



Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.journals.elsevier.com/european-journal-of-obstetrics-and-gynecology-and-reproductive-biology

Full length article

A study evaluating quality of life and factors affecting it before, during and after menopause

Hayley A. Hutchings^{*,1}, Nia Taylor, Anagha Remesh, James Rafferty

School of Medicine, Faculty of Medicine, Health and Life Science, Swansea University, Swansea University, Singleton Park, SA2 8PP, Wales



ARTICLE INFO

Keywords:

Menopause
Quality of life
Patient reported outcome measures
SF-36
UQOL

ABSTRACT

Objective: To determine if quality of life (QoL) changes before, during and after menopause and whether these changes are linked to symptoms, demographics, and/or lifestyle factors.

Methods: We undertook a cross-sectional online survey. We invited women aged between 35 and 60 years to complete the survey which included the Short-Form 36 (SF-36) generic quality of life measure, the menopause specific Utian-Quality of life (UQOL) measure, and questions about health and wellbeing, menopause symptoms and hormonal stage. The data were analysed with one-way ANOVA analysis and multivariate regression modelling.

Results: 279 women completed the survey. Most were aged between 51 and 55 years. In the unadjusted analysis there was a tendency for QoL to deteriorate from pre to peri to menopause and then increase slightly post menopause. This was however not significant in multivariate analysis. Multivariate analysis identified that lifestyle factors significantly influenced QoL. Regular exercise resulted in better QoL scores across a number of the UQoL and SF-36 sub-scales. Being very overweight and having more menopause symptoms resulted in worse QoL.

Conclusions: Although there was a trend towards worse quality of life in the peri and menopause stages this was not significantly different in adjusted multivariate analyses. Those experiencing more symptoms had significantly worse QoL. Lifestyle factors may affect QoL, but the picture is not straightforward. It is promising that there was a trend toward improved QoL in the post-menopausal stage. These findings should inform education material and promote awareness of the menopause and its impact on QoL.

(245)

Introduction

Most woman spend more than a third of their lifetime being postmenopausal[1]. The duration of menopause can be influenced by lifestyle factors such as age, race, ethnicity, and smoking[2].

Quality of life (QoL) is defined as “an individual’s perception of their position in life in the context of the cluster and value systems in which they live and in relation to their goals, expectations, standards and concerns”[3].

Research exploring the quality of life of menopausal women, has tended to focus on a specific hormonal stage, on risk factors or on predictors of poor quality of life with limited comparison to non-menopausal women. In one study chronic diseases, vasomotor symptoms and insufficient income were strong predictors of quality of life of

postmenopausal women[1]. This study however just focused on postmenopausal women. Another study of women transitioning into menopause compared with postmenopausal women identified the symptoms that significantly affect quality of life were sleep disturbances, fatigue, and anxiety, suggesting that management of sleep disorders and anxiety may be beneficial to women undergoing the transition to postmenopause[4]. Other studies have identified that that severe menopause symptoms are related to poorer quality of life[5,6].

There is limited research that has explored quality of life across the various hormonal stages and whether lifestyle, demographic factors and menopause symptoms have an impact on QoL. The aim of this study was to determine if and how a woman’s QoL changes when going through menopause and to determine whether these changes are linked to symptoms, demographics, and/or lifestyle factors.

* Corresponding author.

E-mail address: h.a.hutchings@swansea.ac.uk (H.A. Hutchings).¹ ORCID ID: <https://orcid.org/0000-0003-4155-1741>.<https://doi.org/10.1016/j.ejogrb.2023.08.373>

Received 17 April 2023; Received in revised form 31 July 2023; Accepted 21 August 2023

Available online 23 August 2023

0301-2115/© 2023 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Table 1
Demographic characteristics, hormonal stage and lifestyle factors of the participating women.

Variable	Categories	Frequency (N = 279)	Percent (%)
Age	35–40	32	11.5
	41–45	47	16.8
	46–50	80	28.7
	51–55	84	30.1
	56–60	36	12.9
Ethnicity	White or Caucasian	271	97.1
	Another race	8	2.9
Hormonal Stage	Pre-Menopause	65	23.3
	Peri Menopause	100	35.8
	Menopause	50	17.9
	Post Menopause	64	22.9
Current Weight	Healthy weight	82	29.4
	Slightly under weight	6	2.2
	Very underweight	0	0
	Slightly overweight	132	47.3
	Very overweight	59	21.1
Smoker	Yes	27	9.7
	No	252	90.3
Drink Alcohol	Yes	190	68.1
	No	89	31.9
Alcohol Consumption	2–4 times a week	80	28.7
	5–6 times a week	17	6.1
	Everyday	6	2.2
	Once a week	87	31.2
	None	89	31.9
Caffeine Consumption	Around 400 mg	51	18.3
	Less than 400 mg	187	67.0
	More than 400 mg	25	9.0
	None	16	5.7
Diet	Moderately healthy	147	52.7
	Moderately unhealthy	19	6.8
	unhealthy	8	2.9
	healthy	105	37.6
Exercise	Once a week	36	12.9
	Twice a week	52	18.6
	3 times a week	48	17.2
	4 times a week	26	9.3
	5 times a week	28	10.0
	6 times a week	15	5.4
	Everyday	43	15.4
	Never	31	11.1
Exercise Intensity	Intense	43	15.4
	Moderately intense	100	35.8
	None of the above	31	11.1
	Not intense	53	19.0
	Slightly intense	44	15.8
Very intense	8	2.9	

Methods

We created a survey to collect demographic and lifestyle information, menopause symptoms and to assess the QoL of women. We invited women aged 35–60 years to participate. The survey contained four sections:

- Section 1: Participants' consent to take part in the survey.
- Section 2: General demographic and lifestyle questions, hormonal stage, and any menopause related symptoms.
- Section 3: Short Form 36 Survey (SF-36[7]) which assessed general quality of life (https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form.html). Selected as it is a validated questionnaire that has previously been used in menopause research studies.
- Section 4: Disease specific Utian Quality of Life (UQOL) Scale[8] which assessed menopause specific QoL ([https://www.menopause.org/publications/clinical-practice-materials/menopause-qol-instrument-\(uqol\)](https://www.menopause.org/publications/clinical-practice-materials/menopause-qol-instrument-(uqol))). Selected as it is a validated questionnaire that has previously been used in menopause research studies.

Participants were asked to indicate which hormonal stage they were in. They were provided with the following definitions in order to complete the question on hormonal stage:

- Pre menopause: Regular menstruation occurs, menopause has not yet begun.
- Peri menopause: Periods are starting to become irregular, and menopausal symptoms, such as hot flashes, mood swings and brain fog may have begun.
- Menopause: 12 months after periods become irregular
- Post menopause: 12 months after the last period.

The survey and information sheet were sent via email to staff and students within Swansea University. As we were asking for participants to be aged 35 years or older, the students were likely to be mature or postgraduate students. The total staff and student numbers are approximately 3,300 and 20,500 respectively. We also invited participation through snowballing methods and local social media groups (staff Yammer fora and Facebook groups).

Pilot study

To assess the clarity, reliability and applicability of our survey, a pilot study was conducted with a representative sample of 10 women. The results of the pilot study identified that in section two not every question needed to be mandatory. The alcohol consumption (y/n) question was mandatory, but if the participant answered no to this question, the following question about amount of alcohol consumed in a week was not mandatory. These modifications were made to enhance the quality of our survey before it was published to the public. The data obtained from the pilot representative sample were not included in the study analysis.

Instruments

SF-36 scoring

The SF-36 is made up of 36 questions and was scored according to the developers guidance (https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form/scoring.html). We calculated scores for each of the eight SF-36 sub-scales: physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain and general health. These were scored from 0 to 100, with zero being the lowest (worse QoL), and 100 being the highest (best QoL) score.

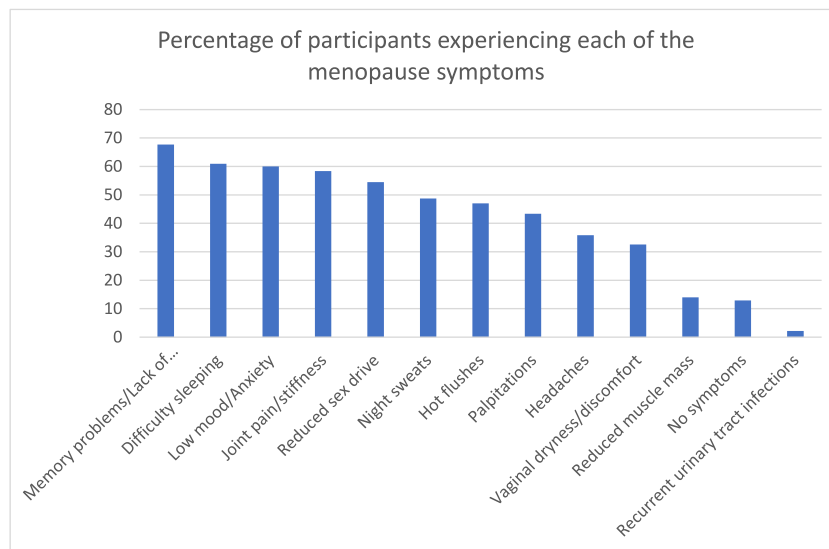


Fig. 1. Percentage of participants experiencing menopause symptoms (N = 279).

UQOL scoring

The UQOL is made up of 23 questions and was scored according to the developers’ guidance ([https://www.menopause.org/publications/clinical-practice-materials/menopause-qol-instrument-\(uqol\)](https://www.menopause.org/publications/clinical-practice-materials/menopause-qol-instrument-(uqol))). We calculated scores for each of the four UQOL subscales: occupational QoL, health QoL, emotional QoL and sexual QoL. We also calculated a total UQOL score, which is the sum of the four UQOL sub-scales. The total score ranges from 48 to 100. A lower score on each of the sub-scale and total scores indicated worse quality of life.

Menopause symptoms

We created four composite categories based on the presence of menopause symptoms[9]:

- Vasomotor symptoms: night sweats, hot flushes.
- Psychosocial symptoms: low mood/anxiety, memory problems.
- Physical symptoms: difficulty sleeping, headaches, joint pain, reduced muscle mass, palpitations, recurrent urinary tract infections (UTIs).
- Sexual symptoms: vaginal dryness/discomfort, reduced sex drive.

Table 2

Univariate analysis of hormonal Stage and QoL. Each row of the table corresponds to a one-way ANOVA model. A p-value smaller than our chosen cutoff indicates we can reject the null hypothesis that all means are equal so at least two means are different from each other.

QoL Scale	Pre menopause (Mean (SD))	Peri menopause (Mean (SD))	Menopause (Mean (SD))	Post menopause (Mean (SD))	P-value
SF-36					
Physical Functioning	90.23 (18.99)	83.90 (18.06)	80.90 (20.42)	82.97 (17.99)	P = 0.039*
Role limitations due to physical health	87.18 (30.44)	69.00 (40.55)	72.00 (39.48)	69.79 (38.82)	P = 0.016*
Energy and fatigue	45.31 (20.19)	35.00 (17.95)	35.10 (18.72)	46.25 (22.92)	P < 0.001*
Role limitations due to emotional problems	72.82 (38.14)	51.00 (42.76)	53.33 (42.06)	61.46 (39.04)	P = 0.007*
Social functioning	81.35 (22.23)	64.75 (26.73)	67.50 (25.88)	72.27 (25.63)	P < 0.001*
Emotional wellbeing	58.71 (11.04)	52.64 (12.04)	54.24 (11.88)	58.88 (12.15)	P < 0.001*
Pain	81.41 (22.11)	64.17 (22.40)	70.56 (22.48)	69.22 (23.49)	P < 0.001*
General health	62.46 (21.69)	55.45 (21.72)	56.90 (19.56)	63.28 (21.75)	P = 0.059
UQOL					
Occupational QoL	23.23 (5.61)	22.31 (6.30)	22.22 (5.60)	23.58 (5.67)	P = 0.450
Health QoL	20.37 (4.47)	20.13 (4.45)	19.20 (3.67)	20.72 (4.41)	P = 0.298
Sexual QoL	9.00 (2.17)	8.56 (2.50)	8.80 (2.09)	9.27 (2.13)	P = 0.256
Emotional QoL	14.72 (2.66)	16.04 (2.75)	15.76 (2.87)	15.88 (3.03)	P = 0.026*
Total UQOL score	67.32 (9.40)	67.04 (9.64)	65.98 (8.80)	69.44 (9.44)	P = 0.234

*p < 0.05.

Statistical analysis

We conducted statistical analyses using SPSS version 28 (SPSS Inc., Chicago, IL, USA) and R version 4.2.1 (R Foundation, Vienna, Austria.) [10] statistical analysis software. We investigated the relationship between demographic, lifestyle factors, symptoms, hormonal stage and QoL using one-way analysis of variance (ANOVA), and regression analysis. Age was not included as a co-variate in the multivariate analysis as there was found to be significant correlation with hormonal stage. Ethnicity was also not included in the multivariate analysis as over 97% of the participants in our sample were white. We constructed multivariate regression models for each outcome from the UQOL and SF-36 questionnaires. We constructed separate models with a single composite menopause symptom count variable and with the four composite menopause symptom variables previously described. We selected the final model for each outcome based on model goodness of fit, measured using the Akaike Information Criterion [11], and consideration of model assumptions. We assumed outcomes were continuous unless there were a small number of possible values for the outcome, in which case data were modelled using multinomial logistic regression. P values less than 0.05 were considered statistically significant.

Sample size

In order to detect a medium effect size based on the quality of model fit, with an 80% power based on 35 predictors, we calculated that a sample size of 196 was required. This was based on undertaking a linear regression with at least one predictor having a significant effect (at the $p = 0.05$ level) on the outcome variable [12].

Research ethics

Ethical approval was granted by Swansea University Medical School Ethics Committee. Participants could not move onto the survey questions without first giving consent. The significance and purpose of this research study was explained to each participant prior to survey completion. We did not collect any personal identifiable information. Each participant was assured that the answers they submitted would be confidential and only aggregate anonymised data would be presented in publications.

Results

Overall, 279 women aged between 35 and 60 years participated in the study. Table 1 shows the demographic characteristics, ethnicity, hormonal stage and lifestyle factors of the participating women. Most women were in the 51–55 years age category. Most were white/caucasian and non-smokers. A large proportion consumed alcohol with just over one third drinking more than once a week. Almost one third identified as a healthy weight and three quarters reported exercising more than once a week with approximately 70% indicating that the exercise was intense. Less than half stated that they had a healthy diet with around half claiming to have a moderately healthy diet. The majority did not exceed the recommended daily amount of daily caffeine.

Menopause symptoms

Of the 279 women who responded to the survey, most experienced at least one menopause symptom. The most common symptoms were difficulty sleeping and memory problems/ lack of concentration. Fig. 1 illustrates the most frequently documented symptoms in our sample.

Hormonal stage and QoL

Table 2 illustrates the SF-36 and UQOL QoL scores according to menopausal stage. Most of the respondents were in the *peri*-menopausal

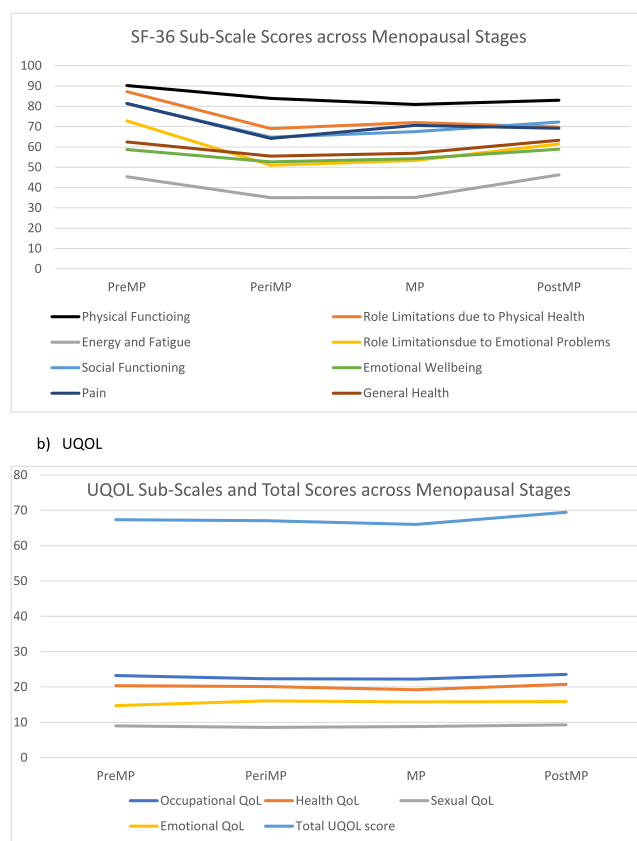


Fig. 2. Changes in quality of life scores across different menopausal stages: a) SF-36 subscales b) UQOL total and sub-scales.

category, followed by the pre-menopause, post-menopause, and menopause.

The general trend was for QoL scores to be better in pre-menopausal women, which often declined in peri and menopausal stages and improved again after menopause (see Fig. 2).

Based on the univariate analysis, there was a statistically significant difference in all the SF-36 sub-scale scores between the hormonal stages, with the exception of general health. Only the UQOL emotional quality of life sub-scale was significantly different across groups, with *peri*-menopausal women having the best QoL.

Multivariate models

Results from multivariate regression models for all sub-scales of the UQOL and the SF-36 questionnaires are shown in Tables 3–5.

Being very overweight compared to healthy weight resulted in a worse QoL scores. An increased number of psychosocial and physical menopause symptoms resulted in poorer QoL scores for many of the SF-36 sub-scales. Regular exercise had a positive impact on QoL. There was a dose response relationship observed for some of the QoL sub-scales, with increased exercise frequency resulting in greater improvements in QoL scores. The effect sizes however differed across the various sub-scales, with the trend in number of days per week of exercise being more clearly observable as a dose/response curve in the UQOL total score model. Drinking moderate amounts of alcohol resulted in small improvements in QoL scores. An improvement in QoL scores was observed for the SF-36 energy/fatigue and emotional well-being sub-scales, in women at the post menopause stage. We did not observe a worsening in QoL scores for women at the menopause stage in any of the models.

Table 3

Multivariate linear regression models of the effect of predictor variables on the various UQOL and SF-36 sub-scales containing variables for the four composite categories of menopause symptoms. Rows shown in **bold type** indicate $p < 0.05$.

	UQoL – Total Score		UQoL – Occupational QoL		UQoL – Health QoL		SF36 – General Health		SF36 – Energy and Fatigue		SF36 – Emotional Wellbeing	
	Estimate	p value	Estimate	p value	Estimate	p value	Estimate	p value	Estimate	p value	Estimate	p value
(Intercept)	18.553	<0.001	13.975	<0.001	10.212	<0.001	12.027	<0.001	10.209	<0.001	13.549	<0.001
Menopause Stage (comparator – Pre menopause)												
Peri menopause	1.197	0.483	1.356	0.232	0.958	0.159	1.035	0.187	0.969	0.16	0.707	0.179
Menopause	–0.604	0.764	0.875	0.512	–0.162	0.84	0.676	0.464	0.412	0.611	0.579	0.35
Post menopause	1.39	0.458	1.894	0.129	0.438	0.557	1.821	0.035	2.532	0.001	1.593	0.006
Weight (comparator – healthy weight)												
slightly underweight	–4.468	0.227	–2.364	0.336	–1.594	0.279	–0.186	0.913	–1.397	0.349	–0.336	0.768
slightly overweight	–0.824	0.51	0.024	0.977	–1.066	0.033	0.088	0.878	–0.24	0.634	–0.489	0.205
very overweight	–3.573	0.026	–0.661	0.532	–2.42	<0.001	–1.573	0.032	–1.097	0.088	–0.701	0.153
Smoker	–0.16	0.93	–0.021	0.986	–1.034	0.154	0.252	0.763	–0.768	0.296	–0.98	0.081
Alcohol Consumption (comparator – None)												
once a week	1.275	0.333	1.7	0.052	0.031	0.953	1.171	0.053	1.475	0.006	0.796	0.05
2-4times a week	2.721	0.045	1.408	0.119	1.031	0.057	0.999	0.109	1.328	0.016	0.363	0.384
5-6 times a week	4.046	0.08	1.325	0.387	1.394	0.129	1.815	0.087	1.582	0.09	0.781	0.271
everyday	7.103	0.068	2.487	0.334	2.147	0.165	–0.847	0.634	1.733	0.268	–0.154	0.897
Daily Caffeine Consumption (comparator – None)												
less than 400 mg	–1.76	0.444	–0.79	0.605	–0.166	0.856	1.603	0.13	0.55	0.553	–0.33	0.641
around 400 mg	–1.052	0.676	–0.822	0.623	–0.227	0.821	0.825	0.476	0.638	0.53	–0.454	0.558
more than 400 mg	–2.953	0.301	–1.735	0.36	0.383	0.736	0.896	0.494	0.343	0.766	0.067	0.939
Exercise (comparator – Never)												
once a week	2.395	0.285	1.724	0.246	0.292	0.743	0.362	0.725	0.182	0.84	–1.078	0.118
twice a week	4.555	0.023	2.789	0.035	1.47	0.064	0.499	0.585	0.168	0.834	–0.352	0.565
3 times a week	5.89	0.005	2.306	0.099	2.745	0.001	1.424	0.14	0.774	0.361	–0.161	0.804
4 times a week	8.602	<0.001	3.018	0.059	4.303	<0.001	1.505	0.173	1.201	0.215	0.134	0.856
5 times a week	6.904	0.004	0.747	0.636	5.434	<0.001	0.093	0.932	–0.841	0.38	–1.375	0.061
6 times a week	8.64	0.003	1.993	0.297	6.103	<0.001	3.211	0.016	2.24	0.054	0.463	0.601
everyday	10.282	<0.001	2.722	0.061	6.177	<0.001	1.477	0.141	0.058	0.948	–0.33	0.623
Menopause Symptoms												
Number of vasomotor symptoms	–0.095	0.901	–0.41	0.422	0.078	0.799	0.499	0.158	0.201	0.516	0.272	0.25
Number of psychosocial symptoms	–1.435	0.094	–1.987	0.001	–0.331	0.33	–1.324	0.001	–2.251	<0.001	–1.699	<0.001
Number of physical symptoms	–0.119	0.805	0.051	0.873	–0.36	0.061	–0.772	0.001	–0.407	0.037	–0.231	0.12
Number of sexual symptoms	2.416	0.001	0.641	0.192	0.508	0.085	–0.007	0.984	–0.079	0.791	–0.201	0.377

Discussion

The univariate analysis identified a statistically significant difference in QoL between the four hormonal stages. This was seen across seven of the eight SF-36 but only one of the UQOL sub-scales. Pre-menopausal women tended to have the best QoL, with women in *peri*-menopausal and menopausal stages experiencing the worse QoL. The findings from the univariate analysis did not persist when additional variables were included and a multivariate analysis was performed. However, it is promising that there appeared to be a trend toward improved QoL in the post-menopausal stage.

Being overweight and having a large number of menopausal symptoms resulted in worse QoL. Regular exercise and consuming a small amount of alcohol had a positive impact and resulted in an improvement in QoL scores. In our models, smoking and caffeine had no impact on QoL scores.

Our findings concur with research that has explored QoL using the SF-36 in and around menopause. A study conducted by Mishra et al., 2003[13] used the SF-36 to measure alterations in the physical and mental health based upon their menopausal status/ the use of HRT. The results highlighted that pre-menopausal woman had a better state of health/well-being compared with menopausal/postmenopausal women. Budakoğlu et al.,2007[14] showed that the QoL in post-menopausal women was worse than premenopausal women using the

SF-36 survey. Similar to the findings in our unadjusted analysis, Avis et al[15] showed that early perimenopausal women reported lower QoL compared with premenopausal women, but menopausal status was no longer associated with QoL when analyses were adjusted for other variables.

Interestingly, we showed no significant differences in three of the four UQOL subscales or in the total UQOL QoL score between the different hormonal stages in our univariate analysis. The only sub-scale which was significantly different across the groups was the emotional QoL sub-scale. The pre-menopausal group however had lower emotional QoL scores, indicating worse QoL compared to the *peri*-menopausal, menopausal and post-menopausal groups. Our findings are at variance with those of Greenblum et al., 2013[4], who identified that menopausal symptoms linked with the menopausal transition and early post menopause had a negative impact of QoL by using the UQOL instrument. What was however aligned with our findings was that the results indicate that quality of life in midlife women is affected by these symptoms only to a small extent[4]. This concurs with our findings that indicated that QoL was not significantly affected by hormonal stage.

In relation to factors that affect QoL. Our findings regarding exercise having a positive impact on QoL concur with previous studies that have identified that being physically active reduces the severity of menopausal symptoms and that exercise moderates the psychological symptoms associated with menopause[16–18]. A population-based follow-up

Table 4

Multivariate linear regression models of the effect of predictors on various UQoL and SF36 sub-scales containing a single composite category for number of menopause symptoms. Rows shown in **bold type** indicate $p < 0.05$.

	UQoL – Emotional QoL		UQoL – Sexual QoL		SF36 – Social Functioning		SF36 – Pain	
	Estimate	p value	Estimate	p value	Estimate	p value	Estimate	p value
(Intercept)	5.154	<0.001	8.175	<0.001	8.431	<0.001	16.072	<0.001
Menopause Stage (comparator – Pre menopause)								
Peri menopause	–0.179	0.725	–0.81	0.072	–0.035	0.926	–0.592	0.474
Menopause	–0.627	0.281	–0.833	0.105	0.108	0.802	0.885	0.351
Post menopause	–0.587	0.282	–0.416	0.387	0.495	0.221	0.545	0.539
Weight (comparator – healthy weight)								
slightly underweight	–0.959	0.392	0.465	0.638	0.163	0.844	–0.139	0.939
slightly overweight	0.24	0.518	–0.103	0.754	–0.231	0.403	–0.311	0.604
very overweight	–0.09	0.851	–0.491	0.246	–0.41	0.249	–1.406	0.071
Smoker	0.955	0.083	–0.536	0.269	–0.31	0.447	1.515	0.093
Alcohol Consumption (comparator – None)								
once a week	–0.894	0.025	0.342	0.328	0.925	0.002	0.83	0.197
2–4 times a week	–0.547	0.181	0.704	0.051	0.805	0.008	0.784	0.234
5–6 times a week	0.573	0.41	0.706	0.251	0.905	0.08	–1.694	0.131
everyday	0.687	0.556	1.791	0.082	0.959	0.267	–0.243	0.897
Daily Caffeine Consumption (comparator – None)								
less than 400 mg	0.128	0.853	–0.599	0.325	–0.458	0.369	0.002	0.999
around 400 mg	0.718	0.345	–0.662	0.324	–0.785	0.164	–1.53	0.211
more than 400 mg	0.025	0.977	–1.334	0.08	–0.486	0.446	0.432	0.755
Exercise (comparator – Never)								
once a week	0.627	0.354	–0.483	0.418	–0.383	0.445	0.873	0.432
twice a week	0.623	0.298	–0.299	0.571	–0.294	0.508	–0.215	0.826
3 times a week	0.798	0.209	0.089	0.874	–0.436	0.355	0.242	0.815
4 times a week	1.339	0.064	–0.032	0.96	–0.381	0.477	–0.568	0.629
5 times a week	0.798	0.265	–0.078	0.901	–0.415	0.434	–0.153	0.895
6 times a week	–0.167	0.847	0.396	0.605	–0.165	0.798	–0.278	0.843
everyday	0.834	0.207	0.485	0.406	–0.118	0.809	0.53	0.623
Number Of Menopause Symptoms	0.411	<0.001	0.133	0.026	–0.286	<0.001	–0.673	<0.001

study from Finland highlighted that motivation to increase physical activity through the menopause transition is a factor linked with improved QoL[19].

A study conducted by the North American Menopause Society, found that obese women suffered more severely from hot flushes, muscle/joint pain and urinary problems which prevented them from doing several activities and resulted in a lower QoL for these obese menopausal women[20]. Additionally, Koo et al. identified that obese women had more frequent menopausal symptoms than normal/overweight women which also differed depending on their hormonal stage[21]. Results from our models further support this evidence, with women who self-reported being very overweight having worse QoL.

Previous research has identified that that excessive alcohol consumption can exacerbate symptoms of menopause[22]. However, a study conducted by Trius-Soler et al. showed that moderate beer consumption significantly reduced several symptoms of perimenopause [23]. Beer is the main food source of isoxanthohumol the strongest phytoestrogens identified. Phytoestrogens have been reported to reduce perimenopausal symptoms thus increasing the QoL for menopausal women[24]. We found that consuming small amounts of alcohol (once a week) resulted in better QoL scores.

In terms of smoking, a study conducted by Dotlic et al., showed that the longer duration a woman had smoked the worse the QoL score, which associated was with a worse menopause QoL[25]. Our models failed to identify that smoking was a risk factor for worse QoL. The fact that smoking did not have any effect on QoL could be explained by the small number of smokers we had in our sample.

In our study we failed to identify that caffeine influenced QoL scores. Faubion et al., have previous identified that caffeine use is associated with greater vasomotor symptom bother in postmenopausal women

[26].

Dotlic et al., in their study of women in pre and post menopause had similar results to ours, with high BMI, more menopause symptoms and being sedentary having a negative influence on QoL; whereas moderate alcohol consumption and more physical activity had a positive impact. [27]. Barkoot et al also found that increased number of menopausal symptoms was associated with worse QoL in menopausal women[28].

Our study has some limitations. Our sample demographic was mostly white/caucasian ethnicity (97.1%). Further work is therefore needed to determine whether ethnicity has any influence on QoL. In addition, our survey did not include questions on hormone replacement therapy (HRT) and therefore those participants completing the survey whilst on HRT may have had better QoL than those not on HRT or any other form of menopause treatment. The impact of HRT on QoL is an area that also warrants further investigation. Our survey only targeted women aged 35–60 years. It would be useful to explore QoL in older and younger women to explore how age impacts QoL in addition to hormonal stage.

Despite these limitations, our study has numerous strengths. We collected data on a large sample of women across the range of hormonal categories. The data obtained from the SF-36 and UQOL was self-reported and therefore obtained information on each participants' individual experiences with menopause symptoms and QoL. We used two validated QoL tools- the disease specific UQOL and the SF-36 instruments which have been used previously to explore QoL in menopausal women[4,29]. Previous studies have also concentrated on a single or two hormonal stages, whereas our study explored all four hormonal stages.

Table 5

Multivariate, multinomial logistic regression models of the effect of predictors on the SF36 sub-scales role limitation due to emotional problems and role limitation due to physical problems.

Predictor	Role limitations due to Emotional Problems (comparator 1, n = 68)						Role limitations due to Physical Problems (comparator 1, n = 44)					
	2 n = 51		3 n = 38		4 n = 122		2 n = 28		3 n = 30		4 n = 177	
	OR	p value	OR	p value	OR	p value	OR	p value	OR	p value	OR	p value
Menopause Stage (comparator – Pre menopause)												
Peri menopause	0.98	>0.9	1.26	0.8	1.57	0.5	0.49	0.4	2.3	0.4	0.34	0.14
Menopause	1.51	0.6	0.86	0.9	1.29	0.7	0.63	0.6	1.87	0.5	0.5	0.3
Post menopause	1.55	0.6	2.6	0.3	2.05	0.3	0.46	0.4	1.05	>0.9	0.44	0.3
Weight (comparator – healthy or underweight)												
slightly overweight	0.53	0.2	2.39	0.2	0.72	0.4	1.32	0.7	1.51	0.5	0.92	0.8
very overweight	0.67	0.5	3.37	0.085	0.78	0.6	2.63	0.2	3.04	0.14	1.31	0.6
Smoker	0.79	0.7	1.93	0.3	0.7	0.6	—	—	—	—	—	—
Alcohol Consumption (comparator – None)												
once a week	2.73	0.041	2.03	0.2	2.57	0.04	1.22	0.8	0.53	0.3	1.29	0.6
2-4times a week	1.59	0.4	2.36	0.13	2.02	0.13	2.92	0.11	2.26	0.2	2.25	0.11
>= 5 times a week	0.51	0.5	1.84	0.4	0.58	0.5	1.54	0.6	1.46	0.7	0.6	0.5
Exercise (comparator – None or limited exercise)												
good or excellent exercise	1.6	0.3	1.07	0.9	1.2	0.7	2.15	0.2	1.45	0.5	1.57	0.3
Menopause Symptoms												
Number of vasomotor symptoms	0.73	0.3	1.69	0.12	1.2	0.5	1.13	0.7	1.31	0.4	1.56	0.089
Number of psychosocial symptoms	0.79	0.5	0.32	0.005	0.23	<0.001	1.08	0.9	1.16	0.8	0.52	0.046
Number of physical symptoms	0.91	0.6	0.79	0.2	0.68	0.02	0.8	0.3	0.64	0.047	0.62	0.004
Number of sexual symptoms	0.7	0.2	1.16	0.6	0.75	0.2	1.83	0.081	1.19	0.6	1.31	0.3

Conclusions

The most common menopause symptoms were memory problems/lack of concentration, difficulty sleeping, low mood and anxiety and joint pain/stiffness. Although there was a trend towards improved QoL post menopause, this was not significant when other factors were taken into account. We identified that being very overweight and increasing number of menopause symptoms, had a negative impact on QoL and that exercise had a positive effect.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We would like to acknowledge the North American Menopause Society and Wulf H. Utian for permission to use the UQOL and the RAND Corporation for permission to use the SF-36 in this study. We would also like to thank all the participants who took the time to complete the survey.

References

- Mohammad-Alizadeh-Charandabi S, Rezaei N, Hakimi S, Montazeri A. Predictors of health-related quality of life in postmenopausal women: a population-based study. *J Caring Sci.* 2012;1(4):201–8. Epub 20121126. doi: 10.5681/jcs.2012.028. PubMed PMID: 25276696; PubMed Central PMCID: PMC4161088.
- Ceylan B, Özerdoğan N. Factors affecting age of onset of menopause and determination of quality of life in menopause. *tjod* 2015;12(1):43–9.
- Division of Mental Health and Prevention of Substance Abuse, World Health Organization. WHOQoL user manual. (Available at: <https://www.who.int/tools/whoqol> (access date 16 September 2022)). 1998.
- Greenblum CA, Rowe MA, Neff DF, Greenblum JS. Midlife women: symptoms associated with menopausal transition and early postmenopause and quality of life. *Menopause* 2013;20(1):22–7. <https://doi.org/10.1097/gme.0b013e31825a2a91>. PubMed PMID: 22929034.
- Elazim HA, Lamadah SM, Al Zamil LG. Quality of Life Among of Menopausal Women. *Journal of Biology, Agriculture and Healthcare* 2014;11.
- Shin H, Lee E. Factors influencing quality of life in post-menopausal women. *Korean Journal of Women Health Nursing* 2020;26(4):336–45.
- Ware Jr JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care* 1992;30(6):473–83. PubMed PMID: 1593914.
- Utian WH, Janata JW, Kingsberg SA, Schluchter M, Hamilton JC. The Utian Quality of Life (UQOL) Scale: development and validation of an instrument to quantify quality of life through and beyond menopause. *Menopause* 2002;9(6):402–10. <https://doi.org/10.1097/00042192-200211000-00005>. PubMed PMID: 12439099.
- Radtke JV, Terhorst L, Cohen SM. The Menopause-Specific Quality of Life Questionnaire: psychometric evaluation among breast cancer survivors. *Menopause* 2011;18(3):289–95. <https://doi.org/10.1097/gme.0b013e3181ef975a>. PubMed PMID: 20881889; PubMed Central PMCID: PMC3017657.
- R Core Team. R: A language and environment for statistical computing. Available from: <https://www.R-project.org/> (access date 3 February 2023). Vienna, Austria: R Foundation for Statistical Computing; 2021. Available from: <https://www.R-project.org/>.
- Burnham KP, Anderson DR. Multimodel inference: understanding AIC and BIC in Model Selection. *Sociological Methods & Research* 2004;33:261–304. <https://doi.org/10.1177/0049124104268644>.
- Selya AS, Rose JS, Dierker LC, Hedeker D, Mermelstein RJ. A Practical Guide to Calculating Cohen's f(2), a Measure of Local Effect Size, from PROC MIXED. *Front Psychol.* 2012;3:111. Epub 20120417. doi: 10.3389/fpsyg.2012.00111. PubMed PMID: 22529829; PubMed Central PMCID: PMC3328081.
- Mishra GD, Brown WJ, Dobson AJ. Physical and mental health: changes during menopause transition. *Quality of Life Research* 2003;12(4):405–12. <https://doi.org/10.1023/a:1023421128141>. PubMed PMID: 12797713.
- Budakoglu II, Ozcan C, Eroglu D, Yanik F. Quality of life and postmenopausal symptoms among women in a rural district of the capital city of Turkey. *Gynecological Endocrinology* 2007;23(7):404–9. <https://doi.org/10.1080/09513590701444748>. PubMed PMID: 17701772.
- Avis NE, Assmann SF, Kravitz HM, Ganz PA, Ory M. Quality of life in diverse groups of midlife women: assessing the influence of menopause, health status and psychosocial and demographic factors. *Quality of Life Research* 2004;13(5):933–46. <https://doi.org/10.1023/B:QURE.0000025582.91310.9f>. PubMed PMID: 15233507.
- Elavsky S. Physical activity, menopause, and quality of life: the role of affect and self-worth across time. *Menopause.* 2009;16(2):265–71. doi: 10.1097/gme.0b013e31818c0284. PubMed PMID: 19169167; PubMed Central PMCID: PMC2728615.

- [17] McAndrew LM, Napolitano MA, Albrecht A, Farrell NC, Marcus BH, Whiteley JA. When, why and for whom there is a relationship between physical activity and menopause symptoms. *Maturitas* 2009;64(2):119–25.
- [18] Kang HK, Kaur A, Dhiman A. Menopause-Specific Quality of Life of Rural Women. *Indian J Community Med.* 2021;46(2):273-6. Epub 20210529. doi: 10.4103/ijcm.IJCM_665_20. PubMed PMID: 34321740; PubMed Central PMCID: PMC8281871.
- [19] Moilanen JM, Aalto A-M, Raitanen J, Hemminki E, Aro AR, Luoto R. Physical activity and change in quality of life during menopause -an 8-year follow-up study. *Health and Quality of Life Outcomes* 2012;10(1).
- [20] ScienceDaily. Obesity can lead to more severe hot flashes and other menopause symptoms: Study confirms that a higher body mass index is related to a higher prevalence of certain menopause symptoms. : The North American Menopause Society (NAMS); 2017 [12 December 2022]. Available from: www.sciencedaily.com/releases/2017/05/170531084443.htm.
- [21] Koo S, Ahn Y, Lim J-Y, Cho J, Park H-Y. Obesity associates with vasomotor symptoms in postmenopause but with physical symptoms in perimenopause: a cross-sectional study. *BMC Women's Health* 2017;17(1).
- [22] Velez A. Why Alcohol Affects Women More in Menopause 2020 [12 December 2022]. Available from: <https://www.endocrineweb.com/menopause-alcohol>.
- [23] Trius-Soler M, Marhuenda-Munoz M, Laveriano-Santos EP, Martinez-Huelamo M, Sasot G, Storniolo CE, et al. Moderate Consumption of Beer (with and without Ethanol) and Menopausal Symptoms: Results from a Parallel Clinical Trial in Postmenopausal Women. *Nutrients*. 2021;13(7). Epub 20210630. doi: 10.3390/nu13072278. PubMed PMID: 34209273; PubMed Central PMCID: PMC8308431.
- [24] White A, Cherney K. Are Phytoestrogens Good for You? 2021 [12 December 2022]. Available from: <https://www.healthline.com/health/phytoestrogens>.
- [25] Dotlic J, Markovic N, Gazibara T. Patterns of smoking and menopause-specific quality of life: smoking duration matters more. *Behavioral Medicine* 2023;49(1): 29–39.
- [26] Faubion SS, Sood R, Thielen JM, Shuster LT. Caffeine and menopausal symptoms: what is the association? *Menopause* 2015;22(2):155–8. <https://doi.org/10.1097/GME.0000000000000301>. PubMed PMID: 25051286.
- [27] Dotlic J, Radovanovic S, Rancic B, Milosevic B, Nicevic S, Kurtagic I, et al. Mental health aspect of quality of life in the menopausal transition. *Journal of Psychosomatic Obstetrics and Gynecology* 2021;42(1):40–9.
- [28] Barkoot S, Sr., Saeed A, AlMetrek M, AlShahrani S, H Al, AlShahrani A, et al. The Quality of Life of and Social Determinants Affecting Menopausal Women in Aseer's Healthy Cities in Saudi Arabia: A Cross-Sectional Study. *Cureus*. 2022;14(11): e31942. Epub 20221127. doi: 10.7759/cureus.31942. PubMed PMID: 36465193; PubMed Central PMCID: PMC9708048.
- [29] Zolnierczuk-Kieliszek D, Kulik TB, Jarosz MJ, Stefanowicz A, Pacian A, Pacian J, et al. Quality of life in peri- and post-menopausal Polish women living in Lublin Province—differences between urban and rural dwellers. *Annals of Agricultural and Environmental Medicine* 2012;19(1):129–33. PubMed PMID: 22462457.