 and more, and [c]the low group of K6 Total Score of less than five by the cut-off value five and 13 of the K6 Total Score. †*P* values are from Kruskal-Wallis tests (rank-sum) analyzed on nonparametric comparisons among [a]the high group of K6 Total Score of 13 or more, [b]the medium group of K6 Total Score of less than 13 and 5 and more, and [c]the low group of K6 Total Score of less than five by the cut-off value 5 and 13 of the K6 Total Score. ‡*P* values are from Steel-Dwass test analyzed on nonparametric for all pair groups of [a]the high group of K6 Total Score of 13 or more, [b]the medium group of K6 Total Score of less than 13 and 5 and more, and [c]the low group of K6 Total Score of less than five by the cut-off value 5 and 13 of the K6 Total Score.

(n = 129) in the normal control group, respectively [13]. The mean of FSFI of the participants in this study was the same as the mean of the FSAD group in this previous study. Furthermore, the cut-off value proposed by Wiegel *et al.* was 26.55 [19]. Even in comparison with that, the sexual function of Japanese health workers seems to be low on average.

In other research, the FSFI Total Score average of 1,034 healthy women aged 20 to 79 was 14.6, 21 for those in their 20s, 17.4 in their 30s, 16.4 for those in their 40s, 13.1 for those in their 50s, 10.9 for those in their 60s, and 9.8 for those in their 70s [20] [21]. These sexual functions of the FSFI Total Score of all participants and the sexual function in the 30s, 40s, and 50s were lower than that of the same ages in our study; however, that was nearly the same as our result in 20s, 60s. There was no significant difference in median FSFI Total Score between divorced and married women. However, divorced women had significantly higher FSFI Total Score than married women. In Japan, middle-aged and older adults' sexuality has indicated that couples are becoming increasingly sexless [22]. Sexual life is no longer emphasized in married life; hence there may be a tendency to enjoy sex outside of marriage. In the situation where men and women are equal without marriage, it can be inferred that women naturally enjoy sexual life and open the way for couples to have sex.

In the Mental Health among Middle-aged and Older Adults-Evidence from a Nationwide Panel Survey in Japan, the mean value of K6 in middle-aged women aged 50 to 59 years was 3.43 (n = 13,876) [23]. In our study, all participants' mean K6 Total Score was 4.3. Therefore, although the target age classes of both studies are different, our study respondents are considered to have a more emotional burden. In another study on the relationship between teachers' busyness, mutual benefit and trust between teachers, and mental health, the average K6 Total Score of teachers (n = 113) at all eight public junior high schools in two cities Shizuoka Prefecture, Japan, was 4.5. Moreover, the percentage of those teachers with a K6 Total Score of 5 or higher was 42.5% [24]. The mean K6 Total Score of the teachers at public junior high schools in the previous study was similar to that in this study.

Moreover, according to the Comprehensive Survey of Living Conditions in the 2012 Ministry of Health, Labor and Welfare (MHLW), the percentage of people aged 20 and over with a K6 Score of 10 or more feel psychological distress equivalent to mood disorders and anxiety disorders, and here is no change in the number of persons, 10.4% in 2010, 10.5% in 2016, and 10.3% in 2019 in Japan. On the other hand, 16% of women with a K6 Total Score of 10 and more were higher, and 5% of all women with a K6 Total Score of 13 and more considered a serious mental illness in our study. As a national policy concerning the decrease in the percentage of individuals who suffer from mood disorders or anxiety disorders in MHLW's "Comprehensive Survey of Living Conditions," the target value with a K6 Total Score of 10 and more is 9.4% in 2022 [25] [26].

According to one CDC (Center for Disease Control and Prevention) report,

which surveyed adults across the U.S. in 2020, 31% of respondents reported symptoms of anxiety or depression during the COVID-19 Pandemic [27]. Another survey involved medical healthcare workers (n = 848) at the Japanese Red Cross Medical Center (Tokyo, Japan) in 2020; 10.0% developed a moderate-to-severe anxiety disorder, and 27.9% developed depression [28]. Hence, for employees with a high K6 value, the workplace must review the work style and contents to reduce stress and provide psychological support for improving living conditions such as sleep.

A clear association was not seen between female sexual function and depression or anxiety by correlation coefficient in all participants. However, a weak to moderate correlation was found in the relationship between K6 and FSFI in women with a K6 Total Score of 5, 9, 10, 11, 12 or more. In the previous study of the prevalence and types of sexual dysfunction in depressed women patients (n = 135, the mean age 32) and comparing them with non-depressed women (n = 135, the mean age 32), the mean FSFI rating scale score was 27.79 ± 3.38 in cases. On the other hand, it was 31.09 ± 3.65 in controls ($P < 0.001$), hence, the study sample mainly contained patients with mild and moderate depression, and women with depression had significantly higher sexual dysfunction [29]. The results of this previous study support our findings. There is no previous study in Japan showing a relationship with sexual function using the K6. In addition, it will also be necessary to verify the relationship between sexual function and depression or anxiety using a scale other than FSFI in the future.

In the previous studies' findings, the K6 cut-off values of psychological distress are 5 [30] [31] [32] [33], 9 [34], 10 [35], 13 [18] [36] [37] [38] [39], 5 and 13 [40] [41], 9 and 13 [42], respectively. Therefore, based on the results of these previous studies, the cut-off values in this study were set and analyzed the FSFI Total Score and Domain Scores among the two groups of the K6 high group and K6 low group or the three groups of the K6 high group, K6 medium group and K6 low group by these cut-off values.

For the participants with a K6 Total Score of 11, 12, 13, or more, a decrease in female sexual function was significantly revealed. There may also be an impact due to the small number, and proportion of participants considered a serious mental illness in the whole participants. Therefore, the intervention for decreasing female sexual function in women with a K6 Total Score of 11 or more will be needed. According to our study, in the high K6 Total Score group of 13 and over, the female sexual function in Total and Domain scores except desire was significantly reduced. In the breakdown of the age groups of participants with a K6 Total Score of 13 or more, 7 of the 40s and less for 9 participants had not reached menopause. Therefore, women with a K6 screening of 13 or more considered a serious mental illness might also need to be screened for sexual function to address depression or anxiety and improve quality of life with appropriate treatment and counseling for FSD. In the previous study of the prevalence of sexual dysfunction in females with recurrent depressive disorder, women with depression have a high prevalence of sexual dysfunction. However, a significant

improvement in depression and sexual functioning was observed at the end of 6 weeks of antidepressant therapy [43].

Finally, in this study, each internal consistency reliability was measured by Cronbach's alpha coefficient of both FSFI and K6 was high enough to be comparable with previous reports [13] [35] [44]. Regarding the study's limitations, this survey showed the results of a specific population in a limited area targeting health workers belonging to four medical facilities in Okinawa Prefecture. Therefore, further large-scale research is required to generalize the evidence. The participants of this study were assumed to be physically healthy women to investigate the proportion of women who work without recognizing that they are depressed daily and to find out the state of sexual function compared with health workers in the same group. At the time of the survey in 2012, no study in the past investigated anxiety or depression using K6 in health workers in medical facilities in our country, so we decided to use K6.

In the future, more evidence from a randomized control test to compare the sexual function of women who have been diagnosed with depression with health workers will be needed. Moreover, appropriate treatment and care are required to screen for sexual function before and after treatment for depression. Sexually dysfunctional patients should be needed screening for symptoms of depression. Since improvements in sexual functioning consistently belong to the most significant predictors of depression remission, adequate treatment of sexual functioning should be an integral component of therapy for all depressed women.

5. Conclusion

In this study, a clear relationship between female sexual function and depression or anxiety in most health workers was not revealed among the participants. However, there was a moderate correlation between the K6 Total Score and the FSFI Total Score in healthcare worker participants with a Total K6 Score of 11 or more by Spearman's Rank-Order Correlation Coefficient. Furthermore, significant relationships were found in the association between a sexual function with high depression or anxiety, whereas the low group had a K6 cut-off value of 11 in the Mann-Whitney U test. Hence, female sexual morbidity for high depression or anxiety should be managed with interventions.

Authors' Contributors

Yuko Harding: participated in the conception and design, analysis, and interpretation of data, drafting the article, revising it for intellectual content, and final approval of the finished article.

Shinichiro Ueda: participated in the conception and design, revising it for intellectual content, and final approval of the finished article.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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