



Original article

A cross-sectional cohort study of menopause-related symptoms in British Columbia

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ARTICLE INFO

Keywords:

Menopause
Health burden
Women's health

ABSTRACT

Menopause is a universal experience for women, yet research on its symptoms and associated health-seeking behaviors remains limited. This study documented menopause-related symptoms and severity, and their impacts on the mental health and quality of life among midlife women in British Columbia. Of a total of 1850 participants (mean age = 49.43 ± 5.59 years) who completed an online survey, 56.95% experienced symptoms above a “clinically acceptable” threshold, psychosocial symptoms being the most prevalent, with 37.66% of participants scoring above the threshold for depression and 24.38% doing so for anxiety, while 30.85% reported reduced quality of life. Higher levels of education and income were associated with fewer menopause symptoms, lower anxiety and depression scores, and improved quality of life. Geographic locality also influenced outcomes, with women in larger urban areas reporting fewer menopause symptoms and lower mental health burdens than those in smaller communities. The findings of this first-of-its-kind Canadian study highlight the significant burden of menopause symptoms, and underscore the role of social determinants of health, including education, income, and geographic locality, in shaping menopause experiences. These insights emphasize the need for targeted interventions to improve menopause care and support mental health outcomes in midlife Canadian women.

1. Introduction

Females make up half of the global population, and nearly all will reach menopause, defined as the end of ovulation [1], occurring on average at about age 51 in North America [2]. The menopausal transition (perimenopause) occurs when estrogen production begins to fluctuate and progesterone production declines, and can last for up to 10 years [3]. Symptoms typically begin during perimenopause, with peak severity at late perimenopause (the stage nearing the time of menopause) for vasomotor symptoms and sleep disturbances, while sexual and urogenital symptoms tend to increase well beyond into postmenopause (the years after menopause, and often lasting a few decades of life) [2,4]. Many women are unaware of common symptoms related to

estrogen and progesterone decline, often perceiving their presence as a normal part of aging [5,6] and dismissing the significant discomfort and impact to their daily lives [5]. Furthermore, women often perceive social stigma associated with menopause, preventing them from discussing it [7–9].

There are a range of menopause-related symptoms, including sleep disturbances, depression and anxiety, cognitive difficulties (e.g., memory problems), and sexual symptoms (e.g., decreased desire) [4,10]. Approximately 50% of women report genitourinary symptoms such as incontinence and urgency [5], while 80% report vasomotor symptoms (hot flashes and night sweats) [11], and in contrast to long-held beliefs that these symptoms last only a few years, frequent vasomotor symptoms persist for a median of 7.4 years, with even longer durations for

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¹ Menopause Chicks.

some women [4,11]. Of those who report vasomotor symptoms, more than one third report moderate to severe symptoms for up to 10 years or more postmenopause [12]. Menopause-related symptoms are impacted by socioeconomic status, education, current health status, access to resources, quality of life [13–17], income, history of childhood abuse or neglect, stress [17], levels of physical activity [15], and smoking [11]. Of note, some research indicates that most symptoms, apart from vasomotor symptoms, may be more associated with age than with menopause (end of ovulation) per se [18]. These symptoms can greatly impact a woman's quality of life [19], and mental health symptoms in menopause correlate with negative mental health outcomes [20] and an increased number of physician visits [21]. Lack of knowledge and believing that the symptoms they are experiencing are normal [22] or not serious enough [23], feeling shame to ask for support [6], lack of time to deal with the health care system, language barriers, and cost [23], and care providers' reluctance to address menopause [6] or even dismissing patients [24] have all been identified as barriers to accessing care. There is a critical need for research, particularly from a Canadian perspective given its unique healthcare system, and also that 18% of Canada's population lives in rural areas, which may have implications for access to care. Moreover, the burden of untreated menopause-related symptoms in Canadian women yields an astounding annual cost of \$3.5 billion dollars. [25] The government of British Columbia has identified mental health "wellness promotion and prevention" as a priority area, and given this, the Canadian government (2025) announced that menopause hormone therapy would be covered under universal pharmacare with one of the initial roll-outs occurring in British Columbia.

The overall goal of this study was to document the range and severity of menopause-related symptoms among midlife women in British Columbia, to explore sociodemographic predictors of menopause-related symptoms severity, and the relationship between symptoms and mental health outcomes. We also compared postmenopausal women who were naturally postmenopausal to those who had hysterectomy to those who had other reasons contributing to their menopause. An exploratory goal was to also compare women who underwent unilateral versus bilateral oophorectomy. There are implications of the findings for how it may inform clinicians managing menopause symptoms. This paper also represents the first in a series to follow that focus on additional outcomes measured. This paper examining menopause symptoms, distress, and impacts on mental health and quality of life in a uniquely Canadian sample will fill a critical gap in our knowledge about the experiences of menopause.

2. Methods

2.1. Study design and setting

This study utilized a cross-sectional, mixed-methods design consisting of an online survey (25–30 min to complete) and follow-up in-depth 1:1 online interviews with a cohort of those who completed the survey (not discussed in current paper). There was a patient/community partner on the research team and as a co-author. The study was approved by the University of British Columbia Behavioural Research Ethics Board (H23–02732).

2.2. Participants

Eligibility included being assigned female at birth (regardless of gender), aged 39–60, and residing in British Columbia (BC). The study team distributed posters throughout various communities (e.g., recreation centres, libraries, town halls, meeting spaces), and in a variety of businesses, health centres, and hospitals throughout BC. We also used social media (i.e., Facebook, Instagram and LinkedIn), transit advertisements in smaller urban areas, emails to existing research cohorts at BC Women's Hospital, and volunteers from REACH BC (a health research study platform in British Columbia). Through the posters and

advertisements, prospective participants were provided a summary of the study objectives and provided a link or QR code to the consent form and online survey (captured with BC Children's Hospital Research Institute REDCap). Fig. 1 depicts the recruited and final sample.

2.2.1. Variables

2.2.1.1. Demographic and health data. We assessed gender, sexual orientation, race, relationship status, legal status (i.e., whether a Canadian citizen, landed immigrant, refugee, etc.), number of persons in household (including relative age), religious affiliation, education level, household income, student status, and height and weight (for body mass index, BMI).

2.2.1.2. Participant health and health history. We assessed self-reported history of hysterectomy and oophorectomy, and concurrent chronic health conditions (e.g., endometriosis, polycystic ovarian syndrome, diabetes, high blood pressure, heart disease, obesity, autoimmune disorders, mental health conditions, etc.), access to menopause hormone therapy (MHT), and use of hormonal birth control, including oral contraceptive (OCP) use.

2.2.1.3. Menopause and symptoms. We asked about date of last menstrual period, presence and severity of menopause symptoms using the validated Menopause Rating Scale (MRS) [26] an 11-item measure that asked participants to rate a list of symptoms on a Likert scale of 0 = "none", 1 = "mild", 2 = "moderate," 3 = "severe" and 4 = "extremely severe." The MRS is both reliable and valid [26,27]. Items assessed three groups of symptoms: somatic (hot flashes, heart discomfort, sleep problems and joint pain), psychologic (depressive mood, irritability, anxiety, and physical and mental exhaustion), and urogenital (sexual problems, bladder problems, and vaginal dryness). An MRS total score of ≥ 14 is considered a clinically relevant threshold indicating the need for treatment for climacteric symptoms [27]. We also assessed how menopause symptoms affect quality of life with the Menopause Specific Quality of Life Scale (MENQOL) [28], a 29-item questionnaire that grouped responses into four domains: Vasomotor (e.g., hot flashes and night sweats), physical (e.g., feeling tired, frequent urination), psychosocial (e.g., feelings of anxiety, nervousness, poor memory), and sexual (e.g., avoiding intimacy, changes to sexual desire). For each item, participants first indicated whether they had experienced the symptom in the past month. If the symptom was present, they then rated how bothersome from 0 (not experienced) to 7 (extremely bothersome) it was for them. Following the standard MENQOL scoring procedure, responses were transformed to create an 8-point scale ranging from 1 (symptom not experienced) to 8 (extremely bothersome). Item scores were averaged within each domain to produce domain-specific scores, with higher values indicating greater symptom burden.

2.2.1.4. Psychological domains. We assessed anxiety with the Generalized Anxiety Disorder Scale (GAD-7) a 7-item, validated measure that asks participants to rate how often, over the last two weeks, they have been bothered by symptoms of anxiety [29,30]. Response options ranged from "not at all" to "nearly every day." Total scores were categorized as minimal anxiety (0–4), mild (5–9), moderate (10–14), or severe anxiety (15–21). Depressive symptoms were assessed with the Patient Health Questionnaire-9 (PHQ-9), a 9-item measure that assessed the frequency at which participants experienced symptoms of depression in the last two weeks, such as "feeling down, depressed or hopeless" [31]. Respondents rated each statement on a 4-point scale from "not at all" to "nearly every day." Total scores were summed and categorized as none (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27). The PHQ-9 is a widely-used measure that has been validated in both general and clinical populations [32]. Both PHQ-9 and GAD-7 scales were validated for reliability and validity in the current

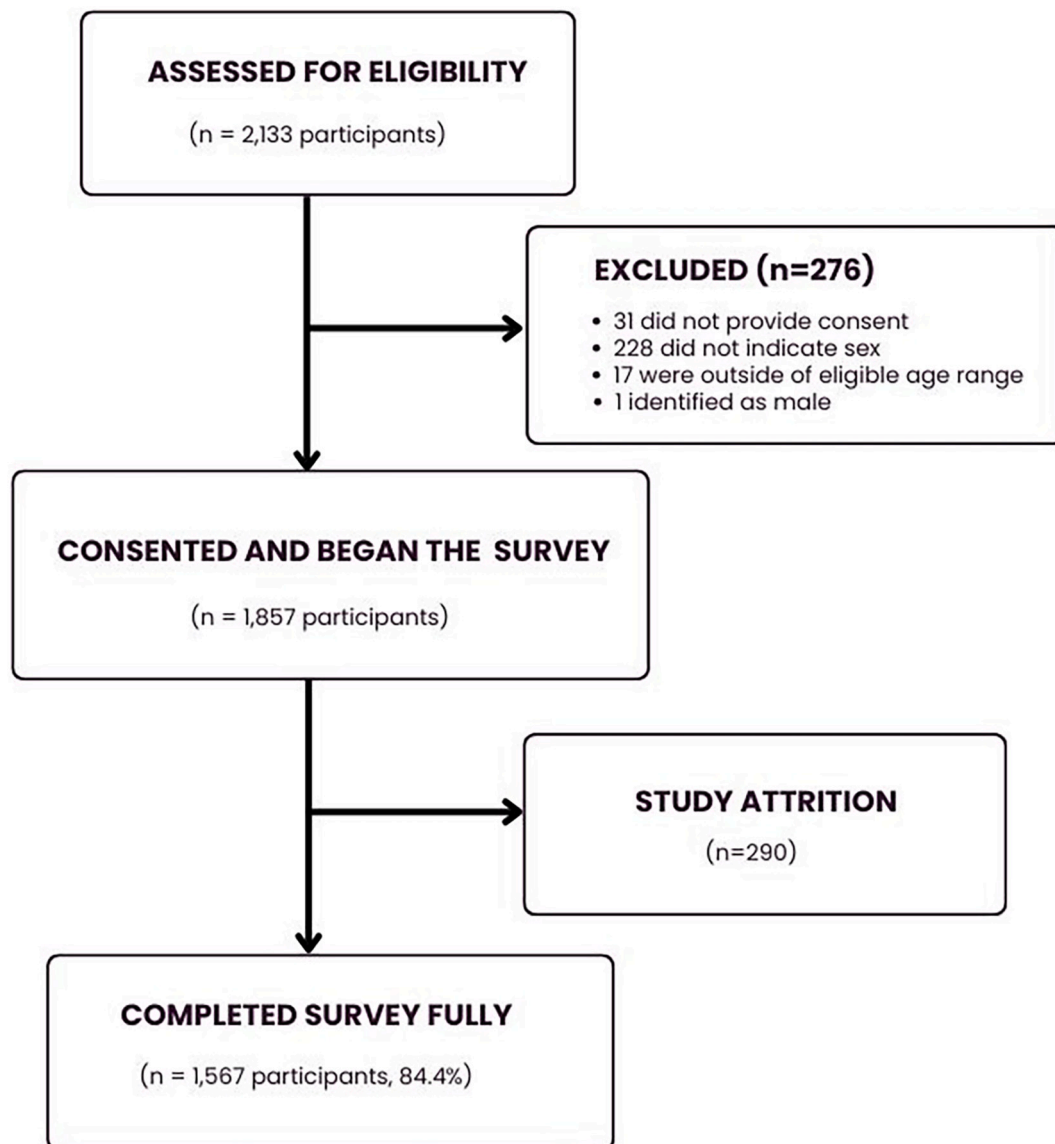


Fig. 1. Flow of participants from recruitment to completion.

sample. Quality of life was assessed with the 23-item Utian Quality of Life (UQOL) Scale with a focus on domains impacted by menopause symptoms, including occupational QoL, health QoL, emotional QoL, and sexual QoL [33]. This scale asked participants to rate statements such as “I am content with my romantic life” on a scale from “not true of me” to “very true of me.” Total scores are categorized as low (0–23), moderate (24–69), moderately high (70–92), and very high (93–115).

2.2.2. Statistical methods

Data underwent inspection, visualization, and computational checks to ensure consistency and completeness. Coding and skip patterns were verified against survey instruments. Categorical variables were summarized using the number and percentage of participants belonging to each category. Continuous variables were summarized using means and standard deviation. Comparisons between main strata groups were performed using Pearson's Chi-square tests and Fisher exact tests for small cells (<5) for categorical variables, and Mann–Whitney *U* tests (2 categories) and Kruskal–Wallis for (3+ categories) for continuous variables. As differing numbers of participants completed sections of the survey, the sample size is reflected in all Tables and Figures.

2.2.3. Bias and sample representation

The sample was derived from a self-selected, voluntary online survey, meaning participation was not randomized and depended on individual interest, internet access, and willingness to engage with the study. As a result, the sample may not be representative of the broader BC population. To assess the potential for selection bias, we compared key demographic and socioeconomic characteristics of survey respondents to corresponding population-level estimates from the most recent Canadian Census (2021). Notably, Census data are reported at the aggregated level by Census Division (CD), and individual-level comparisons are not possible. As such, we can only assess and adjust the sample's representativeness at the population level using CD-based distributions. Differences between the sample and the general population on race, income, and education were examined descriptively, and any substantial deviations were noted. The geographic distribution of our sample is presented in Appendix Fig. 1.

3. Results

3.1. Sample characteristics

Our sample was diverse in terms of socioeconomic levels, education, and race (Table 1), offering a strong and representative foundation for the analysis. The study included 1850 participants with a mean age of 49.43 (±5.59) years. Most participants identified as women (97.89%) and heterosexual (88.65%). The sample was racially diverse, though the vast majority of participants identified as white (80.92%). In addition, 74.92% of study participants were legally married or common law, and 96.27% were Canadian citizens. Comorbidities were assessed as ever diagnosed and currently diagnosed (Table 2). The most prevalent overall self-reported comorbidities were anemia (37.22%) and obesity (33.76%), followed by fibroids (25.38%) and endometriosis (23.80%).

In terms of menstrual cycle patterns and hormonal treatment (Table 3), 852 (49.94%) of the 1706 participants who answered this question reported natural menopause, 481 (28.19%) still reported a period in the last year, and 372 (21.81%) did not have a period due to other reasons (hormonal contraceptive, hysterectomy, or other medical reasons). Among the 235 participants who reported a hysterectomy, 42 (17.87%) had a subtotal hysterectomy (defined as surgical removal leaving the cervix in place) and 193 (82.13%) had a total hysterectomy (defined as removal of entire uterus including the cervix). In the full sample, 171 participants (10.02%) reported an oophorectomy, with 4.28% having both ovaries removed. Overall, 97 participants had undergone both a hysterectomy and an oophorectomy. On the day of survey completion, out of 446 patients that accessed any hormone therapy, 103 (23.09%) used estrogen, 76 (17.04%) used progesterone, and 261 (58.52%) used both hormone therapies. Only 241 (14.13%) of participants were on hormonal birth control (including oral contraceptives).

Table 4 presents the means and percentages of participants who were above the clinical threshold for the menopause-related (MRS, MENQOL) and psychological (PHQ-9, GAD-7, Utian Quality of Life) scales. Overall, 56.95% of participants reported menopause symptoms above the threshold (total MRS score 14 and above). Degree of bothersome menopause symptoms (MENQOL domain scores) showed that up to 33.39% scored above thresholds (mean MENQOL domain score above five). A total of 37.66% scored above the clinical threshold for depressive symptoms, and 24.38% for anxiety, respectively. Just under one third (30.85%) endorsed a reduced quality of life.

We conducted a subanalysis on MRS scores for those reporting no period in the last 12 months ($n = 1224$ participants; excluding those who had a period at any time in the past year) comparing reasons for menopause. Women who were postmenopausal and had undergone a hysterectomy had significantly higher MRS scores than both the naturally menopausal ($p < 0.001$) and menopausal group “due to other reasons” ($p < 0.001$). In a subsequent subanalysis of 1224 women who did not menstruate the past 12 months and did provide a total MRS score, we compared postmenopausal women who had two ovaries removed ($n = 73$; bilateral oophorectomy) to one ovary removed ($n = 78$; unilateral oophorectomy) to no ovaries removed ($n = 1073$). Those with bilateral oophorectomy had significantly more menopause symptoms (higher MRS scores) than those with intact ovaries ($p = 0.0054$).

3.2. Impact of social-demographic characteristics on outcomes

Outcomes were stratified by race, size of locality, annual household income, and level of education. All stratification variables, except community size, were obtained directly from the survey. Community size was derived by linking participants' six-digit postal codes to publicly available 2021 Canadian census data. For this analysis, community size refers to the population of the census subdivision, categorized according to Statistics Canada's standard definitions: small (1000–29,999), medium (30,000–99,999) and large population centers (100,000 and

Table 1
Demographic Characteristics (N = 1850).

Measured characteristic	Count (%)
<i>Current gender identity (combined categories)*</i>	
Women	1811 (97.89%)
Two-spirit**	12 (0.65%)
Non-binary, Genderqueer, or similar identity	23 (1.24%)
Other	4 (0.22%)
<i>Sexual orientation (combined categories)</i>	
Heterosexual	1640 (88.65%)
Bisexual	104 (5.62%)
Pansexual	30 (1.62%)
Gay/Lesbian	24 (1.30%)
Prefer to self describe	38 (2.05%)
Other	14 (0.76%)
<i>Visual minority</i>	
White	1497 (80.92%)
Visual Minority	325 (17.57%)
Prefer not to answer	28 (1.51%)
<i>Identified as Black</i>	
No	1795 (97.03%)
Yes	27 (1.46%)
Prefer not to answer	28 (1.51%)
<i>Identified as Asian*</i>	
No	1676 (90.59%)
Yes	146 (7.89%)
Prefer not to answer	28 (1.51%)
<i>Identified as Other minority*</i>	
No	1778 (96.11%)
Yes	44 (2.38%)
Prefer not to answer	28 (1.51%)
<i>Identified as Indigenous*</i>	
Not Indigenous	1712 (92.54%)
Indigenous	61 (3.30%)
Multi-race - Indigenous	49 (2.65%)
Prefer not to answer	28 (1.51%)
<i>First Nation identity*</i>	
First Nations	55 (2.97%)
Metis	44 (2.38%)
No	1744 (94.27%)
Prefer not to answer	7 (0.38%)
<i>Age (Mean (SD))</i>	
	49.43 (5.59)
<i>Current legal status in Canada (combined other)</i>	
Canadian citizen - born in Canada	1510 (81.62%)
Canadian citizen - not born in Canada	271 (14.65%)
Landed immigrant/permanent resident	50 (2.70%)
Other	14 (0.76%)
Prefer not to answer	5 (0.27%)
Selected characteristic	Count (%)
<i>Legally married/common law</i>	
No	442 (23.89%)
Yes	1386 (74.92%)
Prefer not to answer	22 (1.19%)
<i>How many individuals live in your household?</i>	
1	258 (13.95%)
2	608 (32.86%)
3	376 (20.32%)
4	449 (24.27%)
5	101 (5.46%)
6+	47 (2.54%)
Prefer not to answer	11 (0.59%)
<i>Religion (combined categories)</i>	
No religion	703 (38.00%)
Christian	429 (23.19%)
Religious/spiritual - prefer not to be more specific	359 (19.41%)
Other religion	178 (9.62%)
Prefer not to answer	181 (9.78%)
<i>What is your highest achieved education level?</i>	
No certificate, diploma or degree	23 (1.24%)
Secondary (high) school diploma or equivalent	130 (7.03%)
Apprenticeship or trades certificate or diploma	72 (3.89%)
College, CEGEP or other non-university certificate or diploma	361 (19.51%)
University certificate or diploma below bachelor	171 (9.24%)
University certificate, diploma or degree at bachelor	598 (32.32%)
Post-graduate university degree (e.g. Masters or Doctorate)	460 (24.86%)
Prefer not to answer	35 (1.89%)

(continued on next page)

Table 1 (continued)

Selected characteristic	Count (%)
<i>Are you currently attending school?</i>	
No	1714 (92.65%)
Yes	108 (5.84%)
Prefer not to answer	28 (1.51%)
<i>Household income (combined categories)</i>	
<\$50,000	186 (10.05%)
\$50,000 - \$79,999	199 (10.76%)
\$80,000 - \$149,999	655 (35.41%)
\$150,000 and over	615 (33.24%)
Prefer not to answer	195 (10.54%)
<i>BMI</i>	
Underweight	17 (0.92%)
Normal weight	398 (21.51%)
Overweight	360 (19.46%)
Obesity	352 (19.03%)
Unknown	723 (39.08%)
<i>BMI (Mean (SD))***</i>	49.43 (5.59)

* Categories are not mutually exclusive. Two participants identified as Indigenous and Asian.

** Two participants that identified as Two spirited also identified as Non-binary, Genderqueer, or similar identity, making total identified as Two-spirited =14 participants.

*** Those with missing BMI are excluded.

Table 2

Top ten comorbidities (N = 1706).

Comorbidities	Overall Count (%)	Ever diagnosed Count (%)	Currently diagnosed Count (%)
Anemia	635 (37.22%)	594 (34.82%)	136 (7.97%)
Obesity	576 (33.76%)	485 (28.43%)	392 (22.98%)
Fibroids	433 (25.38%)	400 (23.45%)	154 (9.03%)
Endometriosis	406 (23.80%)	345 (20.22%)	158 (9.26%)
Asthma	377 (22.10%)	352 (20.63%)	180 (10.55%)
High cholesterol	335 (19.64%)	294 (17.23%)	183 (10.73%)
Autoimmune disorder	329 (19.28%)	238 (13.95%)	200 (11.72%)
Pneumonia confirmed using chest x-ray	313 (18.35%)	301 (17.64%)	10 (0.59%)
Hypertension	300 (17.58%)	258 (15.12%)	201 (11.78%)
Infertility	297 (17.41%)	251 (14.71%)	46 (2.70%)

Note: Overall includes ever diagnosed, currently diagnosed and believe in having the condition but not formally diagnosed.

Ever includes ever diagnosed and currently diagnosed.

above). There were no significant differences by race strata for any of the menopause or psychological outcomes (dichotomized as white and non-white; see Supplementary Table 1). When stratified by size of locality, all scales demonstrated statistically significant differences based on locality (Table 5; overall $p < 0.05$) except for the Psychosocial subscale of the MENQOL ($p = 0.0964$). For the MRS scores, pairwise comparisons revealed no significant difference between small (1000–29,999) and medium (30,000–99,999) localities ($p = 0.2655$), however, a significant difference was observed between large localities (100,000+) and both small ($p = 0.0025$) and medium localities ($p < 0.001$). Individuals residing in larger localities (100,000+) reported lower MRS scores, suggesting fewer menopause symptoms compared to those in smaller or medium-sized localities (Table 5).

There were domain specific relationships between menopausal quality of life and locality. The MENQOL Vasomotor, Physical, and

Table 3

Menstrual cycle patterns and hormonal treatment (N = 1706).

Selected characteristics	Total
<i>Currently menstruating</i>	
	481 (28.19%)
<i>Not menstruating (amenorrhea)</i>	
	1,224 (71.75%)
Natural menopause	852 (49.94%)
Hormonal contraceptive	108 (6.33%)
Hysterectomy	221 (12.95%)
Other medical reason**	43 (2.52%)
<i>Prefer not to answer</i>	1 (0.06%)
<i>Had hysterectomy and/or oophorectomy*</i>	
No	1397 (81.89%)
Yes	308 (18.05%)
Prefer not to answer	1 (0.06%)
<i>Had hysterectomy</i>	
No	1470 (86.20%)
Yes	235 (13.76%)
Subtotal hysterectomy	42 (2.45%)
Total hysterectomy	193 (11.31%)
Prefer not to answer	1 (0.06%)
<i>Had oophorectomy</i>	
No	1535 (89.98%)
Yes	171 (10.02%)
One ovary removed	98 (5.74%)
Both ovaries removed	73 (4.28%)
<i>On MHT</i>	
No	1234 (72.33%)
Yes	446 (26.14%)
Estrogen only	103 (6.04%)
Progesterone only	76 (4.45%)
Estrogen and progesterone combination	261 (15.30%)
Other***	22 (1.29%)
Prefer not to answer	26 (1.52%)
<i>On hormonal birth control (Incl OCP medications)</i>	
No	1452 (85.11%)
Yes	241 (14.13%)
Prefer not to answer	13 (0.76%)

MHT = menopause hormone therapy.

* Categories are not mutually exclusive.

** Other medical reason includes endometriosis related procedures, other surgeries excluding hysterectomy, cancer treatment.

*** Categories are not mutually exclusive. Can be in combination with 3 other MHT type.

Table 4

Summary of Menopause (MRS, MENQOL) and Psychological (PHQ-9, GAD-7 and Utian Quality of Life) scales.

Scale/Domain*	Mean (±STD)	Above/below moderate threshold count (%)**
MRS (N = 1705)	15.62 (7.89)	971 (56.95%)
MENQOL Vasomotor domain (N = 1706)	3.30 (2.02)	420 (24.62%)
MENQOL Psychosocial domain (N = 1696)	3.93 (1.73)	506 (29.83%)
MENQOL Physical domain (N = 1701)	3.90 (1.49)	419 (24.63%)
MENQOL Sexual domain (N = 1677)	3.72 (2.27)	560 (33.39%)
PHQ-9 score (N = 1601)	8.43 (6.16)	603 (37.66%)
GAD-7 score (N = 1600)	6.10 (5.43)	390 (24.38%)
Utian quality of life score (N = 1598)***	77.14 (14.83)	493 (30.85%)

Note: Number of participants for each question can vary.

Total and average scores are calculated after multiple imputation.

* MRS, PHQ-9, GAD-7 and Utian presented as total score, all MENQOL domains as average score.

For MRS total score clinical threshold 14 and above was used.

** % is calculated based on the total number of participants replied to the question.

*** For Utian quality of life below moderate threshold.

Table 5
Outcome mean scores stratified by selected characteristics.

Domain	Size of Locality				p-values (overall)	P-value AB	P-value BC	P-value AC	N
	1000–29,999 (A)	30,000–99,999 (B)	100,000+ (C)						
MRS	15.9 (7.5)	16.4 (7.6)	14.9 (8.2)		<0.001	0.2655	0.0025	<0.001	1641
MENQOL – Vasomotor	3.4 (2.0)	3.4 (2.0)	3.1 (2.0)		0.0284	0.5773	0.0143	0.0451	1642
MENQOL – Psychosocial	3.9 (1.7)	4.1 (1.7)	3.9 (1.7)		0.0964	0.1221	0.0348	0.5657	1633
MENQOL – Physical	4.0 (1.5)	4.1 (1.4)	3.8 (1.5)		0.0022	0.1240	<0.001	0.0512	1638
MENQOL – Sexual	3.9 (2.2)	3.9 (2.3)	3.5 (2.3)		0.0015	0.9051	0.0041	0.0013	1615
Utian quality of life	77.7 (14.7)	74.7 (14.6)	78.1 (15.0)		<0.001	0.0017	<0.001	0.4724	1538
PHQ-9	8.5 (6.0)	9.0 (6.2)	8.0 (6.2)		0.0170	0.2541	0.0054	0.0853	1541
GAD-7	5.7 (5.1)	6.7 (5.6)	5.9 (5.5)		0.0082	0.0041	0.0096	0.7334	1540

Domain	Education				p-values (overall)	NA	NA	NA	N
	Less than bachelor's	Bachelor's or higher	NA						
MRS	17.7 (7.9)	14.1 (7.5)			<0.001				1697
MENQOL – Vasomotor	3.7 (2.1)	3.0 (1.9)			<0.001				1698
MENQOL – Psychosocial	4.2 (1.8)	3.8 (1.7)			<0.001				1689
MENQOL – Physical	4.2 (1.5)	3.6 (1.4)			<0.001				1694
MENQOL – Sexual	4.1 (2.4)	3.4 (2.2)			<0.001				1671
Utian quality of life	73.3 (14.7)	79.8 (14.4)			<0.001				1591
PHQ-9	9.8 (6.5)	7.5 (5.7)			<0.001				1594
GAD-7	7.0 (5.8)	5.5 (5.1)			<0.001				1593

Domain	Income				p-values (overall)	NA	NA	NA	N
	Less than 100,000	100,000 and over	NA						
MRS	16.7 (8.4)	14.9 (7.5)			<0.001				1548
MENQOL – Vasomotor	3.4 (2.1)	3.2 (2.0)			0.0348				1549
MENQOL – Psychosocial	4.0 (1.8)	3.9 (1.7)			0.0679				1560
MENQOL – Physical	4.0 (1.6)	3.8 (1.4)			0.0016				1544
MENQOL – Sexual	3.5 (2.3)	3.9 (2.3)			<0.001				1524
Utian quality of life	74.1 (15.1)	79.0 (14.4)			<0.001				1455
PHQ-9	9.7 (6.6)	7.7 (5.8)			<0.001				1457
GAD-7	6.5 (5.7)	5.8 (5.2)			0.0715				1457

Note: Mean and SD are calculated from non-missing responses only.

Sexual domains showed significant differences across locality sizes, with the largest localities (100,000+) having women with fewer symptoms. The Psychosocial domain symptom total did not differ by locality.

Utian quality of life scores also depended on locality size (Table 5). There were significantly higher scores in the 100,000+ group compared to both the 30,000–99,999 group (non-significant pairwise comparison) and the 1000–29,999 group ($p < 0.001$). Conversely, the 30,000–99,999 group consistently reported lower scores than both other groups, suggesting that medium-sized localities may have unique challenges affecting menopausal health outcomes.

Those living in largest localities (100,000+) had lower depressive symptoms compared to those in medium-sized localities (30,000–99,999). However, the difference between small and large localities was only marginally significant. Anxiety (GAD-7 scores) was significantly lower in the largest localities (100,000+) compared to medium-sized localities (30,000–99,999). However, the small and large localities did not significantly differ.

Higher education (more than a bachelor's degree) was consistently associated with better outcomes across all scales than less education (less than a bachelor's degree). Individuals with a bachelor's degree or higher reported significantly lower depression (7.5 vs. 9.8) and anxiety (5.5 vs. 7.0) ($p < 0.001$ for both). Similarly, higher education was associated with fewer menopause symptoms (14.1 vs. 17.7, $p < 0.001$) and higher quality of life (79.8 vs. 73.3, $p < 0.001$) (Table 5).

Higher income (\$100,000 + CAD) was consistently associated with better health outcomes across several scales (Table 5). Individuals with higher income reported significantly fewer depressive symptoms (7.7 vs. 9.7, $p < 0.001$), and better quality of life (79.0 vs. 74.1, $p < 0.001$) and lower menopause symptom scores (14.9 vs. 16.7, $p < 0.001$). Significant

differences were also observed in the Vasomotor ($p = 0.0348$) and Physical domains ($p = 0.0016$) of the MENQOL, where higher-income individuals reported better function. However, no significant differences were observed for anxiety symptoms (GAD-7, $p = 0.0715$) or the Psychosocial MENQOL domain ($p = 0.0679$).

4. Discussion

Our findings highlight the significant burden of menopause symptoms reported by BC women, which impact overall quality of life and mental health outcomes. There is a concerning lack of evidence to guide the care of mid-life women, and menopause is no exception. In Canada, there has been a lack of regional and national data on the burden of menopause, which means health policy is not guided by the best possible information. Consistent with previous research in other countries [11,12], vasomotor symptoms were highly prevalent in this Canadian sample, with over 90% of the sample endorsing at least 1 symptom in the moderate or higher range. Our findings on the influence of demographic variables on symptoms supports and extends existing research. Education and income emerged as protective factors, with higher educational attainment and greater income associated with fewer menopause symptoms, lower anxiety and depression scores, and higher quality of life. Geographic locality also emerged as a significant factor influencing menopause symptoms and mental health outcomes. Women in larger urban areas reported fewer menopause symptoms and lower depression and anxiety scores than those in smaller sized localities.

Some of these results align with prior studies suggesting that socio-economic status plays a critical role in health outcomes during midlife [13–16]. Women with higher education levels may have greater health

literacy, enabling them to recognize symptoms and seek appropriate care earlier. Similarly, those with higher income may have better access to healthcare resources, including extended health benefits and specialized care. These disparities underscore the importance of targeted interventions to support women from lower socioeconomic backgrounds, akin to “meeting people where they are at”. This also includes delivering culturally sensitive care, and may entail advocating for newcomer (i.e., immigrants and refugees) health clinics that deliver menopause care. The policy change planned for 2026 in Canada to offer universal, free menopause hormone therapy may be transformative for menopause care and access for these underserved populations.

The findings on impact of population density are entirely novel, and suggest that efforts to improve access to healthcare resources, social support networks, and educational opportunities in smaller urban centers may be important for managing midlife Canadian women's health. These results highlight the need for policy-driven efforts to improve healthcare accessibility in smaller and medium-sized communities. Notably, we did not find a significant difference between our white and non-white participants in menopause symptoms or mental health outcomes, in contrast to prior studies that have found racial disparities in menopause experiences [15,16]. These socioeconomic advantages may offset disparities typically associated with race, resulting in comparable health outcomes across the two populations. However, within racial subgroups, socioeconomic factors such as income and education remained significant predictors of health outcomes, emphasizing the intersectionality of race and socioeconomic status.

When accessing care, women often wait for their care provider to initiate a discussion on menopause, but many doctors often fail to do so [5]. As a result, women not educated on menopause or related symptoms may never initiate the conversation with their provider. This is exacerbated by the fact that women may only recognize vasomotor symptoms as being menopause-related, and dismiss other joint, cognitive, and genitourinary symptoms as being part of the menopause symptom picture [34]. Moreover, when patients do access care and raise concern about symptoms, many experience dismissal [24]. The universal access healthcare system in Canada may inadvertently serve to exacerbate some of these effects. The Canadian health system is designed to *react* to menopause, not provide proactive support, while mental health and workplace supports remain insufficient. Together, these patterns reveal deeper structural gaps across research, clinical practice, and policy, underscoring the urgent need to strengthen health system responses and better support women through this transitional life stage.

The fact that we found high levels of psychological symptoms in our sample and that these were associated with degree of menopause symptoms (on the MRS) suggests that women navigating menopause may benefit from psychological approaches to manage both menopause-related and psychosocial symptoms. Indeed there is some evidence that psychological treatment (e.g., cognitive behavioural therapy) [4,35] can significantly reduce some menopause-related symptoms (e.g., vasomotor symptoms, insomnia, depression, anxiety) but stigma and cost associated with seeking care from a psychologist can limit women [36]. There is also evidence that patients seek care from a variety of allied health professionals [37–39], but there is limited research on their efficacy. While having a healthcare provider may offer general health benefits, it does not necessarily translate into effective menopause management for all symptoms. Well known barriers such as reluctance to address menopause symptoms, leading to dismissal of patients [24] cost, time constraints, and stigma surrounding menopause may prevent women from actively seeking care. Addressing these barriers requires a multifaceted approach, including improved physician education, destigmatization efforts, and expanded healthcare coverage for menopause-related treatments, particularly since our study found significant effects of social determinants, as well as psychological factors, on the menopause experience.

In summary, our findings highlight the substantial impact of menopause symptoms on midlife women and the critical role of

socioeconomic, mental health, and geographic factors in shaping these experiences. Efforts to improve menopause care should prioritize increasing awareness, enhancing healthcare provider training, and addressing socioeconomic disparities to ensure equitable access to menopause support and treatment in Canada. Adopting a “healthy menopause framework” that focuses on health from a variety of perspectives [40], including the woman's own, may help to ensure a more personalized approach to care. Future research should continue to explore the intersections of race, socioeconomic status, and healthcare access in menopause experiences to inform targeted interventions that improve the quality of life for all women. Future research should also explore cultural perceptions of menopause and healthcare access among diverse populations to better understand the nuances of these experiences.

There are limitations of the study that must be taken into account. Despite our intentional recruitment methods, our sample was primarily white, had a mean high income, and the overwhelming majority identified as cisgender and heterosexual. We compared our sample to population census data and found that overall, our participants were more affluent and highly educated, with lower representation of visible minority populations overall. These differences emphasize the importance of accounting for selection bias and applying population-based adjustments in future analyses to ensure equitable interpretation and generalizability of findings. However, our income and education levels of the sample largely map onto population level data for BC residents. Though our sample was mostly white, we did have broad geographic representation from across the province, and visible minority proportions differ widely depending on the region of BC. Given the barriers in care experienced by under-served populations, future research should strive to understand the menopause-related experiences of more diverse populations.

In conclusion, these findings underscore a potential “urban advantage” in menopausal health outcomes, possibly reflecting differences in healthcare access, lifestyle factors, or environmental influences across locality sizes. These findings also highlight the protective role of education, potentially driven by improved health literacy, access to resources, and socioeconomic advantages.

Contributors

Lori A. Brotto contributed to the conception and design of the study, acquisition and interpretation of data, drafting of the article and revising the manuscript critically for important intellectual content.

Sabina Dobrer contributed to design of the study, analysis and interpretation of data, drafting of the article or revising the manuscript critically for important intellectual content.

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Amy Booth contributed to the conception and design of the study, and revising the manuscript critically for important intellectual content.

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Cynthia Lin Hsieh contributed to acquisition of data, interpretation of data, and revising the manuscript critically for important intellectual content.

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and revising the manuscript critically for important intellectual content.

Shirley Weir contributed to the conception and design of the study, and revising the manuscript critically for important intellectual content.

Paul J. Yong contributed to the conception and design of the study, interpretation of data, and drafting the article and revising the manuscript critically for important intellectual content.

Gina Ogilvie contributed to the conception and design of the study, acquisition and interpretation of data, and drafting the article and revising the manuscript critically for important intellectual content.

All authors saw and approved the final version and no other person made a substantial contribution to the paper.

Ethical approval

The study was approved by the University of British Columbia Behavioural Research Ethics Board (H23–02732).

Provenance and peer review

This article was not commissioned and was externally peer reviewed.

Funding

This research was funded by Pacific Blue Cross and the BC Women's Health Foundation. The funding organizations had no role in the design of the study, in the collection or interpretation of the data, or in the preparation and review of the manuscript.

Declaration of competing interest

The authors declare that they have no competing interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.maturitas.2026.108874>.

Data availability

All data and materials supporting the results reported in this paper will be made publicly available via a project space on the Open Science Framework (OSF) upon publication. You may contact the lead author directly for access to the data file.

References

- [1] A. Ambikairajah, E. Walsh, N. Cherbuin, A review of menopause nomenclature, *Reprod. Health* 19 (2022) 29.
- [2] S. Palacios, V. Henderson, N. Siseles, D. Tan, P. Villaseca, Age of menopause and impact of climacteric symptoms by geographical region, *Climacteric* 13 (2010) 419–428.
- [3] I.C. Lega, A. Fine, M.L. Antoniadis, M. Jacobson, A pragmatic approach to the management of menopause, *CMAJ* 195 (19) (2023) E677–E682.
- [4] R.C. Thurston, H.N. Thomas, A.J. Castle, C.J. Gibson, Menopause as a biological and psychological transition, *Nat. Rev. Psychol.* 4 (2025) 530–543.
- [5] S.C. Bailey, E.N. Andrews, C.C. Halton, M.S. Wolf, Evaluation of a discussion guide to promote patient understanding of menopause and informed treatment decision-making, *J. Women's Health* 30 (3) (2021) 445–451.
- [6] S.A. Kingsberg, M. Krychman, S. Graham, B. Bernick, S. Mirkin, The women's EMPOWER survey: women's knowledge and awareness of treatment options for vulvar and vaginal atrophy remains inadequate, *J. Sex. Med.* 14 (2017) 425–433.
- [7] J. Gavin, K. Riach, E. Bariola, Temporality and gendered agency: menopausal subjectives in women's work, *Hum. Relat.* 2 (1) (2019) 57–73.
- [8] S. Krajewski, Advertising menopause: You have been framed, *Continuum* 33 (1) (2018) 137–148.
- [9] M. Nosek, H.P. Kennedy, M. Gudmundsdottir, Silence, stigma, and shame: a postmodern analysis of distress during menopause, *Adv. Nurs. Sci.* 33 (3) (2010) E24–E36. Jul 1.
- [10] N.E. Avis, S. Brockwell, J.F. Randolph Jr., S. Shen, V.S. Cain, M. Ory, G. A. Greendale, Longitudinal changes in sexual functioning as women transition through menopause: results from the study of women's health across the nation, *Menopause* 16 (3) (2009) 442–452. May 1.
- [11] E. Gold, A. Colvin, N. Avis, et al., Longitudinal analysis of vasomotor symptoms and race/ethnicity across the menopausal transition: study of women's health across the nation (SWAN), *Am. J. Public Health* 96 (2006) 1226–1235.
- [12] E. Freeman, M.D. Sammel, R.J. Sanders, Risk of long-term hot flashes after natural menopause: evidence from the Penn ovarian aging study cohort, *Menopause* 21 (9) (2014) 924–932.
- [13] R.G. Brzyski, M.A. Medrano, J.M. Hyatt-Santos, J.S. Ross, Quality of life in low-income menopausal women attending primary care clinics, *Fertil. Steril.* 76 (2001) 44–50.
- [14] L. Hall, L.C. Callister, J.A. Berry, G. Matsumura, Meanings of menopause: cultural influences on perception and management of menopause, *J. Holist. Nurs.* 25 (2007) 106–118.
- [15] E.O. Im, B. Lee, W. Chee, A. Brown, S. Dormire, Menopausal symptoms among four major ethnic groups in the US, *West. J. Nurs. Res.* 32 (4) (2010) 540–565.
- [16] W. Makeba, G. Richard-Davis, A. Weickert, L. Christensen, E. Ward, S. Schragar, A review of African American women's experiences in menopause, *Menopause* 29 (11) (2022) 1331–1337.
- [17] R.C. Thurston, H. Joffe, Vasomotor symptoms and menopause: findings from the study of women's health across the nation, *Obstet. Gynecol. Clin. N. Am.* 38 (2011) 489–501.
- [18] K. Weidner, I. Croy, T. Siepmann, E. Braehler, M. Beutel, A. Bittner, Menopausal syndrome limited to hot flushes and sweating: a representative survey study, *J. Psychosom. Obstet. Gynaecol.* 38 (3) (2017) 170–179.
- [19] R.E. Nappi, R. Kroll, E. Siddiqui, B. Stoykova, C. Rea, E. Gemmen, et al., Global cross-sectional survey of women with vasomotor symptoms associated with menopause: prevalence and quality of life burden, *Menopause* 28 (8) (2021) 875–882.
- [20] S.C. Hooper, V.B. Marshall, C.B. Becker, A.Z. LaCroix, P.K. Keel, L.S. Kilpela, Mental health and quality of life in postmenopausal women as a function of retrospective menopause symptom severity, *Menopause* 29 (6) (2022) 707–713.
- [21] J. Whiteley, J.S. Wagner, A. Bushmakin, L. Kopenhaver, M. DiBonaventura, J. Racketta, Impact of the severity of vasomotor symptoms on health status, resource use, and productivity, *Menopause* 20 (5) (2013) 518–524.
- [22] S.C. Bailey, E.N. Andrews, C.C. Halton, M.S. Wolf, Evaluation of a discussion guide to promote patient understanding of menopause and informed treatment decision-making, *J. Women's Health* 30 (3) (2021) 445–451. Mar 1.
- [23] L. Hvas, H. Thorsen, K. Sondergaard, Discussing menopause in general practice, *Maturitas* 46 (2) (2003) 139–146.
- [24] M.K. Richardson, N. Coslov, N.F. Woods, Seeking health care for perimenopausal symptoms: observations from the women living better survey, *J. Women's Health* 32 (4) (2023) 434–444. Apr 1.
- [25] Canadian Menopause Foundation, Menopause and work in Canada, 2023.
- [26] L.A. Heinemann, T. DoMinh, F. Strelow, S. Gerbsch, J. Schnitker, H.P. Schneider, The menopause rating scale (MRS) as outcome measure for hormone treatment? A validation study, *Health Qual. Life Outcomes* 2 (2004) 1–7. Dec.
- [27] J.E. Blumel, E. Arteaga, J. Parra, C. Monsalve, V. Reyes, M.S. Vallejo, R. Chea, Decision-making for the treatment of climacteric symptoms using the Menopause Rating Scale, *Maturitas* 111 (2018) 15–19.
- [28] J.R. Hilditch, J. Lewis, A. Peter, B. van Maris, A. Ross, E. Franssen, G.H. Guyatt, P. G. Norton, E. Dunn, A menopause-specific quality of life questionnaire: development and psychometric properties, *Maturitas* 24 (6) (1996) 161–175. Jun 1.
- [29] B. Lowe, D. Oliver, S. Muller, E. Braehler, D. Schellberg, W. Herzog, et al., Validation and standardization of the generalized anxiety disorder screen (GAD-7) in the general population, *Med. Care* 46 (3) (2008) 266–274.
- [30] R.L. Spitzer, K. Kroenke, J.B. Williams, B. Lowe, A brief measure for assessing generalized anxiety disorder: the GAD-7, *Arch. Intern. Med.* 166 (10) (2006) 1092–1097.
- [31] M. Kroenke, R.L. Spitzer, J.B. Williams, The PHQ-9: validity of a brief depression severity measure, *J. Gen. Intern. Med.* 16 (9) (2001) 606–613.
- [32] T.J. Hartung, M. Friedrich, C. Johansen, H.U. Wittchen, H. Faller, U. Koch, et al., The hospital anxiety and depression scale (HADS) and the 9-item patient health questionnaire (PHQ-9) as screening instruments for depression in patients with cancer, *Cancer* 123 (21) (2017) 4236–4243.
- [33] W.H. Utian, J.W. Janata, S.A. Kingsberg, M. Schluchter, J.C. Hamilton, The Utian quality of life (UQOL) scale: development and validation of an instrument to quantify quality of life through and beyond menopause, *Menopause* 25 (11) (2018) 1224–1231.
- [34] L. Hoga, J. Rodolpho, B. Gonçalves, B. Quirino, Women's experience of menopause: a systematic review of qualitative evidence, *JBI Database System Rev. Implement. Rep.* 13 (8) (2015) 250–337, <https://doi.org/10.11124/jbisrir-2015-1948>. Sep 16. (PMID: 26455946).
- [35] E. Samami, Z. Shahhosseini, F. Elyasi, The effects of psychological interventions on menopausal hot flashes: a systematic review, *International journal of reproductive biomedicine.* 20 (4) (2022) 255–272. May 23.
- [36] K. Barber, A. Charles, Barriers to accessing effective treatment and support for menopausal symptoms: a qualitative study capturing the Behaviours, beliefs and experiences of key stakeholders, *Patient Pref Adher.* 17 (2023) 2971–2980.
- [37] F.I. Antônio, R.D. Herbert, K. Bø, A.C. Rosa-e, L.A. Lara, Franco M. de Menezes, C. H. Ferreira, Pelvic floor muscle training increases pelvic floor muscle strength more in post-menopausal women who are not using hormone therapy than in women who are using hormone therapy: a randomised trial, *Aust. J. Phys.* 64 (3) (2018) 166–171. Jul 1.
- [38] J. Mercier, M. Morin, D. Zaki, B. Reichetzer, M.C. Lemieux, S. Khalifé, C. Dumoulin, Pelvic floor muscle training as a treatment for genitourinary

- syndrome of menopause: a single-arm feasibility study, *Maturitas* 125 (2019) 57–62. Jul 1.
- [39] K.A. Stanzel, K. Hammarberg, J. Fisher, 'Not everybody is an internet person': barriers for menopause-related health literacy among immigrant women from the horn of Africa nations, *Health Promot. J. Austr.* 32 (S1) (2020) 61–68.
- [40] L. Jaspers, N.M. Daan, G.M. van Dijk, T. Gazibara, T. Muka, K.X. Wen, et al., Health in middle-aged and elderly women: a conceptual framework for healthy menopause, *Maturitas* 8 (1) (2015) 93–98.