World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

The impact of menopause on sexual health a cross-sectional study using data from women living in Northern Greece

Aikaterini E Sousamli and Panagiota D Dourou *

Department of Midwifery, Faculty of Health and Care Sciences, University of West Attica, 12243 Athens, Greece.

World Journal of Advanced Research and Reviews, 2025, 26(03), 526-537

Publication history: Received on 28 April 2025; revised on 31 May 2025; accepted on 03 June 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.26.3.2176

Abstract

Menopause represents a significant life transition for women, often accompanied by physical, psychological, and sexual health challenges. With the increasing life expectancy in women, a considerable part of their life will be spent in the postmenopausal period. The decline in estrogen levels leads to vasomotor symptoms, such as hot flashes and night sweats, as well as psychological symptoms, including anxiety, depression, and irritability. Sexual dysfunction is another key concern, with many menopausal women experiencing reduced libido, vaginal dryness, and pain during intercourse. This study aimed to evaluate the impact of menopause on sexual health. The study sample consisted of 100 menopausal and 101 non-menopausal women aged 45-55. An anonymous questionnaire included sociodemographic questions, the Female Sexual Function Index (FSFI), the DASS-21 index, MENQOL index, Pittsburgh Sleep Quality Index, SF-12 questionnaire, and the Hot Flash-Related Daily Interference Scale (HFRS). The results showed that menopausal women had significantly lower sexual desire, arousal, lubrication, orgasm, and satisfaction, with higher levels of sexual discomfort and pain ($P<0.001$). Increased sexual and vasomotor symptoms were associated with poorer sexual function, while psychological distress (anxiety, depression, and stress) compounded the challenges of sexual dysfunction. Poor sleep quality also had adverse effects on sexual health. Menopause is strongly associated with declines in sexual function, highlighting the need for healthcare providers to offer guidance and treatment options tailored to women's health history and preferences. Lifestyle changes, like regular physical exercise and a healthy diet, alongside psychological and medical interventions, can play a role in the improvement of sexual health and quality of life.

Keywords: Menopause; Sexual dysfunction; Sexual health; Vasomotor symptoms; Psychosocial health; Quality of life; Hormone therapy; Hot flashes

1. Introduction

Menopause marks a significant life transition for women [1]. It is estimated that approximately 6,000 women in the United States enter menopause each day, and with increasing life expectancy, they will spend nearly 40% of their lives in the postmenopausal stage [2]. The onset of menstruation (menarche) and menopause, both fundamental aspects of female reproductive function, serve as critical milestones in a woman's life cycle, significantly influencing sexual health and function [3]. While some women perceive this change positively, it is often associated with aging and negative connotations, particularly in Western cultures [1]. The menopausal transition is characterized by a decrease in ovarian function, leading to reduced estrogen levels and various physical, psychological, and social changes [4]. These changes can result in common symptoms, including hot flashes, mood swings, sleep disturbances, sexual dysfunction and increased risks for osteoporosis and cardiovascular diseases [5]. The symptoms have a direct impact on women's quality of life, including sexual health, which tends to decline during this period [6]. Despite the growing body of research on menopausal symptoms, there remain gaps in understanding their frequency, severity, and the overall impact on women's well-being.

* Corresponding author: Panagiota D Dourou

1.1. Menopause and Sexual Health

Sexuality in women is a relatively new field of biomedical research [3].

In premenopausal women, the vaginal wall is thick, well-vascularized, and lubricated. However, during menopause, as estrogen levels decline, the vaginal wall becomes thinner and paler. This can lead to atrophic vaginitis, an inflammation of the vaginal tissue that may result in brown or yellow discoloration. Additionally, the vagina loses elasticity, narrows, and shrinks, causing discomfort. These vaginal and vulvar changes can lead to various symptoms that negatively impact quality of life and sexual function [2].

Studies indicate that the majority of women remain sexually active during menopause. However, a significant proportion (approximately 60%) report sexual dysfunction, primarily characterized by a decrease in sexual desire or an avoidance of sexual intercourse [4].

According to the American Psychiatric Association's DSM-IV classification, common sexual dysfunctions observed during perimenopause include disorders or lack of sexual desire, difficulties in sexual arousal, inability to achieve orgasm and pain during sexual intercourse (dyspareunia) [4].

Dyspareunia, in particular, is a leading factor contributing to loss of interest in sex for many women [1].

Psychological, social, and environmental factors play a critical role in shaping sexual function and behavior. A comprehensive approach to women's sexuality must extend beyond the biological process and consider emotional, psychological, and societal influences [3].

Research suggests that women feel more comfortable discussing sexual concerns when the healthcare provider initiates the conversation. However, such issues are rarely addressed in clinical practice [1].

Both the natural decline in estrogen levels during natural menopause and the reduction of androgens due to aging or surgical menopause contribute to sexual symptoms, such as reduced sexual desire, impaired arousal, painful intercourse (dyspareunia), decreased orgasm intensity and lower overall sexual satisfaction [3].

Additionally, menopause affects emotional and cognitive aspects of sexuality through hormonal changes in reproductive function. However, the extent of this impact varies among women, depending on individual history and psychological factors [3].

2. Material and methods

2.1. Study Design and Participants

This study utilized a cross-sectional design with a sample of 201 women aged 45-55, divided into two groups, the menopausal group (n=100), women who had not menstruated for at least 12 consecutive months and the premenopausal group (n=101), women with regular menstrual cycles. The purpose of this study was to evaluate the menopausal symptoms and to investigate their effect in women's quality of life. This research was conducted in Gynecological Clinics of Health Centers in Drama and Serres. Women who came for a gynecological examination were asked about their participation in the study and those who agreed to participate were included in it. The survey was conducted from June to October 2023.

2.2. Measurements

The measurement tools are a self-administered questionnaire that, in addition to socio-demographic questions, includes the following validated instruments in order to evaluate various dimensions of health, such were the Female Sexual Function Index (FSFI) which evaluates sexual dysfunction, including desire, arousal, and satisfaction [7], the Depression, Anxiety, and Stress Scale (DASS-21) which measures depression, anxiety and stress [8], the Menopause-Specific Quality of Life (MENQOL) which assesses the impact of menopausal symptoms on her quality of life [9], the Pittsburgh Sleep Quality Index (PSQI) which evaluates sleep disturbances and overall sleep quality [10], the SF-12 Health Survey therein measures physical and mental health-related to quality of life [11]and lastly the Hot Flash-Related Daily Interference Scale (HFRS) which quantifies the frequency and impact of hot flashes on quality of life [12].

2.3. Statistical Analysis

Data were analyzed using SPSS 22.0, with comparisons made between menopausal and premenopausal groups using t-tests and correlation analyses. Linear regression analysis using the stepwise method and logarithmic transformations, where necessary, were used to find independent factors related to the depression, sexual functioning and quality of life scales, from which dependence coefficients and their standard errors (SE) were obtained. To find independent factors related to the sleep quality scale, logistic regression analysis using the stepwise method was performed and Odds ratios with their 95% confidence intervals (95% CI) were obtained. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Participant characteristics

The study sample consisted of 201 women, of whom 100 (49.8%) were postmenopausal. Table 1 presents the demographic characteristics of the participants, both for the entire sample and separated by menopausal status.

Table 1 Sociodemographic Characteristics of the Women in the Sample

		Total Sample	**Pre-Menopausal**	**Post-Menopausal**	**P P Pearson's x2 test**
		N (%)	**N (%)**	**N (%)**	
Ethnicity	Greek	192(95.5)	99(98)	93(93)	0.101+
	Other	9(4.5)	2(2)	7(7)	
If other, specify	Albanian	6(3)	2(2)	4(4)	-
	Russian	3(1.5)	0(0)	3(3)	
Age, Mean (SD)		50(2.7)	49.7(2.6)	50.3(2.9)	0.114++
BMI, Mean (SD)		26,8 (3.5)	26.6(3.5)	26.9(3.5)	0.471++
BMI Categories	Normal weight	63(31.3)	30(29.7)	33(33)	0.322
	Overweight	108(53.7)	59(58.4)	49(49)	
	Obese	30(14.9)	12(11.9)	18(18)	
Employment Status	No	90(44.8)	45(44.6)	45(45)	0.949
	Yes	111(55.2)	56(55.4)	55(55)	
If yes, occupation	Public Sector Employee	37(33.3)	18(32.1)	19(34.5)	0.792
	Self-employed	21(18.9)	12(21.4)	9(16.4)	
	Private Sector Employee	53(47.7)	26(46.4)	27(49.1)	
Educational Level	Primary School	11(5.5)	1(1)	10(10)	0.031+
	Middle School	38(18.9)	15(14.9)	23(23)	
	High School	115(57.2)	64(63.4)	51(51)	
	Technical Institute (TEI)	22(10.9)	12(11.9)	10(10)	
	University (AEI)	8(4)	4(4)	4(4)	
	Master's Degree	5(2.5)	3(3)	2(2)	
	Doctorate	2(1)	2(2)	0(0)	
	Married	20(10)	13(12.9)	7(7)	
	Married with children	127(63.2)	59(58.4)	68(68)	
	Divorced	16(8)	6(5.9)	10(10)	

Marital Status	In a Relationship	29(14.4)	18(17.8)	11(11)	0.264
	Single	9(4.5)	5(5)	4(4)	
Annual Household Income (in euros)	0-5.000	11(5.5)	6(5.9)	5(5)	
	5.000-12.000	58(28.9)	15(14,9)	43(43)	<0.001
	12.000-20.000	107(53.2)	66(65,3)	41(41)	
	>20.000	25(12.4)	14(13,9)	11(11)	

+Fisher's exact test ++Student's t-test

The majority of participants (95.5%) were Greek, with an average age of 50 years (SD = 2.7), 53.7% were overweight, and 55.2% were employed, with 47.7% working in the private sector. Educationally, 57.2% had completed high school, and a higher proportion of postmenopausal women had finished primary or secondary school compared to their premenopausal counterparts. Regarding marital status, 63.2% were married with children, and 53.2% reported an annual household income of €12,000-20,000, with postmenopausal women reporting higher incomes in the €5,000-12,000 range. Among women who still had menstruation, 48.5% were in the perimenopausal stage. For those who were postmenopausal, the average time since their last period was 1.9 years (SD = 0.9). Only one postmenopausal participant reported using hormone replacement therapy.

3.2. Levels of sexual functioning

Participants who were not in menopause had better sexual functioning in every domain as well as overall compared to menopausal participants. It was observed that women who were not in menopause exhibited a stronger sexual desire compared to those who were in menopause (table 2).

Table 2 Comparison of Sexual Functionality Levels Between Menopausal and Non-Menopausal Women

	Menopausal		***Non-Menopausal***		**P Mann- Whitney test**
	Mean (SD)	**Median (Range)**	**Mean (SD)**	**Median (Range)**	
Sexual Desire	3(1.5)	2.4(1.8-3.6)	4.1(1.4)	4.8(3.6-4.8)	<0.001
Arousal	3.1(1.9)	3.6(1.7-4.8)	4.1(1.7)	4.8(3.6-4.8)	<0.001
Lubrication	3.3(1.8)	3.6(2.4-4.8)	4.2(1.7)	4.8(3.6-4.8)	<0.001
Orgasm	3.4(1.9)	3.6(2.2-4.8)	4.2(1.7)	4.8(3.6-5.2)	<0.001
Satisfaction	3.4(1.8)	3.6(1.6-4.8)	4.2(1.5)	4.8(3.6-4.8)	<0.001
Pain	3.5(1.2)	4(2.8-4.2)	4.2(1)	4.4(3.6-5.2)	<0.001
Total Score	19.7(9)	20.9(12.3-27)	25(8.2)	28(20.8-29.6)	<0.001

3.3. Levels of vasomotor, psychosocial, physical, and sexual symptoms

The scores in all dimensions were significantly higher in women who were in menopause. Consequently, they experienced more vasomotor, psychosocial, physical, and sexual symptoms compared to women who were not in menopause (table 3).

Table 3 Comparison of Menopausal Symptoms Between Menopausal and Non-Menopausal Women

	Menopausal		***Non-Menopausal***		**P Mann- Whitney test**
	Mean (SD)	**Median (Range)**	**Mean (SD)**	**Median (Range)**	
Vasomotor Symptoms	5(1.7)	5(3.7-6.3)	3.3(1.5)	2.3(2.3-4)	<0.001
Psychosocial Symptoms	3.5(1.7)	3.3(2.2-4.8)	2.1(1.5)	1.4(1-2.9)	<0.001
Physical Symptoms	3.6(1.4)	3.6(2.6-4.5)	2(1.4)	1.2(1-2.7)	<0.001
Sexual Symptoms	4.3(2.2)	4.3(2.3-6.2)	1.8(1.8)	1(1-1)	<0.001

Spearman's correlation coefficients of anxiety/ depression/ stress scales, quality of life, and sexual functioning in menopausal women in relation to the menopausal symptoms scale

In the correlation between sweating/ hot flashes and menopausal symptoms in menopausal women with quality of life, sleep quality, sexual functioning, and symptoms of anxiety, depression, and stress, the study found that more psychosocial, sexual, physical, and vasomotor symptoms were associated with higher levels of depression, anxiety, and stress. Just as the frequency of hot flashes/ sweating increased per week, participants' levels of anxiety and depression also rose. Additionally, higher levels of stress and depression were associated with greater problems related to these hot flashes/ sweating. Conversely, participants who managed and controlled these symptoms more effectively experienced fewer symptoms of depression. The more frequently participants experienced hot flashes/ sweating on a weekly basis, the worse their mental health was (table 4).

Table 4 Spearman Correlation Coefficients of Anxiety/Depression/Stress Scales, Quality of Life, and Sexual Functionality in Menopausal Women in Relation to the Menopausal Symptoms Scale

			Menopausal Symptoms Scale (MENQOL)			
			Vasomotor	**Psychosocial**	**Psychosocial**	**Sexual**
Anxiety. Depression. Stress Scale (DASS-21)	Depression Score	r	0.27	0.73	0.34	0.34
		P	0.007	<0.001	0.001	<0.001
	Anxiety Score	r	0.20	0.67	0.44	0.39
		P	0.050	<0.001	<0.001	<0.001
	Stress Score	r	0.24	0.82	0.52	0.35
		P	0.016	<0.001	<0.001	<0.001
	Total DASS-21 Score	r	0.25	0.83	0.48	0.41
		P	0.011	<0.001	<0.001	<0.001
Quality of Life (SF-12)	Physical Health Summary Scale	r	-0.29	-0.36	-0.62	-0.23
		P	0.004	<0.001	<0.001	0.023
	Mental Health Summary Scale	r	-0.32	-0.69	-0.34	-0.28
		P	0.001	<0.001	0.001	0.005
Female Sexual Function Index (FSFI)	Sexual Desire	r	-0.40	-0.21	-0.39	-0.72
		P	<0.001	0.036	<0.001	<0.001
	Arousal	r	-0.46	-0.26	-0.42	-0.71
		P	<0.001	0.009	<0.001	<0.001
	Lubrication	r	-0.40	-0.26	-0.40	-0.74
		P	<0.001	0.010	<0.001	<0.001
	Orgasm	r	-0.42	-0.26	-0.41	-0.71
		P	<0.001	0.008	<0.001	<0.001
	Satisfaction	r	-0.43	-0.29	-0.43	-0.72
		P	<0.001	0.004	<0.001	<0.001
	Pain	r	-0.26	-0.39	-0.33	-0.40
		P	0.009	<0.001	0.001	<0.001
	Total FSFI Score	r	-0.43	-0.28	-0.43	-0.74
		P	<0.001	0.005	<0.001	<0.001

3.4. Spearman's correlation coefficients of anxiety, depression, stress, quality of life, and sexual functioning scales in menopausal women in relation to the sweating/ hot flashes scale

Additionally, the more problems they had related to potential hot flashes/ sweating and the less they controlled/ managed them, the worse both their physical and mental health were overall. Finally, frequent hot flashes/ sweating and more problems related to them were linked to worse sexual functionality in all areas. On the other hand, better management and control of these symptoms were associated with improved sexual functionality in all dimensions except for pain (table 5).

Table 5 Spearman Correlation Coefficients of Anxiety, Depression, Stress, Quality of Life, and Sexual Function Scales in Menopausal Women in Relation to the Hot Flush Rating Scale

			Hot Flush Rating Scale (HFRS)		
			Frequency of Hot Flushes/Sweating per Week	**Control/ Management**	**Problems**
Anxiety. Depression. and Stress Scale (DASS-21)	Depression Score	r	0.23	-0.26	0.28
		P	0.019	0.008	0.005
	Anxiety Score	r	0.21	-0.18	0.17
		P	0.041	0.074	0.100
	Stress Score	r	0.16	-0.16	0.22
		P	0.117	0.109	0.027
	Total DASS-21 Score	r	0.21	-0.22	0.24
		P	0.038	0.031	0.016
Quality of Life (SF-12)	Physical Health Summary Score	r	-0.10	0.20	-0.24
		P	0.308	0.042	0.016
	Mental Health Summary Score	r	-0.25	0.33	-0.34
		P	0.013	0.001	0.001
Female Sexual Function Index (FSFI)	Sexual Desire	r	-0.29	0.39	-0.45
		P	0.004	<0.001	<0.001
	Arousal	r	-0.35	0.45	-0.51
		P	<0.001	<0.001	<0.001
	Lubrication	r	-0.35	0.42	-0.46
		P	<0.001	<0.001	<0.001
	Orgasm	r	-0,36	0,451	-0,487
		P	<0.001	<0.001	<0.001
	Satisfaction	r	-0.34	0.42	-0.48
		P	0.001	<0.001	<0.001
	Pain	r	-0.24	0.10	-0.23
		P	0.016	0.319	0.023
	Total FSFI Score	r	-0.34	0.42	-0.49
		P	<0.001	<0.001	<0.001

3.5. The impact of various psychosocial and sexual menopausal symptoms

Multivariate linear regressions were conducted on menopausal women, with dependent variables being the dimensions and overall score of anxiety, depression, stress scales, and independent variables being their sociodemographic characteristics, hot flashes, and menopausal symptoms. Only psychosocial menopausal symptoms were found to be significantly associated with the score in the "Depression" dimension. Findings showed that the more psychosocial menopausal symptoms participants had, the higher their levels of depression. Also, more psychosocial symptoms were associated with higher levels of anxiety. Participants with an annual household income above €20,000 experienced less anxiety compared to those with an income of up to €12.000. In addition, the more vasomotor and psychosocial menopausal symptoms participants had, the higher their stress levels. The more problems related to hot flashes/ sweats participants experienced, the more stress they reported. Furthermore, the more menopausal symptoms participants had, the higher their levels of anxiety, stress, and depression.

The study examined the impact of various psychosocial and sexual menopausal symptoms, as well as factors like income and education, on different dimensions of sexual health. Using logarithmic transformations and the stepwise method, the results presented in the following tables (table 6-12) were obtained.

Table 6 Multivariate linear regression of menopausal women with the dependent variable being the dimension of sexual desire and independent variables including their socio-demographic characteristics, sweating/ hot flashes, and menopausal symptoms

	Dependency coefficient	**Standard error of the coefficient t**	**P-value**
Psychosocial symptoms	-0.024	0.008	0.002
Sexual symptoms	-0.050	0.006	<0.001
Problems from hot flashes/sweating	-0.018	0.004	<0.001
(reference: ≤12.000€) Annual household income (€) 12-20.000	0.067	0.024	0.006

Obviously, higher psychosocial and sexual symptoms, as well as more problems from hot flashes/ sweating, are associated with lower sexual desire. Women with an annual income between €12,000 and €20,000 show significantly higher sexual desire compared to those earning ≤€12.000 (table 6).

Table 7 Multivariate linear regression of menopausal women with the dependent variable being the arousal dimension and independent variables including their socio-demographic characteristics, sweating/hot flashes, and menopausal symptoms

	Dependency coefficient	**Standard error of the coefficient t**	**P-value**
Problems from hot flashes/sweating	-0.057	0.014	<0.001
Sexual symptoms	-0.073	0.010	<0.001
Psychosocial symptoms	-0.035	0.013	0.011
Vasomotor symptoms	-0.053	0.024	0.027

Clearly, increased vasomotor, psychosocial, and sexual menopausal symptoms, as well as problems with hot flashes/ sweats, were linked to lower arousal during sexual intercourse (table 7).

Table 8 Multivariate Linear Regression of Menopausal Women with the dependent variable being the lubrication dimension and independent variables including their socio-demographic characteristics, sweating/ hot flashes, and menopausal symptoms

	Dependency coefficient	**Standard error of the coefficient t**	**P-value**
Sexual symptoms	-0.072	0.011	<0.001
Control/ Management of hot flashes/ sweating	0.028	0.009	0.002
Psychosocial symptoms	-0.032	0.014	0.032

[+]More sexual symptoms and psychosocial symptoms are significantly associated with lower lubrication levels. Conversely better control/management of hot flashes/ sweating is significantly associated with higher lubrication levels (table 8).

Table 9 Multivariate linear regression of menopausal women with the dependent variable being the orgasm dimension and independent variables including their socio-demographic characteristics, sweating/ hot flashes, and menopausal symptoms

	Dependency coefficient	**Standard error of the coefficient t**	**P-value**
Sexual symptoms	-0.064	0.010	<0.001
Control/Management of hot flashes/ sweating	0.024	0.009	0.007

Indubitably, more sexual symptoms are associated with lower orgasm function in menopausal women. Better control/management of hot flashes/sweating is significantly associated with better orgasm function (table 9).

Table 10 Multivariate linear regression of menopausal women with the dependent variable being the satisfaction dimension and independent variables including their socio-demographic characteristics, sweating/ hot flashes, and menopausal symptoms

		Dependency coefficient	**Standard error of the coefficient t**	**P-value**
Sexual symptoms		-0.049	0.007	<0.001
Problems due to hot flashes/sweating		-0.022	0.005	<0.001
Reference: ≤12.000€ Annual household income (€) 12-20.000		0.078	0.029	0.009
>20.000		0.030	0.05	0.555
Reference: Primary/Junior High School				
Educational level	High School	0.091	0.030	0.003
	Technical University/ University/ Postgraduate	0.106	0.045	0.020

More sexual symptoms and problems due to hot flashes/ sweating were significantly associated with lower satisfaction. Participants with higher annual income (12.000 - 20.000€) was associated with higher satisfaction. Also, higher education levels were significantly associated with greater satisfaction, with high school and university/ postgraduate education showing positive effects. More sexual symptoms and problems due to hot flashes/sweating were significantly associated with lower satisfaction (table 10).

Table 11 Multivariate linear regression of menopausal women with the dependent variable being the pain dimension and independent variables including their socio-demographic characteristics, sweating/ hot flashes, and menopausal symptoms

	Dependency coefficient	**Standard error of the coefficient t**	P-value
Psychosocial symptoms	-0.021	0.008 0.009	
Sexual symptoms	-0.016	0.006 0.010	

More psychosocial and sexual symptoms led to increased pain during sexual intercourse (table 11).

Table 12 Multivariate linear regression of menopausal women with the dependent variable being the overall sexual function and independent variables including their socio-demographic characteristics, sweating/ hot flashes, and menopausal symptoms

	Dependency coefficient	**Standard error of the coefficient t**	**P-value**
Problems from hot flashes/ sweating	-0.046	0.011	<0.001
Sexual symptoms	-0.068	0.008	<0.001
Vasomotor symptoms	-0.042	0.019	0.027
Psychosocial symptoms	-0.021	0.011	0.048

The combination of psychosocial, sexual, and vasomotor symptoms, along with hot flashes/ sweats, contributed to worse overall sexual functionality. Next, a multivariate logistic regression was conducted on menopausal women, with the sleep quality scale as the dependent variable and their sociodemographic characteristics, hot flashes/ sweating, and menopausal symptoms as independent variables. Using the stepwise method, the results presented in the Table S9 were obtained (table 12).

3.6. Multivariate Analysis of Sleep Quality Determinants

Table 13 Multivariate logistic regression of menopausal women with the dependent variable being the sleep quality scale and independent variables including their socio-demographic characteristics, sweating/ hot flashes, and menopausal symptoms

	Odds Ratio (95% Confidence Interval)	**P-value**
Physical symptoms	2.17(1.32-3.56)	0.002
Sexual symptoms	1.37(1.03-1.83)	0.033
Frequency of hot flashes/sweating	1.04(1-1.07)	0.026

As demonstrated, women with more severe physical symptoms had 2.17 times higher odds of experiencing poorer sleep quality ($p = 0.002$). Also, increased sexual symptoms were associated with 1.37 times higher odds of poor sleep quality ($p = 0.033$). Higher frequency of hot flashes/ sweating slightly increased the likelihood of poor sleep quality (OR = 1.04, $p = 0.026$). Following, multivariate linear regressions were performed with the dimensions of quality of life as dependent variables and sleep quality, sexual function, anxiety/ stress/ depression symptoms, hot flashes/ sweating, menopausal symptoms, and the sociodemographic characteristics of menopausal women as independent variables. The results presented in Tables 13 and 14 were obtained.

Table 14 Multivariate logistic regression of menopausal women with the physical health dimension of quality of life as the dependent variable and independent variables including sociodemographic characteristics, hot flashes/ sweating, and menopausal symptoms

	Regression coefficient	**Standard error of the coefficient**	**P-value**
Physical Symptoms	-3.76	0.61	<0.001
Sexual Symptoms	-2.35	0.47	<0.001
Sexual Desire	2.50	0.65	<0.001
Pain	1.32	0.62	0.036
BMI	-0.79	0.19	<0.001
(No = Reference)			
Exercise	3.56	1.35	0.010

As has been pointed out, more physical and sexual symptoms, as well as a higher BMI, contribute to worse quality of life in menopause. Higher sexual desire and regular exercise are linked to better physical well-being. Interventions that reduce menopausal symptoms, encourage sexual well-being, support weight management, and promote exercise may significantly improve physical health-related quality of life for menopausal women (table 14).

4. Discussion

This cross-sectional study examined the impact of menopause on sexual health among middle-aged women living in Northern Greece. The findings indicate that sexual function significantly declines during menopause, affecting all domains—desire, arousal, lubrication, orgasm, satisfaction, and pain during intercourse (Table 2). These results align with previous literature showing that the decline in estrogen levels during menopause leads to vaginal atrophy, reduced lubrication, and dyspareunia, which collectively impair sexual function and quality of life [2–4] .

Approximately 60% of women report some form of sexual dysfunction during menopause, with reduced libido and avoidance of sexual intercourse being the most common complaints [4]. Our results demonstrated that women with more sexual, vasomotor, and psychosocial symptoms experienced worse outcomes across all aspects of sexual functioning. This supports the view that menopausal sexual dysfunction is not only biological, but is also amplified by psychological and emotional factors such as depression, anxiety, and stress (3,13–15).

Specifically, our multivariate regression analyses showed that sexual and psychosocial symptoms were independently associated with lower scores in all dimensions of sexual functioning, including desire, arousal, and orgasm (Tables 6–12). Moreover, vasomotor symptoms and hot flash-related problems had a notable negative impact on sexual satisfaction and overall function, consistent with other studies [13, 14].

In line with the SWAN study [15] and other international research [16], we found that socioeconomic factors, such as income and education, significantly influenced sexual health. Women with higher annual household income (€12,000–€20,000) reported greater sexual desire and satisfaction than those with lower income. Higher educational attainment was also associated with higher levels of sexual satisfaction (Table 10), possibly due to greater health literacy, empowerment, and access to care.

Interestingly, women who reported better control of hot flashes showed improved lubrication, orgasm, and satisfaction, highlighting the importance of symptom management as a potential target for intervention (Tables 8–10). These findings underline the interconnectedness of physical and psychological menopausal symptoms and their effect on sexual well-being.

Despite experiencing decreased desire or satisfaction, many menopausal women continue to value sexual activity and intimate relationships [17, 18]. Unfortunately, sexual health is often neglected in routine clinical care, and women may not raise concerns unless prompted by healthcare professionals [1, 3]. Our study reinforces the need for healthcare providers to initiate conversations about sexual health and offer individualized treatment options based on women's symptoms, income level, and personal needs.

4.1. Limitations of the Study

This study has some limitations. The sample size in this study was relatively small, which limits the ability to draw broader conclusions and generalize the results to the wider population from which the sample was derived. Additionally, the majority of participants were Greek women. Women of other nationalities or minority groups, such as Roma women, were not included in the study due to language barriers, as they did not understand the language used in the study. The nonclinical sample provided information on mental health problems, which were often undiagnosed. However, menopausal stage was based on self-report, which were not validated by hormone levels. Self-report might have led underreported perimenopausal stages. Therefore, the generalisability of our findings should be cautiously considered

5. Conclusion

Clinicians should adopt a holistic and patient-centered approach to managing sexual health concerns in menopausal women. This includes hormonal and non-hormonal therapies, psychological support, and lifestyle interventions such as exercise and diet, which have been shown to alleviate menopausal symptoms and improve overall quality of life. Special attention should be given to psychosocial support, as depression and anxiety directly affect sexual function.

Compliance with ethical standards

Acknowledgments

The author did not receive specific funding or assistance from third parties for the completion of this study.

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

The conduct of the research was permitted by the 4th Ministry of Education and Culture of Macedonia and Thrace (DADAX 1937/22-6-2023), which includes the aforementioned Health Centers, and after the approval of the Ethics Committee of the PADA (50262/ 7-13-2023.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Minkin MJ. Menopause. Obstetrics and Gynecology Clinics of North America 2019; 46: 501–514.

[2] Takahashi TA, Johnson KM. Menopause. Medical Clinics of North America 2015; 99: 521–534.

[3] Nappi ProfRE, Cucinella L, Martella S, et al. Female sexual dysfunction (FSD): Prevalence and impact on quality of life (QoL). Maturitas 2016; 94: 87–91.

[4] Makara-Studzińska MT, Kryś-Noszczyk KM, Jakiel G. Epidemiology of the symptoms of menopause – an intercontinental review. pm 2014; 3: 203–211.

[5] Smail L, Jassim G, Shakil A. Menopause-Specific Quality of Life among Emirati Women. IJERPH 2019; 17: 40.

[6] Greenblum CA, Rowe MA, Neff DF, et al. Midlife women: symptoms associated with menopausal transition and early postmenopause and quality of life. Menopause 2013; 20: 22–27.

[7] Rosen, C. Brown, J. Heiman, S. Leib R. The Female Sexual Function Index (FSFI): A Multidimensional Self-Report Instrument for the Assessment of Female Sexual Function. Journal of Sex and Marital Therapy 2000; 26: 191–208.

[8] Lovibond SH, Lovibond PF. Manual for the Depression Anxiety and Stress Scales. 2nd Ed. Sydney: Psychology Foundation, 1995.

[9] Lewis JE, Hilditch JR, Wong CJ. Further psychometric property development of the Menopause-Specific Quality of Life questionnaire and development of a modified version, MENQOL-Intervention questionnaire. Maturitas 2005; 50: 209–221.

[10] Buysse DJ, Reynolds CF, Monk TH, et al. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Research 1989; 28: 193–213.

[11] Ware JE, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: Construction of Scales and Preliminary Tests of Reliability and Validity. Medical Care 1996; 34: 220–233.

[12] Hunter MS, Liao KL. A psychological analysis of menopausal hot flushes. British J Clinic Psychol 1995; 34: 589–599.

[13] Avis NE, Crawford SL, Greendale G, et al. Duration of Menopausal Vasomotor Symptoms Over the Menopause Transition. JAMA Intern Med 2015; 175: 531.

[14] Lampio L, Polo-Kantola P, Himanen S-L, et al. Sleep During Menopausal Transition: A 6-Year Follow-Up. Sleep; 40. Epub ahead of print July 2017. DOI: 10.1093/sleep/zsx090.

[15] Cain VS, Johannes CB, Avis NE, et al. Sexual functioning and practices in a multi-ethnic study of midlife women: Baseline results from swan. Journal of Sex Research 2003; 40: 266–276.

[16] Dennerstein L, Koochaki P, Barton I, et al. Hypoactive Sexual Desire Disorder in Menopausal Women: A Survey of Western European Women. The Journal of Sexual Medicine 2006; 3: 212–222.

[17] Thornton K, Chervenak J, Neal-Perry G. Menopause and Sexuality. Endocrinology and Metabolism Clinics of North America 2015; 44: 649–661.

[18] Scavello I, Maseroli E, Di Stasi V, et al. Sexual Health in Menopause. Medicina 2019; 55: 559.