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Does Type of Menopause Affect the Sex Lives of Women?

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Background: The aim of this study was to investigate factors affecting the sex lives of middle-aged women, and whether surgical menopause affects sexual function differently from natural menopause, by comparing effects on sexual performance of women with similar demographic features.





Material/Methods: The study included 151 women with surgical menopause (SM), 357 women with natural menopause (NM), and 186 perimenopausal women (PM). The women were asked to complete a 6-question survey of sexual performance parameters. The relationship between the demographic and clinical features and hormone levels of the groups and sexual function parameters were evaluated. We also compared these parameters between the 3 study groups, and paired comparisons were made between the SM group and the NM group.

Results: Demographic features, serum DHEA-S, total testosterone, and FSH levels were found to have statistically significant effects on sexual performance of women ($p<0.05$). The sexual function scores for the frequency of sexual desire, coitus, and orgasm were significantly higher in the PM group, whereas vaginal lubrication scores were lower compared to the NM and SM group ($p<0.05$). In paired comparison of NM and SM, the scores for the frequency of coitus, orgasm, and vaginal lubrication were significantly higher in the SM group, while sexual desire frequency scores were higher in the NM group ($p<0.05$).

Conclusions: Our study approached to this topic in an extended manner and found significant relationships between several demographic-clinical and hormonal factors. SM was found to not affect female sexual performance, except for sexual desire, more than NM.

MeSH Keywords: **Female • Menopause • Perimenopause • Sexual Dysfunctions, Psychological**

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Background

Menopause is an important period affecting women's lives due to physical, endocrinological, and psychological changes. Different symptoms and diseases may develop depending on a woman's genetic disposition, lifestyle, socio-cultural environment, medical or surgical history, and healthcare during this period [1]. The type of menopause – natural or surgical – also seems to affect some menopausal symptoms, especially sexual function. Therefore, surgical interventions for benign gynecologic disorders in premenopausal periods remain controversial in terms of possible impact on women's sexuality. In both menopause and perimenopause, women begin to experience some problems in their sexual lives due to endocrinological and physiological changes, including decreases in sex hormones and genitourinary atrophy. In addition, many have examined factors relevant to the initial time, severity, and type of these changes during perimenopause [2–4]. Demographic and clinical features of women and their partners, such as age, occupation, body mass index, residence, level of education, economic status, and hormone levels, including follicle-stimulating hormone (FSH), estradiol (E_2), total testosterone (TT) and dehydroepiandrosterone sulfate (DHEA-S), can have remarkable effects on sexual life.

Sexual well-being is an essential component of woman's healthcare and is important to maintaining an active sex life before planning any surgery, including hysterectomy and bilateral salpingo-oophorectomy. Approximately 75% of all hysterectomies are performed in conjunction with bilateral salpingo-oophorectomy for benign gynecologic diseases [5–7]. Several studies have investigated the effects of surgical menopause on the sexual life of women and found conflicting results. Some researchers found negative impacts of surgical menopause on sexual functions, while others indicated that it had no effect or even improved sexual life [8–12].

Material and Methods

The study included 151 women with surgical menopause (SM), 357 women with natural menopause (NM), and 186 perimenopausal women (PM), who all attended menopause and gynecology clinics of the Department of Obstetrics and Gynecology at Ondokuz Mayıs University, Samsun, Turkey between 2007 and 2017. All authors and the study protocol complied with the World Medical Association Declaration of Helsinki regarding ethical issues and principles in research involving human subjects. Local ethics committee (Ondokuz Mayıs University Clinical Research Ethics Committee) approval was obtained for the study (OMU-KAEK 2013/298) and written informed consent was obtained from the subjects who participated.

Menopausal participants were between 49 and 62 years of age and had been postmenopausal for at least 1 year. The women with SM had undergone a total abdominal hysterectomy and bilateral salpingo-oophorectomy for benign gynecologic diseases such as uterine fibroids, ovarian masses, and resistant abnormal uterine bleeding. The women with NM had intact uteruses and ovaries. Both groups were similar in socio-cultural factors and economic and individual features, including age, parity, body mass index, education, employment, duration of menopause, medical-surgical history, hormone replacement therapy use, and partner's characteristics.

Perimenopausal women were between 43 and 49 years of age and were similar to the menopausal groups in socio-cultural factors and economic and individual features, including age, parity, body mass index (BMI), education, occupation, medical-surgical history, and partner's characteristics.

Exclusion criteria for the participants were the following: type 1 diabetes mellitus (DM) and medication-dependent type 2 DM, hypertension (HT) except for stage 1 essential HT, cardiovascular disease, chronic obstructive pulmonary disease, neurological or psychiatric diseases, antipsychotic and antidepressant drug use, thyroid dysfunction, morbid obesity, previous surgery within the last year, having a malignant disease, prolapsed pelvic organ or any surgery for prolapsus, any type of incontinence, alcohol or any drug abuse affecting sexual life, and homosexuality.

Exclusion criteria for sexual partners of the participants were the following: type 1 DM and medication-dependent type 2 DM, hypertension (HT) except for stage 1 essential HT, cardiovascular disease, chronic obstructive pulmonary disease, neurological or psychiatric diseases, antipsychotic and antidepressant drug use, thyroid dysfunction, morbid obesity, previous surgery within 2 years, previous surgery for any prostate disease, symptomatic benign prostate hypertrophy, and any sexual dysfunction such as erectile dysfunction or premature ejaculation.

To compare hormonal changes that can affect sex life, serum the levels of thyroid-stimulating hormone (TSH), prolactin (PRL), follicle-stimulating hormone (FSH), estradiol (E_2), total testosterone (TT), and dehydroepiandrosterone sulfate (DHEA-S) were measured at the biochemistry laboratory of Ondokuz Mayıs University. Serum TSH, PRL, E_2 , and TT levels were analyzed using a Roche Hitachi Modular E170 (Roche Diagnostic, Mannheim, Germany) autoanalyzer device with the electrochemiluminescence method. DHEA-S level was measured in an Immulite 2000 (Siemens, Flanders, NJ, USA) autoanalyzer device using the electrochemiluminescence method.

The Modified Female Sexual Function Index (FSFI), developed by Rosen et al., was used to compare the sexual performances of the participants [13]. We included coital frequency, excluded coital satisfaction, and used a modified FSFI in a 6-question face-to-face survey with all study groups. The overall test-retest reliability coefficients of the FSFI were high for each individual domain. The 6-question survey of sexual performance parameters is shown in Appendix 1.

Statistical analysis

The Kolmogorov-Smirnov test was used to determine whether the continuous variables were normally distributed, while the Levene test was used to evaluate the homogeneity of variances. Categorical data are displayed as numbers of cases and percentages, and descriptive statistics for continuous variables are expressed as median (25th–75th) percentiles, where applicable.

When the differences were not normally distributed, the data were compared using the Mann-Whitney U test; in other cases, the Kruskal-Wallis test was used for comparisons between more than 2 independent groups. When the p values from the Kruskal-Wallis test statistics were statistically significant, Conover's multiple-comparison test was used to determine which groups differed from which others.

Categorical data were analyzed with Pearson's chi-square test. However, when comparing the categorical variables in the 2×2 contingency tables, the Yates (continuity correction) test was used when 1 or more of the cells had an expected frequency of 5–25, and Fisher's exact test was used when 1 or more of the cells had an expected frequency of 5 or fewer. Furthermore, in the R×C contingency tables, a likelihood ratio test was preferred when 1 or more of the cells had an expected frequency of 5 or fewer.

The best predictor(s) of any component in sexual dysfunction were evaluated with multinomial logistic regression analyses with backward elimination. Any variable with an invariable test p value <0.25 was accepted as a candidate for the multivariable model, along with all variables of known clinical importance. Odds ratios, 95% confidence intervals, and Wald statistic for each independent variable were also calculated.

Data analysis was performed with IBM SPSS Statistics version 17.0 software (IBM Corporation, Armonk, NY, USA). A p value less than 0.05 was considered as statistically significant.

Results

The study included a total of 694 women with similar demographic features. Waist/rip ratio was higher in NM.

The intergroup comparisons of the continuous-categorical demographic and clinical features and hormone levels of the study groups are shown in Table 1.

Sexual performance parameters, including the frequency of sexual desire, coitus, orgasm, dyspareunia, sexual arousal, and vaginal lubrication were compared between all 3 study groups, and paired comparisons were made between PM and NM, PM and SM, and NM and SM. The scores for the frequency of sexual desire, coitus, and orgasm were significantly higher in the PM group, while the PM group's vaginal lubrication scores were lower than that of the NM and SM groups. In the paired comparison of NM and SM, the scores for the frequency of coitus, orgasm, and vaginal lubrication were significantly higher in the SM group, while the sexual desire frequency score was highest in the NM group (Table 2).

The relationship between the demographic and clinical features of the participants and the frequency of sexual desire was evaluated, and increased partner's age and woman's BMI were significantly related to decreased sexual desire, while a high level of education and serum DHEA-S concentration were found to increase the frequency of sexual desire (Table 3).

The relationship between the demographic and clinical features of the participants and the coital frequency was evaluated. There was significantly decreased coital frequency in the NM and SM groups, but no statistically significant difference in coital frequency was found between the NM and SM groups. In addition, woman's age, partner's age and parity were found to decrease coital frequency, while a high economic level and high serum TT concentration increase coital frequency (Table 3).

When the relationship between the demographic and clinical features of the participants and frequency of orgasm was evaluated, increased age of the woman's and a lower level of education were found to significantly decrease the orgasm frequency (Table 3).

The association between the demographic and clinical features of the participants and vaginal lubrication was evaluated. There was a statistically significant increase in inadequate vaginal lubrication in women who experienced NM or SM, lived in a city, and had a lower economic level (Table 3).

The relationship between the demographic and clinical features of the participants and dyspareunia frequency was evaluated; increased age of marriage, lower education level, living in a village, and being postmenopausal were found to significantly increase the frequency of dyspareunia (Table 3).

Table 1. Comparison of the continuous-categorical demographic and clinical features and hormone levels of the study groups.

	PM (n=186)		NM (n=357)		SM (n=151)		p Value
Age (year)	46.0	(43.0–49.2) ^{a,b}	57.0	(53.0–62.0) ^{a,c}	52.0	(49.0–56.0) ^{b,c}	<0.001
Marriage age (year)	19.0	(17.0–22.2)	19.0	(17.0–22.0)	20.0	(18.0–23.0)	0.050
Gravidity	4.0	(3.0–5.2) ^a	5.0	(3.0–7.0) ^{a,c}	3.0	(2.0–5.0) ^c	<0.001
Parity	3.0	(2.0–4.0) ^a	3.0	(2.0–5.0) ^{a,c}	3.0	(2.0–4.0) ^c	<0.001
Concomitant disease	69	(37.1%) ^b	147	(41.2%) ^c	40	(26.5%) ^{b,c}	0.007
HT	30	(16.1%)	80	(22.4%)	22	(14.6%)	0.060
DM	18	(9.7%)	47	(13.2%)	15	(9.9%)	0.379
Cardiac	6	(3.2%)	27	(7.6%) ^c	3	(2.0%) ^c	0.013
Other	22	(11.8%) ^{a,b}	22	(6.2%) ^a	4	(2.6%) ^b	0.003
Menopause duration (year)	–		7.0	(3.0–12.5)	5.0	(2.0–10.0)	0.012
BMI (kg/m ²)	31.0	(28.0–35.0) ^b	30.0	(27.0–33.1) ^c	28.6	(26.9–32.0) ^{b,c}	<0.001
Waist/hip ratio	0.83	(0.79–0.87) ^a	0.84	(0.80–0.89) ^{a,c}	0.83	(0.78–0.86) ^c	0.006
Previous surgery*	77/186	(58.6%) ^{a,b}	95/306	(69.0%) ^{a,c}	5/110	(95.5%) ^{b,c}	<0.001
HRT			32/357	(9.0%)	25/151	(16.6%)	0.020
Partner's age (year)	50.0	(46.0–53.0) ^{a,b}	60.0	(55.0–65.0) ^{a,c}	55.0	(52.0–60.0) ^{b,c}	<0.001
Partner's weight (kg)	80.0	(72.0–87.0)	80.0	(73.2–87.0)	79.0	(70.0–85.0)	0.072
Level of education							
Illiterate	37	(19.9%) ^a	139	(38.9%) ^{a,c}	20	(13.2%) ^c	<0.001
Elementary school	94	(50.5%) ^a	131	(36.7%) ^{a,c}	75	(49.7%) ^c	0.002
Secondary school	7	(3.8%) ^b	18	(5.0%)	15	(9.9%) ^b	0.038
High school	35	(18.8%) ^a	38	(10.6%) ^a	27	(17.9%)	0.014
University	13	(7.0%)	31	(8.7%)	14	(9.3%)	0.716
Occupation							
Housewife	146	(78.5%)	279	(78.2%)	116	(76.8%)	0.927
Retired	18	(9.7%) ^a	62	(17.4%) ^a	19	(12.6%)	0.042
Worker	22	(11.8%) ^a	16	(4.5%) ^{a,c}	16	(10.6%) ^c	0.003
Partner's level of education							
Illiterate	5	(2.7%) ^a	39	(11.1%) ^a	9	(6.0%)	0.002
Elementary school	59	(31.7%) ^a	145	(41.3%) ^{a,c}	42	(28.2%) ^c	0.008
Secondary school	29	(15.6%)	32	(9.1%)	18	(12.1%)	0.080
High school	51	(27.4%) ^a	70	(19.9%) ^{a,c}	51	(34.2%) ^c	0.002
University	42	(22.6%)	65	(18.5%)	29	(19.5%)	0.528
Partner's occupation							
Employee	12	(6.5%)	10	(2.8%) ^c	12	(7.9%) ^c	0.025
Civil servant	61	(32.8%) ^{a,b}	54	(15.1%) ^{a,c}	34	(22.5%) ^{b,c}	<0.001

Table 1 continued. Comparison of the continuous-categorical demographic and clinical features and hormone levels of the study groups.

	PM (n=186)		NM (n=357)		SM (n=151)		p Value
Self-employed	49	(26.3%) ^{a,b}	50	(14.0%) ^a	26	(17.2%) ^b	0.002
Farmer	10	(5.4%) ^a	69	(19.3%) ^{a,c}	13	(8.6%) ^c	<0.001
Unemployed	3	(1.6%)	4	(1.1%)	0	(0.0%)	0.159
Retired	51	(27.4%) ^{a,b}	170	(47.6%) ^a	65	(43.0%) ^b	<0.001
Partner's concomitant disease	38	(20.4%) ^a	116	(32.5%) ^{a,c}	33	(21.9%) ^c	0.003
HT	16	(8.6%)	44	(12.3%)	19	(12.6%)	0.376
DM	10	(5.4%)	24	(6.7%)	10	(6.6%)	0.819
Cardiac	13	(7.0%) ^b	45	(12.6%) ^c	1	(0.7%) ^{b,c}	<0.001
Other	5	(2.7%)	10	(2.8%)	4	(2.6%)	0.994
Income level							
Low	15	(8.1%) ^a	47	(13.2%) ^{a,c}	10	(6.6%) ^c	0.042
Middle	114	(61.3%)	209	(48.5%)	87	(57.6%)	0.759
High	53	(28.5%)	100	(28.0%)	53	(35.1%)	0.256
Very high	4	(2.2%)	1	(0.3%)	1	(0.7%)	0.103
Residence							
Village	22	(11.8%) ^a	80	(22.4%) ^{a,c}	21	(13.9%) ^c	0.003
Town	47	(25.3%)	72	(20.2%)	45	(29.8%)	0.054
City	117	(62.9%)	205	(57.4%)	85	(56.3%)	0.376
FSH	9.4	(4.9–23.0) ^{a,b}	47.6	(33.6–65.0) ^{a,c}	59.5	(45.0–82.9) ^{b,c}	<0.001
PRL	12.0	(8.4–15.4) ^{a,b}	9.1	(6.2–13.6) ^a	9.5	(6.3–16.6) ^b	<0.001
E ²	55.0	(25.0–100.0) ^{a,b}	12.0	(10.0–20.0) ^a	12.0	(10.0–22.0) ^b	<0.001
TT	0.56	(0.31–0.83) ^{a,b}	0.44	(0.25–0.71) ^{a,c}	0.45	(0.27–0.65) ^{b,c}	<0.001
DHEA-S	107.0	(73.9–154.5) ^{a,b}	73.8	(44.7–126.0) ^a	84.3	(50.6–121.2) ^b	<0.001
TSH	1.5	(0.8–2.5)	1.4	(0.8–2.8)	1.4	(0.9–2.4)	0.899

a, b and c are represent the patients with the highest scores on the modified FSFI score system. ^a – sexual desire: 5=almost always or always; ^b – coitus frequency: 4 and above in the month; ^c – orgasm: 5=almost always or always.

When the relationship between the demographic and clinical features of all participants and the frequency of sexual arousal were evaluated, we found a significantly increased frequency of sexual arousal in women who lived in a city and had a higher economic level and lower serum FSH concentration (Table 3).

Discussion

Women's sexual performance can be affected by many factors, including age, parity, BMI, marital status, sexual activity,

menopausal status, residence, occupation, socio-economic level, education level, previous sexual traumas and genitourinary surgeries, psychological factors, and sexual attitude, which is affected by folklore, religions, and beliefs, and the partner's socio-demographic features such as age, BMI, occupation, and education level [4–14]. In the evaluation of sexual performance, some scoring indexes have been developed with questions regarding sexual parameters such as sexual desire, coitus frequency and satisfaction, sexual arousal, orgasm, vaginal lubrication, and dyspareunia [13]. In the present study, we aimed to determine the demographic and clinical features affecting

Table 2. Comparison of the sexual performance parameters, including the frequency of sexual desire, coitus, orgasm, dyspareunia, sexual arousal, and vaginal lubrication were compared between study groups.

	PM (n=186)	NM (n=357)	SM (n=151)	p Value	p ¹²	p ¹³	p ²³
Sexual desire frequency				<0.001	<0.001	<0.001	0.041
Never or almost never	34 (18.3%)	175 (49.0%)	55 (36.4%)				
A few times	85 (45.7%)	123 (34.5%)	73 (48.3%)				
Most times	67 (36%)	59 (16.5%)	23 (15.3%)				
Coital frequency				<0.001	<0.001	<0.001	0.002
Once every 2 or 3 months	5 (2.7%)	91 (25.5%)	20 (13.2%)				
1 time per month	19 (10.2%)	102 (28.6%)	47 (31.1%)				
2–3 times per month	71 (38.2%)	102 (28.6%)	50 (33.1%)				
≥4 times per month	91 (48.9%)	62 (17.4%)	34 (22.5%)				
Orgasm frequency				<0.001	<0.001	<0.001	<0.001
Never or almost never	25 (13.4%)	158 (44.3%)	42 (27.8%)				
Very rarely	70 (37.6%)	117 (32.8%)	66 (43.7%)				
A few times	71 (38.2%)	59 (16.5%)	29 (19.2%)				
Most times	20 (10.8%)	23 (6.4%)	14 (9.3%)				
Lubrication				<0.001	<0.001	<0.001	0.002
None	137 (73.7%)	156 (43.7%)	51 (33.8%)				
Inadequate	42 (22.6%)	135 (37.8%)	55 (36.4%)				
Adequate	7 (3.8%)	66 (18.5%)	45 (29.8%)				
Dyspareunia frequency				<0.001	<0.001	<0.001	0.877
Never or almost never	123 (66.1%)	186 (52.1%)	82 (54.3%)				
A few times	47 (25.3%)	95 (26.6%)	33 (21.9%)				
Most times or always	16 (8.6%)	76 (21.3%)	36 (23.8%)				
Arousal frequency				0.388	–	–	–
Never or almost never	14 (7.5%)	44 (12.3%)	27 (17.9%)				
Very rarely	97 (52.2%)	171 (47.9%)	68 (45.0%)				
A few times	73 (39.2%)	134 (37.5%)	50 (33.1%)				
Most times	2 (1.1%)	8 (2.2%)	6 (4.0%)				

sexual performance and whether the type of menopause (NM and SM) have different impacts on sexual performance scores.

Previous studies have shown that sexual desire begins to decrease in late perimenopause [15–17]. A study from China showed that sexual desire was lower in women aged 56–60 than in those aged 45–55, and vaginal dryness and dyspareunia also became more prevalent with age [18]. Therefore, age has been suggested as an important factor of sexual desire in women. In addition, hypoactive sexual desire

dysfunction (HSDD) in middle-aged women has been associated with being partnered, consuming alcohol, vaginal dryness, dyspareunia, depressive symptoms, and use of psychotropic medications. However, menopausal status and vasomotor symptoms have not been associated with low sexual desire or HSDD [2]. In line with these studies, we found that increased partner's age and woman's BMI were significantly related to decreased sexual desire, while higher education level and serum DHEA-S concentration were found to increase frequency of sexual desire. In contrast, perimenopausal women were

Table 3. The relationship between the demographic and clinical features of the participants and all sexual function parameters.

	Odds ratio	95% Confidence interval		Wald	p Value
		Lower limit	Upper limit		
Never or almost never^a					
NM	2.944	1.574	5.507	11.429	<0.001
SM	3.743	1.824	7.678	12.961	<0.001
PM	1.000	–	–	–	–
Partner's age	1.084	1.047	1.122	20.759	<0.001
Level of education	0.704	0.575	0.863	11.415	<0.001
DHEA-S	0.996	0.992	0.999	5.750	0.016
BMI	1.076	1.025	1.129	8.809	0.003
A few times^a					
NM	1.125	0.651	1.941	0.177	0.674
SM	1.705	0.910	3.194	2.777	0.096
PM	1.000	–	–	–	–
Partner's age	1.040	1.006	1.074	5.358	0.021
Level of education	0.995	0.836	1.184	0.003	0.955
DHEA-S	0.996	0.993	0.999	6.906	0.009
BMI	1.025	0.979	1.072	1.094	0.296
Once every 2 or 3 months^b					
NM	4.256	1.308	13.844	5.791	0.016
SM	4.778	1.419	16.094	6.373	0.012
PM	1.000	–	–	–	–
Age	1.081	1.005	1.164	4.334	0.037
Parity	1.216	1.053	1.405	7.085	0.008
Partner's age	1.156	1.094	1.221	26.841	<0.001
Economic level	0.489	0.305	0.785	8.791	0.003
TT	0.215	0.085	0.544	10.510	<0.001
1 time per month^b					
NM	2.305	1.111	4.784	5.028	0.025
SM	3.420	1.625	7.196	10.491	<0.001
PM	1.000	–	–	–	–
Age	1.077	1.009	1.150	5.029	0.025
Parity	1.132	0.989	1.295	3.247	0.072
Partner's age	1.064	1.011	1.119	5.749	0.016
Economic level	0.983	0.660	1.466	0.007	0.934
TT	1.154	0.742	1.794	0.404	0.525
2–3 times per month^b					
NM	1.789	1.017	3.148	4.073	0.044
SM	2.024	1.114	3.677	5.359	0.021
PM	1.000	–	–	–	–
Age	0.984	0.928	1.043	0.294	0.588
Parity	1.181	1.040	1.340	6.598	0.010

Table 3 continued. The relationship between the demographic and clinical features of the participants and all sexual function parameters.

	Odds ratio	95% Confidence interval		Wald	p Value
		Lower limit	Upper limit		
Partner's age	1.035	0.989	1.082	2.175	0.140
Economic level	0.999	0.703	1.419	0.000	0.995
TT	1.294	0.917	1.826	2.148	0.143
Never or almost never ^c					
Age	1.147	1.090	1.207	27.848	<0.001
Level of education	0.472	0.368	0.605	34.907	<0.001
Very rarely ^c					
Age	1.061	1.011	1.114	5.779	0.016
Level of education	0.678	0.544	0.844	12.055	<0.001
A few times ^c					
Age	0.977	0.928	1.028	0.798	0.372
Level of education	0.750	0.596	0.943	6.043	0.014
Adequate ^d					
Village	1.995	1.064	3.741	4.636	0.031
Town	0.694	0.385	1.252	1.473	0.225
City	1.000	–	–	–	–
NM	7.603	3.341	17.302	23.383	<0.001
SM	16.043	6.658	38.662	38.247	<0.001
PM	1.000	–	–	–	–
Economic level	0.613	0.410	0.916	5.688	0.017
Inadequate ^d					
Village	1.360	0.814	2.275	1.376	0.241
Town	0.440	0.273	0.708	11.419	<0.001
City	1.000	–	–	–	–
NM	2.681	1.746	4.116	20.315	<0.001
SM	3.347	1.950	5.744	19.211	<0.001
PM	1.000	–	–	–	–
Economic level	0.669	0.490	0.914	6.387	0.011
Most times or always ^e					
Village	2.551	1.465	4.440	10.959	<0.001
Town	1.405	0.815	2.420	1.499	0.221
City	1.000	–	–	–	–
NM	2.785	1.519	5.109	10.955	<0.001
SM	4.279	2.150	8.515	17.148	<0.001
PM	1.000	–	–	–	–
Marriage age	1.056	0.997	1.119	3.438	0.064
Level of education	0.589	0.464	0.748	18.856	<0.001
A few times ^e					
Village	0.936	0.534	1.640	0.053	0.818

Table 3 continued. The relationship between the demographic and clinical features of the participants and all sexual function parameters.

	Odds ratio	95% Confidence interval		Wald	p Value
		Lower limit	Upper limit		
Town	0.922	0.578	1.471	0.116	0.733
City	1.000	–	–	–	–
NM	1.311	0.852	2.018	1.520	0.218
SM	1.266	0.731	2.191	0.709	0.400
PM	1.000	–	–	–	–
Marriage age	1.071	1.022	1.121	8.305	0.004
Level of education	0.753	0.632	0.897	10.121	<0.001
Never or almost never ^f					
Village	2.363	1.191	4.691	6.047	0.014
Town	1.257	0.602	2.622	0.370	0.543
City	1.000	–	–	–	–
Economic level	0.681	0.432	1.074	2.732	0.098
FSH	1.001	0.996	1.005	0.160	0.689
TT	1.042	0.973	1.115	1.403	0.236
Very rarely ^f					
Village	1.376	0.840	2.254	1.611	0.204
Town	2.129	1.391	3.260	12.102	<0.001
City	1.000	–	–	–	–
Economic level	0.596	0.446	0.798	12.128	<0.001
FSH	0.993	0.987	0.998	7.497	0.006
TT	0.737	0.528	1.029	3.205	0.073

a, b, c, d, e and f are represent the patients with the highest scores on the modified FSFI score system. ^a – sexual desire: 5=almost always or always; ^b – coitus frequency: 4 and above in the month; ^c – orgasm: 5=almost always or always; ^d – vaginal lubrication: 5=almost always or always; ^e – dyspareunia: 5=almost never or never; ^f – arousal: 5=almost always or always.

found to have significantly higher sexual desire than those with menopause, and sexual desire was found to be higher in women with natural menopause than in those with surgical menopause.

Coital frequency and satisfaction have also been defined as sexual parameters. In the present study, there was significantly increased coital frequency in the PM group when compared to both menopausal groups, but no statistically significant difference in coital frequency was found between NM and SM. In addition, the woman's age, partner's age, and parity were found to decrease coital frequency, while high economic level and serum TT concentration increased coital frequency. Furthermore, Worsley et al. found that women with more physical jobs had higher coital satisfaction, while a higher family income and being married were related to lower sexual

satisfaction. We did not find any significant relationship between income level and coital frequency [19].

In the present study, increased woman's age and a lower level of education were found to significantly decrease orgasm frequency. In addition, women who experienced PM and SM had higher orgasm frequency than those with NM.

This study found significantly increased frequency of sexual arousal in women who lived in a city and had a higher economic level and lower serum FSH concentration. In contrast, some researchers have suggested that high income level is related to lower sexual satisfaction [19]. Moreover, some studies have suggested that androgens, but not FSH, play an important role in libido and sexual arousal [20–22], but other studies have not supported this hypothesis, and instead emphasized physiologic ovarian failure in hormone secretion [23,24]. We also found

increased sexual arousal in perimenopausal women and those with SM, whereas women with NM had lower sexual arousal.

The present study also evaluated another important factor – vaginal lubrication – in all participants, and found statistically significant increases in inadequate vaginal lubrication in women who experienced NM or SM, lived in a city, and had a lower economic level. Dyspareunia was also assessed in this study, and was found to increase in frequency with increased marriage age, lower education level, living in a village, and being postmenopausal. Supporting our data, other studies have found that vaginal dryness and dyspareunia are present in 30–50% of menopausal women due to decreases in serum estradiol and androgen levels, which causes diminished vaginal blood flow and results in vaginal atrophy and lack of lubrication [21,25–28].

Apart from the demographic and clinical features affecting the sexual performance of women, the type of menopause – SM or NM – has been another point of interest in this topic. In the present study, sexual performance parameters, including the frequency of sexual desire, coitus, orgasm, dyspareunia, sexual arousal, and vaginal lubrication, were compared among the 3 study groups; in addition, paired comparisons were conducted between NM and SM. The scores for the frequency of sexual desire, coitus, and orgasm were significantly higher in the PM group, while the vaginal lubrication score was lower in this group than in the NM and SM groups. In the paired comparisons of NM and SM, the scores for the frequency of coitus, orgasm, and vaginal lubrication were significantly higher in the SM group, while the sexual desire frequency score was higher in the NM group. However, the effect of hysterectomies and bilateral salpingo-oophorectomies on the sexual function of women has been a point of contention. Some studies have reported a positive effect of SM on psychological and sexual well-being and sexual performance [10,29–32]. Conversely, Kokcu et al. found that vaginal dryness increased in women with SM, but that SM did not have a more negative effect on female sexual performance than did NM [33].

In contrast to the studies supporting the positive effect of SM on the quality of women's sex lives, several studies reported opposite results on this topic and suggested that the possible determinants of sex life quality include changes in anatomic structures (pelvic organs and supportive tissues), including nerve supplies, decreases in frequency of coitus due to some psychological problems after surgery, and marked decreases in hormone levels (especially estradiol and testosterone) [5,6,34,35]. Moreover, studies have found impaired

sexual life (diminished sexual pleasure, desire, libido and vaginal lubrication) in women with SM when compared to those with NM [9,34,36,37]. Further, Bhattacharya et al. suggested that health-related quality of life was worse after SM than in NM [10]. Using the Golombok-Rust Inventory of Sexual Satisfaction, Topatan et al. reported a positive relationship between menopausal symptom intensity and sexual dysfunction, especially in women with SM [38]. In contrast to these studies, Leiblum et al. suggested that SM from age 50 to 70 had no significant negative effect when compared to NM, but did have a significant negative effect from age 20 to 49 [39]. The effect of SM on sexual life is also important for women who plan to undergo a risk-reducing salpingo-oophorectomy. On this topic, Tucker et al. and Vermeulen et al. found that premenopausal women undergoing risk-reducing salpingo-oophorectomy had higher sexual distress and more dissatisfaction with their sex lives [31–40].

It has long been suggested that age-based changes in serum estradiol, TSH, PRL, DHEA-S, and TT levels, as well as menopausal status, impact the sexual performance of women [41]. A small decline in TT level has been reported in NM, while in SM, TT significantly decreased [25]. Some studies have suggested that androgens play an important role in libido and sexual arousal [20–22]. Supporting these studies, we found that higher serum DHEA-S concentrations increase the frequency of sexual desire, and higher serum TT concentrations increase coital frequency, but lower serum FSH concentrations increase the frequency of sexual arousal. However, some investigations have not supported this hypothesis, and emphasized physiologic ovarian failure in hormone secretion [23,24].

Conclusions

In conclusion, various demographic and clinical factors and the type of menopause can affect the sexual performance of women. Our study approached this topic in an extended manner and investigated the relationships between several factors and sexual function. Age, BMI, level of education, postmenopausal status, parity, economic level, residence, marriage age, partner's age, serum DHEA-S, TT, and FSH levels were found to have statistically significant effects on the sexual performance of women. SM was found to not affect female sexual performance more than NM (except for sexual desire).

Conflicts of interest

None.

Appendix 1

Questionnaire Form of the Study.

Q1: Over the past 6 months, how frequently did you feel sexual desire in your overall sexual life?

- 1 – Never or almost never
- 2 – A few times (less than half the time)
- 3 – Most times (more than half the time)

Q2: Over the past 6 months, how frequently did you have coitus?

- 1 – 1 per 2 or 3 months
- 2 – 1 times per month
- 3 – 2–3 times per month
- 4 – ≥ 4 times per month

Q3: Over the past 6 months, how frequently did you feel sexually aroused during times of coitus?

- 1 – Never or almost never
- 2 – Very rarely
- 3 – A few times (less than half the time)
- 4 – Most times (more than half the time)

Q4: Over the past 6 months, how frequently did you reach orgasm during times of coitus?

- 1 – Never or almost never
- 2 – Very rarely
- 3 – A few times (less than half the time)
- 4 – Most times (more than half the time)

Q5: Over the past 6 months, did you have vaginal lubrication during times of coitus?

- 1 – None
- 2 – Inadequate
- 3 – Adequate

Q6: Over the past 6 months, how frequently did you experience pain during vaginal penetration in coitus?

- 1 – Never or almost never
- 2 – A few times (less than half the time)
- 3 – Most times or always

References:

1. Dennerstein L, Lehert P, Guthrie JR, Burger HG: Modeling women's health during the menopausal transition: A longitudinal analysis. *Menopause*, 2007; 14(1): 53–62
2. Worsley R, Bell RJ, Gartoulla P, Davis SR: Prevalence and predictors of low sexual desire, sexually related personal distress, and hypoactive sexual desire dysfunction in a community-based sample of midlife women. *J Sex Med*, 2017; 14(5): 675–86
3. Gazibara T, Nurkovic S, Kovacevic N et al: Factors associated with sexual quality of life among midlife women in Serbia. *Qual Life Res*, 2017; 26(10): 2793–804
4. Moghasemi S, Ozgoli G, Ahmadi F, Simbar M: Sexual experience of Iranian women in their middle life: A qualitative approach. *Int J Commun Based Nurs Midwifery*, 2018; 6(1): 47–55
5. El-Toukhy TA, Hefni MA, Davies AE, Mahadevan S: The effect of different types of hysterectomy on urinary and sexual functions: A prospective study. *J Obstet Gynaecol*, 2004; 24(4): 420–25
6. Kuppermann M, Summitt RL, Varner RE et al: Sexual functioning after total compared with supracervical hysterectomy: A randomized trial. *Obstet Gynecol*, 2005; 105(6): 1309–18
7. Gelfand MM: Role of androgens in SM. *Am J Obstet Gynecol*, 1999; 180: 325–27
8. Aziz A, Bergquist C, Nordholm L et al: Prophylactic oophorectomy at elective hysterectomy: Effects on psychological well-being at 1-year follow-up and its correlations to sexuality. *Maturitas*, 2005; 51(4): 349–57
9. Böös JN, Von Schoultz B, Carlström K: Elective ovarian removal and estrogen replacement therapy – effects on sexual life, psychological well-being and androgen status. *J Psychosom Obstet Gynecol*, 1993; 14(4): 283–93
10. Bhattacharya SM, Jha A: A comparison of health-related quality of life (HRQOL) after natural and surgical menopause. *Maturitas*, 2010; 66(4): 431–34
11. Tucker PE, Saunders C, Bulsara MK et al: Sexuality and quality of life in women with a prior diagnosis of breast cancer after risk-reducing salpingo-oophorectomy. *Breast*, 2016; 30: 26–31
12. Tucker PE, Cohen PA: Review article: Sexuality and risk-reducing salpingo-oophorectomy. *Int J Gynecol Cancer*, 2017; 27(4): 847–52
13. Rosen C, Brown J, Heiman S et al: The Female Sexual Function Index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. *J Sex Marital Ther*, 2000; 26(2): 191–208
14. Baram DA, Basson R: Sexuality, sexual dysfunction, and sexual assault. In: Berek JS, (ed). *Berek and Novak's gynecology*. Philadelphia: Lippincott Williams and Wilkins, 2007; 313–50
15. Dennerstein L, Dudley E, Burger H: Are changes in sexual functioning during midlife due to aging or menopause? *Fertil Steril*, 2001; 76(3): 456–60
16. Gracia CR, Freeman EW, Sammel MD et al: Hormones and sexuality during transition to menopause. *Obstet Gynecol*, 2007; 109(4): 831–40
17. Avis NE, Brockwell S, Randolph JF Jr. et al: Longitudinal changes in sexual functioning as women transition through menopause: Results from the Study of Women's Health Across the Nation (SWAN). *Menopause* (New York, NY). 2009; 16(3): 442
18. Zhang C, Cui L, Zhang L et al: Sexual activity and function assessment in middle-aged Chinese women using the female sexual function index. *Menopause*, 2017; 24(6): 669–76
19. Smith RL, Gallicchio L, Flaws JA: Factors affecting sexual function in midlife women: Results from the midlife women's health study. *J Womens Health*, 2017; 26(9): 923–32
20. Maas CP, Weijnenberg PTM, Ter Kuile MM: The effect of hysterectomy on sexual functioning. *Annual Review of Sex Research*, 2003; 14(1): 83–113
21. Traish AM, Kim N, Min K et al: Role of androgens in female genital sexual arousal: Receptor expression, structure, and function. *Fertil Steril*, 2002; 77: 11–18
22. Kingsberg SA, Simon JA, Goldstein I: The current outlook for testosterone in the management of hypoactive sexual desire disorder in postmenopausal women. *J Sex Med*, 2008; 5: 182–93
23. Nappi RE, Albani F, Santamaria V et al: Hormonal and psycho-relational aspects of sexual function during menopausal transition and at early menopause. *Maturitas*, 2010; 67(1): 78–83
24. Aziz A, Brännström M, Bergquist C, Silfverstolpe G: Perimenopausal androgen decline after oophorectomy does not influence sexuality or psychological well-being. *Fertil Steril*, 2005; 83(4): 1021–28

25. Huang G, Basaria S, Travison TG et al: Testosterone dose-response relationships in hysterectomized women with and without oophorectomy: Effects on sexual function, body composition, muscle performance and physical function in a randomized trial. *Menopause* (New York, NY), 2014; 21(6): 612–23
26. Basson R: Women's sexuality and sexual dysfunction. In: Gibbs RS, Karlan BY, Haney AF, Nygaard IE (eds.), *Danforth's obstetrics and gynecology*. Philadelphia: Lippincott Williams & Wilkins, 2008; 742–58
27. Gorodeski GI: Effects of menopause and estrogen on cervical epithelial permeability. *J Clin Endocrinol Metab*, 2000; 85(7): 2584–95
28. Sarrel PM: Psychosexual effects of menopause: Role of androgens. *Am J Obstet Gynecol*, 1999; 180(3): 319–24
29. Rhodes JC, Kjerulff KH, Langenberg PW et al: Hysterectomy and sexual functioning. *JAMA*, 1999; 282(20): 1934–41
30. Castelo-Branco C, Biglia N, Nappi RE et al: Characteristics of postmenopausal women with genitourinary syndrome of menopause: Implications for vulvovaginal atrophy diagnosis and treatment selection. *Maturitas*, 2015; 81(4): 462–69
31. Vermeulen RFM, Beurden MV, Korse CM, Kenter GG: Impact of risk reducing salpingo-oophorectomy in premenopausal women. *Climacteric*, 2017; 20(3): 212–21
32. Vermeulen RFM, Beurden MV, Kieffer JM et al: Hormone replacement therapy after risk-reducing salpingo-oophorectomy minimises endocrine and sexual problems: A prospective study. *Eur J Cancer*, 2017; 84: 159–67
33. Kokcu A, Kurtoglu E, Bildircin D et al: Does surgical menopause affect sexual performance differently from natural menopause? *J Sex Med*, 2015; 12(6): 1407–14
34. McPherson K, Herbert A, Judge A et al: Psychosexual health 5 years after hysterectomy: Population-based comparison with endometrial ablation for dysfunctional uterine bleeding. *Health Expect*, 2005; 8(3): 234–43
35. Thakar R, Ayers S, Srivastava R et al: Removing the cervix at hysterectomy: An unnecessary intervention? *Obstet Gynecol*, 2008; 112(6): 1262–69
36. Castelo-Branco C, Palacios S, Combalia J et al: Risk of hypoactive sexual desire disorder and associated factors in a cohort of oophorectomized women. *Climacteric*, 2009; 12(6): 525–32
37. Nappi RE, Lello S, Melis GB et al: LEI (Lack of Testosterone Impact) survey in a clinical sample with surgical menopause. *Climacteric*, 2009; 12: 533–40
38. Topatan S, Yildiz H: Symptoms experienced by women who enter into natural and surgical menopause and their relation to sexual functions. *Health Care Women Int*, 2012; 33(6): 525–39
39. Leiblum SR, Koochaki PE, Rodenberg CA et al: Hypoactive sexual desire disorder in postmenopausal women: US results from the Women's International Study of Health and Sexuality (WISHeS). *Menopause*, 2006; 13(1): 46–56
40. Tucker PE, Bulsara MK, Salfinger SG et al: The effects of pre-operative menopausal status and hormone replacement therapy (HRT) on sexuality and quality of life after risk-reducing salpingo-oophorectomy. *Maturitas*, 2016; 85: 42–48
41. Atis G, Dalkilinc A, Altuntas Y et al: Sexual dysfunction in women with clinical hypothyroidism and subclinical hypothyroidism. *J Sex Med*, 2010; 7(7): 2583–90
42. Petty RG: Prolactin and antipsychotic medications: Mechanism of action. *Schizophr Res*, 1999; 1(35) Suppl.: 67–73