


ORIGINAL RESEARCH

Testosterone and sexual function in menopausal women based on the Female Sexual Function Index (FSFI) score

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Article Info	ABSTRACT
<p>Received Mar 16, 2023 Revised Apr 10, 2023 Accepted May 1, 2023 Published Aug 1, 2023</p> <p>*Corresponding author: Edy Ardiansyah easa_dy@yahoo.com</p> <p>Keywords: Testosterone Female Sexual Function Index Sexual function Duration of menopause</p> <p>This is an open access article under the CC BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)</p> 	<p>Objective: This research aimed to analyze the correlation between testosterone levels and sexual function in postmenopausal women.</p> <p>Materials and Methods: This research was a descriptive observational study with a case series approach conducted at Aras Kabu Health Center Outpatient Polyclinic from May to August 2022. The normality test was carried out using the Shapiro-Wilk test. If the data were not normally distributed, data would be analyzed using the Spearman correlation test. If the data were normally distributed, the data analysis would use the Pearson correlation test.</p> <p>Results: There was a significant relationship between Female Sexual Function Index (FSFI) score with testosterone levels and duration of menopause with $p < 0.05$. The degree of correlation found was 0.619 between testosterone levels and FSFI scores, indicating a moderate and significant positive correlation. A correlation degree of 0.482 was found between FSFI and length of menopause which indicated a significant moderate positive correlation, while the degree of correlation between testosterone levels and length of menopause was found to be 0.711, showing a strong and significant positive correlation.</p> <p>Conclusion: There is a significant relationship between FSFI scores with testosterone levels and duration of menopause as well. There was also a significant relationship between testosterone levels and the duration of menopause.</p>

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Highlights:

1. Testosterone level correlates with FSFI score, showing that sexual function correlates with hormonal physiology.
2. FSFI is a valid and useful tool in measuring sexual function.

INTRODUCTION

Menopause is a natural phase in a woman's life which is marked by the end of the menstrual cycle and the fertile period, which occurs because the ovaries do not produce estrogen. The cessation of menstruation is caused by estrogen deficiency and is not related to pathological conditions.¹ It is predicted that by 2030, there will be 1.2 billion women aged 50 years and over and of these, 76% will live in developing countries. More than 50% of middle-aged women often experience symptoms associated with menopause.²

Decreased libido refers to a reduced desire to have sex. Apart from decreased libido, other symptoms, such as vaginal dryness, hot flushes, and urinary incontinence can also occur in postmenopausal women. Low libido is the most common sexual problem found in women. Hormones are rarely the only factor involved in this problem. Other factors, such as physiological, social and environmental factors are thought to play a role in the occurrence of the disorder.^{3,4} These may include relationship problems, psychological factors, side effects of common drugs, such as antidepressants, or a health problem such as diabetes. Decreased libido or sexual desire can be found throughout a woman's reproductive life and is a response to a number of complex stimuli, including psychological, psychosocial, relationship and physical health.⁵

Heidari et al. tried to see the relationship between menopause and libido assessed in a systematic review. The results found that there was an influence between menopause and decreased libido with figures starting from 21-70% from various related studies.⁶ One of the hormones known to involve in sexual function is testosterone. Testosterone production in premenopausal women is estimated to be around 0.2-0.25 mg/day. In a European study, decreased libido becomes more common as women age, with a prevalence of 11% in women aged 20-29 years and 53% in women aged 60-70 years. Hypoactive sexual desire disorder, which is defined as reduced sexual desire, is more or less equal across age categories (6-13% of women aged 20-70 years).⁷ There are no clear indications for testosterone therapy for postmenopausal women. Nonetheless, some clinicians have administered testosterone for decades, with the goal of reducing a variety of symptoms, with uncertain benefits and risks. However, previous research has shown an improvement in symptoms and sexual satisfaction with the use of testosterone over a 24-week study period.⁸ Although there are some data for the use of physiologic doses of testosterone in the postmenopausal population for the treatment of hypoactive sexual desire disorder, in practice Dunsmoor et al. noted a lack of basic understanding of the

physiology of testosterone in women, a lack of diagnostic tests for low libido, and a lack of a research base to support safe practice in the benefit of giving testosterone in menopausal women.⁵

Research into the relationship between serum testosterone levels and sexual desire and function is now important and should be preceded by careful evaluation of sexual pain, psychological distress, altered body image, relationship factors, as well as sleep and fatigue problems, all of which can increase in the menopausal transition period.⁵ Therefore, through this study, the authors attempted to assess sexual function by considering external factors and assess the relationship between testosterone hormone levels and sexual function in menopausal women.

The Female Sexual Function Index (FSFI) is a brief multidimensional scale for assessing sexual function in women. The scale has received initial psychometric evaluation, including studies of reliability, convergent validity, and discriminant validity. In principle, FSFI consist of several domains such as desire, arousal, lubrication, orgasm, satisfaction, and pain. Research to acknowledge its validity has been performed and its validity can be concluded to have been proven by multitude of research. In Indonesia, the translation of FSFI has been deemed sufficient, valid and reliable.²¹

MATERIALS AND METHODS

This was a descriptive observational study using a case series approach to analyze the correlation between testosterone levels and sexual function in postmenopausal women. The ethical clearance of this study had been issued by Ethical Committee of Medical Research, Faculty of Medicine, University of Sumatra Utara in a letter number 946/KEPK/USU/2022. The process of filling out the questionnaire carried out at the UPT Aras Kabu Polyclinic Outpatient Installation, while blood tests were carried out at the Prodia S. Parman Medan Clinic Laboratory from May to October 2022. The research sample was menopausal women who came for treatment at the UPT Puskesmas Aras Kabu who met the inclusion and exclusion criteria and had signed the consent forms. To facilitate analysis, this study recruited at least 20 patients.

The inclusion criteria in this study were age over 51 years, have stopped menstruating permanently for at least 12 months, married or still having sexual partners, no history of using hormonal contraception, and no history of gynecological surgery. In addition, the exclusion criteria in this study were sudden refusal to participate, taking drugs that can interact directly or

indirectly with androgen hormones, having severe systemic diseases, such as kidney failure, type 2 diabetes mellitus, heart failure, hepatitis, etc. and having psychological disorders.

Respondents were collected and explained about the procedure for filling out the FSFI scoring form that had been used by previous researchers and had been validated. The respondents immediately filled out the scoring form once they understood how to fill it. Then, the blood sample was taken from the respondents for free testosterone levels by using the methods of liquid chromatography (LC) and mass spectrometry (LC-MS/MS) tests.

The normality test results used the Shapiro-Wilk test, indicating that the data were not normally distributed, so the data were analyzed using the Spearman correlation test. This study used a 95% confidence level, and a $p < 0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

This research involved 20 menopausal women of over 51 years old and met the inclusion criteria. The mean age of the sample at menopause was 48.9 ± 2.713 years, with duration of menopause up to the time of the study was 3.8 ± 2.764 years. After completing the FSFI questionnaire, it was found that the average FSFI score in the sample was 22.86 (5.19). In addition, after examining free testosterone levels in the laboratory, it was seen that the average testosterone level in the study sample was $1.05 \text{ pg/ml} \pm 0.67$.

Table 1. Characteristics of research subjects

Characteristics	Mean \pm SD
Age (years)	52.65 ± 1.755
Age at menopause (years)	48.9 ± 2.713
Duration of menopause (years)	3.8 ± 2.764
Coitus frequency (every month)	3.45 ± 2.743
Height (cm)	153.25 ± 9.635
Body weight (kg)	61.35 ± 9.377

Table 2. Average FSFI score and free testosterone levels in the sample

	Mean \pm SD	Md (min-max)
Female Sexual Function Index	22.86 ± 5.19	22.895 (10.7 – 34.1)
Testosterone levels	1.05 ± 0.67	1.695 (0.16 – 3.23)

After the Shapiro-Wilk test was carried out, it was found that the value of testosterone levels had an abnormal distribution along with the duration of menopause. However, the total FSFI scores were found to be normally distributed. Because the two independent variables were not normal, the Spearman correlation test was carried out.

Table 3. Correlation between Female Sexual Function Index with testosterone levels, menopause and duration of menopause.

	r value	p value
Testosterone vs FSFI	0.619	0.004
FSFI score vs menopause duration	0.482	0.031
Testosterone vs menopause duration	0.711	0.000

Those data showed significant relationship between testosterone levels, FSFI scores and menopausal duration ($p < 0.05$). The degree of correlation of 0.619 was found between testosterone levels and FSFI scores, indicating a moderate and significant positive correlation. The degree of correlation of 0.482 was found between FSFI and length of menopause, indicating moderate and significant positive correlation. The degree of correlation between testosterone levels and length of menopause was found to be 0.711, showing a strong and significant positive correlation.

The demographic characteristics of the patients in this study based on age were 52.65 ± 1.75 with age at menopause being 48.9 ± 2.713 . The menopausal age range of the Indonesian population found in this study was almost similar to that of the population study conducted by Yang et al. in 2017 in China with a total of 134,010 female subjects having the age at menopause at the age of 48.6 years [$SD = 4.0$] and the total reproductive years was 32.7 years.⁹ Another study conducted in India also identified that the age of 46.2 ± 4.9 years is the age of natural menopause in India. Indian women started the perimenopausal stage, characterized by irregular menstruation, at the age of 44.69 ± 3.79 years.¹⁰

In this study, the mean score of FSFI in postmenopausal women was 22.86. A previous cross-sectional study conducted at Assiut University Hospital, with a sample of 500 women who took part in a survey of the Arabic version of the Female Sexual Function Index (FSFI), it was found that 67.8% of the women participating in the study suffered from sexual dysfunction, indicating a high prevalence.¹¹ Another study in Indonesia conducted at the Geriatric Clinic, Dr. Soetomo Hospital, Surabaya, in May 2016 used the Female Sexual Function Index (FSFI) questionnaire which indicated

sexual dysfunction if the score was <26.55 for the total aggregate score for each question in sexual domain. It was found that the prevalence of sexual dysfunction was present in 29 patients (78.4%) and 8 patients (21.6%) did not show sexual dysfunction from a total sample of 37 patients.¹²

The range of testosterone levels found in this study was 1.05 ± 0.67 . A study conducted by Jones et al. in 2013 obtained similar results in a sample of general population women selected from a British cohort study. The sample comprised 177 postmenopausal women over 45 years of age and blood samples, obtained by consent at recruitment, revealed a testosterone level of 1.3 nmol/L.¹³ A previous study conducted by Randolph et al. in 2003 to 2930 participants aged 42–52 years, with sample characteristics of African-American (27.6%), Caucasian (47.1%), Chinese (7.4%), Hispanic (8.8%), or Japanese (9.0%) at 7 clinical sites, found higher testosterone levels of 5.22.¹⁴ After menopause, serum estradiol levels decrease by 90%, while testosterone continues to decline by age 25.¹⁵ In a Norwegian population-based survey of sexual habits, 41% of women between the ages of 50 and 59 reported lack of sexual desire as a real problem due to decreased testosterone levels during menopause.¹⁶

This study showed that testosterone levels, FSFI scores and menopausal duration all had a significant relationship with a $p < 0.05$. Female sexual dysfunction is common, affecting 25–43% of women, a percentage that has increased markedly over the years. It is one of the major health problems concerning postmenopausal women, and the frequency of these sexual problems increases as menopause approaches, reaching a peak in the postmenopausal years. Although 33–50% of middle-aged women exhibit some degree of sexual dysfunction related to aging and hormonal status, this percentage may vary according to factors such as the population analyzed, the study design, or the approach used.¹⁷ Ovarian steroids (estradiol, testosterone, and progesterone) modulate sexual desire, or libido, in women. The gradual, age-related cessation of ovarian function associated with natural menopause reduces ovarian steroid levels, accompanied by reduced sexual desire in most postmenopausal women.^{18,19} Other than menopause, there are many factor that may predict sexual dysfunction such as age, estrogen deficiency, type of menopause, chronic medical problems, partner's sex problems, severity of menopause symptoms, dystocia history, and health status. All of these are the physical factors influencing sexual function of menopausal women. In the mental–emotional area, all studies confirmed the impact of depression and anxiety. Social factors, including smoking, alcohol consumption, the quality of relationship with husband, partner's

loyalty, sexual knowledge, access to health care, a history of divorce or the death of a husband, living apart from a spouse, and a negative understanding of women's health were found to affect sexual function.²²

A previous study by Turna et al. found significant differences between women with low libido levels and controls in the level of total testosterone, free testosterone and DHEA-S and full-scale FSFI scores for pre- and postmenopausal women ($p < 0.05$). Reductions in total testosterone, free testosterone, and DHEA-S levels positively correlated with full-scale FSFI score and FSFI desire, FSFI arousal, FSFI lubrication, and FSFI orgasm scores ($p < 0.05$). These data show that women with low libido have lower androgen levels compared to the age-matched normal control group and the decrease in their androgen levels is positively correlated with the female sexual function index domain. Several studies have found that adding testosterone to hormonal therapy can improve sexual function and general well-being among women during climacteric. Significant improvement was seen by several variable studies when surgical menopausal women were given 40 mg of oral testosterone undecanoate daily along with their comparable estrogen therapy to estrogen alone. Twice weekly addition of testosterone undecanoate to daily oral estrogen is associated with a significant improvement in sexual function among postmenopausal women than use of estrogen alone.²⁰ Our study was also consistent with those published by Nathorst-Böös in 2006 which included 53 sample. This was in range with our sample size and indeed it showed that testosterone may have effect towards sexual function, thus, therapy with testosterone may help in improving the patient's sexual function.²³

CONCLUSION

Female Sexual Function Index (FSFI) scores have significant correlation with testosterone levels, as well as with duration of menopause, while the testosterone levels also correlate significantly with the duration of menopause. This proves that sexual function correlates with hormonal physiology.

DISCLOSURES

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Conflict of interest

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Author Contribution

All authors have contributed to all processes in this research, including preparation, data gathering and analysis, drafting and approval for publication of this manuscript.

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