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Assessment of menopausal symptoms in different transition phases using the Greene Climacteric Scale among rural women of North India

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ABSTRACT

Background: Menopause is the universal physiological process of women's midlife and exhibits a wide variety of symptoms. However, there is little data on the menopausal symptoms and factors associated with their severity among rural Indian women.

Aim: To evaluate the prevalence of menopausal symptoms during the different transition phases of menopause among rural women of North India.

Subjects and methods: This cross-sectional study consisted of 351 women aged 35–55 years (mean age 44.6 years) residing in rural areas of North India. A structured questionnaire was used to collect data regarding menopausal status, demographic profile and reproductive history of the participants. Frequency and severity of menopausal symptoms were evaluated using the Greene Climacteric Scale in different stages of menopause. All statistical procedures were accomplished using SPSS version 19.0.

Results: In the present study the mean ages of attainment of menarche and menopause were 14.3 years and 47.2 years, respectively. Mean score of total Greene Climacteric Scale was highest among perimenopausal women (16.12 ± 8.1) over post-menopausal (14.78 ± 7.3) and pre-menopausal women (11.08 ± 6.1). Logistic regression analysis revealed that advancing age, low educational attainment, low socioeconomic status, menopausal status, later age at menarche and higher BMI were all associated with more severe menopausal symptoms.

Conclusion: The climacteric symptoms were more prevalent among women who were perimenopausal followed by post-menopausal women and were the lowest in pre-menopausal women. Age, menopausal status, socio-economic status, and reproductive factors significantly influenced the severity of menopausal symptoms.

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Greene climacteric scale
(GCS); perimenopause;
menopausal symptoms

Introduction

Menopause is an inescapable event which occurs in the middle age of all women unless there is earlier surgical intervention. It is a multidimensional biological, psychological and cultural phenomenon representing a transition from the reproductive to the non-reproductive phase of the female life cycle. Menopause is a natural biological process; however, ovarian failure and the accompanying decline or imbalance in oestrogen and progesterone hormones during this period are associated with a variety of health problems. These health issues may have temporary effects (including hot flushes, irritability, depression and mood swings) as well as long-term effects (such as lower backache, cardiovascular problems, joint pain and osteoporosis) (Greene and Cook 1980; Matthews et al. 1989). It is important to note that previous population studies illustrated that the experience and severity of menopausal symptoms varies within a society and amongst various societies (Leidy 1994; WHO, 1996). A study conducted by Takahashi and Johnson (2015) also noticed that reduced production of oestrogen with continued

secretion of gonadotrophic hormones by the hypothalamus may be responsible for menopausal symptoms. Detailed previous evaluations have suggested that middle-aged women report a number of signs and symptoms during the menopausal transition (McKinlay 1996; Dennerstein et al. 2000), but only vasomotor symptoms (hot flushes and sweating) and vaginal dryness are associated with decreased oestrogen production (Dennerstein et al. 2000; Gold et al. 2006). It has been found by Avis et al. (2001) that there is a diversity of menopause experiences and symptoms among five racial/ethnic groups residing in the US.

Various cross-sectional and longitudinal studies have employed different scales to measure menopausal symptoms in Western countries. The first scales used to measure menopause symptoms were the Kupperman index (Kupperman et al. 1953) and the Blatt menopause index (Blatt et al. 1953). However, in more recent studies, the Greene Climacteric Scale has been widely used as the standardised scale to carry out cross-cultural studies. It is apparent from different studies (Barentsen et al. 2001; Sierra et al. 2005;

Kapur et al. 2009), performed on worldwide populations using the Greene Climacteric Scale, that the prevalence and severity of menopausal symptoms exhibit a sudden incline during menopausal transition and remain high among post-menopausal women (Greene 1998).

A considerable amount of progress has been made in Western societies to evaluate menopausal symptoms, but this topic is still under-studied in developing countries like India. India is a diverse country in terms of its geographical set-up, socio-economic status, cultural context, education, awareness, and accessibility to the healthcare system, and a few studies have been conducted here to understand the severity and intensity of climacteric symptoms during menopausal transition. These earlier studies (Singh and Arora 2005; Stanford et al. 1987) essentially focused on urban areas, leaving the rural area unstudied. Therefore, the present study was conducted to fill this gap and was designed to understand (i) the frequency and severity of symptoms related to menopausal transition and (ii) determinants of the severity of menopausal symptoms in a rural area of Kanpur.

Subjects and methods

Participants

The present cross-sectional study was carried out in six villages (namely Chandula, Lodhar, Bacchipur, Etra, Dilvarpur tuswa and Kursauli) of Kanpur, India. A total of 379 women were interviewed, but 28 women were excluded on the basis of the exclusion criteria. Thus, a sample of 351 rural Indian women, aged between 35–55 years (mean age = 44.6 years) was considered for the study. According to the Uttar Pradesh government, the basic unit for rural areas is the revenue village, which has definite surveyed boundaries. The revenue village may comprise of one or more hamlets, but the entire village is treated as one unit for presentation of data (Census India 2011).

Participants who were pregnant, unmarried or had undergone oophorectomy or hysterectomy were excluded. The sample was divided into three categories according to WHO (1996) guidelines on the basis of menopausal status; these are pre-menopause (menstruating regularly), perimenopause (menstruation becomes irregular, but has occurred once during the past 12 months) and post-menopause (after the menopause, no periods for past 12 months). To achieve the objectives, 118 (33.6%) pre-menopausal, 117 (33.3%) perimenopausal and 116 (33%) post-menopausal women participated. The sample size of the present study was ascertained by using a general formula for single population proportions with the expected prevalence of menopausal symptoms. Since the present study was focused on three groups of menopause, i.e. pre-menopause, perimenopause and post-menopause, it was anticipated that at least 100 participants included in each group would provide an appropriate representation of the sample. The prevalence of menopausal symptoms was assumed to be 36% to achieve the maximum sample size, with 95% of confidence interval and 5% probability of type 1 error. The

sample size was calculated by using the formula given below:

$$n = Z\alpha^2 * p * q / d^2 = (1.96)^2 * 0.36 * 0.64 / (0.05)^2$$

where $Z\alpha = 1.96$ for 95% level of confidence; α is the risk of type 1 error; p = assumed prevalence; $q = 1 - p$; and d = error of estimate.

Using the above formula, the calculated sample size would be 354. On the basis of exclusion and inclusion criteria, a sample of 351 respondents was included.

Prior to collecting the information, all the participants were informed about the purpose of the study and their verbal informed consent was taken. Ethical clearance for the study was obtained from the ethical committee of the institution. Initially, women were asked about their age, marital status, age at marriage, age at menarche and menopause, education level and type of family, joint or nuclear. Mean age at menarche was ascertained by using the Kaplan Meier survival curve. Age of the participants was ascertained from their date of birth. Most of the women were able to recall their date of birth and this was verified from their voter ID and Aadhar card (Government documents of the Republic of India).

To study socio-economic status (SES), the Agarwal scale (Agarwal et al. 2005) was employed, which is a comprehensive and widely used scale to assess the socio-economic status of urban and rural areas of India. It consists of 22 items and the scale is divided into six socio-economic categories: Upper high (more than 76), High (61–75), Upper middle (46–60), Lower middle (31–45), Poor (16–30) and Very poor (less than 15).

To understand and assess menopausal symptoms and their severity during the three phases, the Greene Climacteric scale (Greene 1998) was used. This scale was translated into regional languages. This scale includes 21 symptoms to measure the menopausal symptoms. These symptoms were divided into four clusters and two sub-clusters: psychological (sum of items 1–11) which includes the anxiety sub-cluster (1–6) and the depression sub-cluster (7–11); somatic (sum of items 12–18); vasomotor (sum of items 19–20); and loss of interest in sex (item 21). Respondents' responses were rated for each symptom according to its current condition on a four-point scale: not-at-all (0); a little (1); quite a bit (2); extremely (3). Total Greene Scale (TGS) was calculated to measure the quality-of-life of the women. The mean value for each symptom was calculated by the addition of all individual values divided by the total number of participants. The total mean value of each symptom indicates the total mean scores of each cluster, equal to the Total Greene Scales.

Two anthropometric measurements, i.e. height (cm) and weight (kg), were taken from all participants by using the standard techniques described by Weiner and Lourie (1981) and body mass index (kg/m^2) was calculated. WHO expert consultation (2004) Classification of BMI (kg/m^2) was adopted, where adults were classified as underweight (<18.50); normal (18.50–24.99); overweight (≥ 25.00); and obese (≥ 30.00).

Statistical analysis

The collected data were analysed by the Statistical Package for the Social Sciences (SPSS). Quantitative data were presented as mean \pm SD, whereas qualitative data were expressed as percentages. Student's *t*-test was applied to determine between-group comparisons. Categorical variables were compared between pre-menopausal, perimenopausal and post-menopausal participants using Chi-square analysis. Univariate and multivariate regression analyses were performed to gauge the possible risk factor for severity of menopausal symptoms with respect to various reproductive factors and socio-demographic and anthropometric variables among rural women of Kanpur (India). All the variables were included for univariate logistic regression analysis to find out the risk factors as per their median scores in all the clusters, sub-clusters and Total Greene Scores. Those variables which had shown a statistically significant association in the univariate model were further analysed in the multivariate model. The level of significance for all analyses was set at $p < 0.05$ and a confidence interval of 95% was taken for all tests. All of these statistical considerations were conducted using SPSS (version 19.0, SPSS Inc., Indian Institute of Technology, Kanpur, India).

Results

The overall socio-economic demographic profile of rural women of Kanpur, India is summarised in Table 1. The mean age of respondents of this study was 44.6 (SD = 6.7) years. About 97.4% of women were married and 2.5% were found to be widowed. It was noted that 57.2% of women were illiterate. A substantial proportion of women (73.2%) were

Table 1. Overall socio-demographic profile of women under study.

Socio-demographic variables	Total (n = 351)
Age (years), mean \pm SD ^a	44.6 \pm 6.7
Marital status ^b	
Married	342 (97.4%)
Widowed	9 (2.5%)
Education level ^b	
Illiterate	201 (57.2%)
Primary to middle class	107 (30.4%)
High school	30 (8.5%)
Graduation or more	13 (3.6%)
Occupation ^b	
Working	6 (1.7%)
Worked on own land or shop	88 (25%)
Housewife	257 (73.2%)
Socio-economic status (SES) ^b	
Poor	98 (27.9%)
Lower Middle	231 (65.8%)
Upper Middle	22 (6.2%)
Family type ^b	
Nuclear	193 (54.9%)
Joint	158 (45%)
Age at Menarche (years), Mean \pm SD ^a	14.3 \pm 1.1
Age at Menopause (years), Mean \pm SD ^a	47.27 \pm 2.44
Median age ^a (years)	47.5
Menstrual status ^b	
Pre-menopausal	118 (33.6%)
Perimenopausal	117 (33.3%)
Post-menopausal	116 (33%)

^aContinuous variables are represented as mean \pm SD.

^bCategorical variables are represented as % (n).

housewives, 25% of women worked on their own land or shop and only 1.7% of women were in government/private jobs. About 65.8% of women belonged to the lower middle class, while 27.9% were from a poor socio-economic status. Nearly fifty-five per cent (54.9%) of women had a nuclear family, while 45% had a joint family. The mean ages at menarche and menopause were found to be 14.3 (SD = 1.1) years and 47.27 (SD = 2.44) years, respectively, as assessed using the Kaplan Meier survival curve.

Table 2 displays the frequency and mean score of 21 items in all three groups. Perimenopausal women have a maximum mean score in heart beating quickly or strongly, feeling tense or nervous, excitable, difficulty in concentrating, loss of interest in most things, feeling unhappy or depressed, cry spell, irritability, feeling dizzy or faint, loss of feelings in hands and feet, hot flushes and sweating. In a psychological cluster, the highest mean score of the symptom 'difficulty in sleeping' was reported by post-menopausal women (1.11; SD = 0.77). 'Feeling tired or lacking energy' was higher in pre-menopausal women (1.09; SD = 0.86), while 'irritability' (1.07) was higher in perimenopausal women. In a somatic cluster, 'headache' symptoms increased with menopausal transition and were found to be highly significant among post-menopausal women (1.12; SD = 1), and the maximum score for 'loss of feeling in hands and feet' was found among perimenopausal women (0.44; SD = 0.70). The symptom 'breathing difficulties' did not show much difference in mean score between the groups but was higher among pre-menopausal women (0.50; SD = 0.46). In a vasomotor cluster, the mean scores of symptoms 'hot flushes' (1.16; SD = 0.90) and 'sweating at night' (0.97; SD = 0.81) were found to be higher among perimenopausal women, and the difference in mean scores was statistically significant ($p < 0.001$). The mean score of the symptom 'sexual dysfunction' increased with menopausal transition and presented the maximum score of all the 21 symptoms. The most commonly occurring symptoms were sexual dysfunction (83%), followed by feeling tired or lacking energy (69%), feeling unhappy or depressed (59%) and irritability (59%). The difference in the mean score was statistically significant in 14 symptoms, as shown in Table 2.

Total mean scores of all the clusters and sub-clusters of the Greene Climacteric Scale are presented in Table 3. The differences between psychological, anxiety, depression, somatic, vasomotor, sexual dysfunction clusters and sub-clusters and Total Greene Score (TGS) were found to be highly significant in different menopausal phases. Perimenopausal women had higher scores for psychological cluster (8.76; SD = 4.9), anxiety sub-cluster (4.21; SD = 2.5), depression sub-cluster (4.56; SD = 2.8) and vasomotor cluster (2.13; SD = 1.6). The mean scores of the somatic cluster (4.43; SD = 3.4) and sexual dysfunction (2.27; SD = 0.75) symptoms were higher among post-menopausal women and increased with menopausal transition. The mean value for TGS was maximum among perimenopausal women (16.12; SD = 8.1) followed by the post-menopausal women (13.87; SD = 7.5) and then the pre-menopausal women (10.7; SD = 6.1).

Univariate regression analysis was performed to analyse the possible risk factor for severity of menopausal

Table 2. Descriptive statistics of symptoms in psychological, somatic, vasomotor and sexual dysfunction clusters among rural women in different menopausal stages.

Symptoms	Total, n = 351 (Mean ± SD) (%)	Pre-menopause, n = 118 (Mean ± SD) (%)	Perimenopause, n = 117 (Mean ± SD) (%)	Post-menopause, n = 116 (Mean ± SD) (%)	p-value
1. Heart beating quickly or strongly	0.62 ± 0.74 (47%)	0.47 ± 0.75 (31%)	0.76 ± 0.77 ^a (56%)	0.63 ± 0.66 (52%)	0.01**
2. Feeling tense or nervous	0.79 ± 0.85 (51%)	0.70 ± 0.88 (42%)	0.85 ± 0.85 (55%)	0.84 ± 0.81 (58%)	0.3
3. Difficulty in sleeping	0.86 ± 0.86 (56%)	0.54 ± 0.79 (35%)	0.94 ± 0.92 ^a (58%)	1.11 ± 0.77 ^c (38%)	0.001***
4. Excitable	0.34 ± 0.51 (31%)	0.31 ± 0.59 (25%)	0.38 ± 0.48 (37%)	0.33 ± 0.47 (33%)	0.7
5. Attacks of anxiety, panic	0.36 ± 0.50 (34%)	0.36 ± 0.53 (34%)	0.34 ± 0.49 (33%)	0.37 ± 0.50 (36%)	0.8
6. Difficulty in concentrating	0.65 ± 0.74 (49%)	0.46 ± 0.74 (31%)	0.96 ± 0.83 ^a (64%)	0.53 ± 0.53 ^c (51%)	0.001***
7. Feeling tired or lacking in energy	1.07 ± 0.87 (69%)	1.09 ± 0.86 (70%)	1.03 ± 0.89 (66%)	1.08 ± 0.86 (71%)	0.8
8. Loss of interest in most things	0.64 ± 0.64 (54%)	0.52 ± 0.59 (47%)	0.79 ± 0.68 ^b (64%)	0.60 ± 0.63 ^c (52%)	0.003**
9. Feeling unhappy or depressed	0.70 ± 0.66 (59%)	0.63 ± 0.61 (57%)	0.83 ± 0.67 ^{a,b} (68%)	0.63 ± 0.67 (52%)	0.01**
10. Cry spell	0.63 ± 0.66 (53%)	0.36 ± 0.53 (56%)	0.82 ± 0.75 ^a (63%)	0.71 ± 0.60 ^c (64%)	0.001***
11. Irritability	0.79 ± 0.76 (59%)	0.62 ± 0.61 (59%)	1.07 ± 0.87 ^{a,b} (67%)	0.68 ± 0.70 (54%)	0.001***
12. Feeling dizzy or faint	0.33 ± 0.51 (30%)	0.30 ± 0.52 (26%)	0.35 ± 0.47 (35%)	0.34 ± 0.54 (31%)	0.6
13. Pressure or tightness in head	0.46 ± 0.64 (38%)	0.36 ± 0.63 (27%)	0.44 ± 0.57 (40%)	0.57 ± 0.72 ^c (44%)	0.05*
14. Parts of body feel numbness	0.54 ± 0.78 (36%)	0.40 ± 0.55 (36%)	0.57 ± 0.87 (32%)	0.64 ± 0.85 (39%)	0.05*
15. Headache	0.78 ± 0.94 (44%)	0.59 ± 0.85 (38%)	0.62 ± 0.87 ^b (38%)	1.12 ± 1 ^c (58%)	0.001***
16. Muscle and joint pain	0.88 ± 0.95 (50%)	0.60 ± 0.84 (37%)	0.97 ± 0.94 ^a (56%)	1.09 ± 1 ^c (57%)	0.001***
17. Loss of feeling in hands and feet	0.37 ± 0.63 (29%)	0.37 ± 0.56 (34%)	0.44 ± 0.70 (32%)	0.28 ± 0.61 (20%)	0.15
18. Breathing difficulties	0.46 ± 0.78 (28%)	0.50 ± 0.46 (28%)	0.49 ± 0.80 (29%)	0.39 ± 0.77 (21%)	0.4
19. Hot flushes	0.55 ± 0.76 (28%)	0.14 ± 0.39 (12%)	1.16 ± 0.90 ^{a,b} (69%)	0.34 ± 0.47 ^c (34%)	0.001***
20. Sweating at night	0.47 ± 0.69 (37%)	0.21 ± 0.46 (19%)	0.97 ± 0.81 ^{a,b} (67%)	0.24 ± 0.43 (24%)	0.001***
21. Loss in sex interest	1.59 ± 0.96 (83%)	1.17 ± 0.89 (70%)	1.35 ± 0.88 ^b (78%)	2.27 ± 0.75 ^c (99%)	0.001***

^aSignificant difference between pre-menopause and perimenopause.^bSignificant difference between perimenopause and post-menopause.^cSignificant difference between post-menopause and pre-menopause.* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.**Table 3.** Descriptive statistics of symptoms in psychological, somatic, vasomotor and sexual dysfunction clusters among rural women from different menopausal phases.

Variables	Total data, n = 351 (Mean ± SD)	Pre-menopause, n = 118 (Mean ± SD)	Perimenopause, n = 117 (Mean ± SD)	Post-menopause, n = 116 (Mean ± SD)	F-value	p-value
Psychological	7.44 ± 4.6	6.08 ± 4.3	8.76 ± 4.9 ^{a,b}	7.5 ± 4.5	6.8	0.001***
Anxiety	3.62 ± 2.6	2.86 ± 2.7	4.21 ± 2.5 ^a	3.80 ± 2.5 ^c	8.2	0.000***
Depression	3.82 ± 2.7	3.22 ± 2.4	4.56 ± 2.8 ^{a,b}	3.70 ± 2.6	7.5	0.001***
Somatic	3.81 ± 3.2	3.13 ± 3.1	3.89 ± 3.1	4.43 ± 3.4 ^c	5.9	0.004**
Vasomotor	1.02 ± 1.3	0.35 ± 0.78	2.13 ± 1.6 ^{a,b}	0.59 ± 0.80	83.5	0.001***
Sexual Dysfunction	1.59 ± 0.9	1.17 ± 0.89	1.35 ± 0.88 ^b	2.27 ± 0.75 ^c	56.6	0.001***
TGS	13.87 ± 7.5	10.7 ± 6.1	16.12 ± 8.1 ^a	14.78 ± 7.3 ^c	15.3	0.001***

^aSignificant difference between pre-menopause and perimenopause.^bSignificant difference between perimenopause and post-menopause.^cSignificant difference between post-menopause and pre-menopause.* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

symptoms for all covariate variables individually (Supplementary Table S1). Variables which had shown statistically significant associations in the univariate model were further analysed in the multivariate model. Table 4 shows the association of different factors with clusters and sub-clusters of menopausal symptoms in multivariate regression analysis. According to multivariate regression analysis (Table 4), women who were > 45 years of age were found to have a 5-fold (95% CI = 1.0–23.7, $p < 0.05$) higher probability of the symptom loss of interest in sex. Illiterate women displayed a 2.4-fold (95% CI = 1.3–4.4, $p < 0.01$) higher association with psychological symptoms and were 1.9-times (95% CI = 1.1–3.3, $p < 0.01$) more likely to have depression. Similarly, women who belonged to 'poor' socioeconomic status were significantly associated with vasomotor symptoms (95% CI = 1.0–10.9, $p < 0.05$). The multivariate analyses also revealed that later age at menarche (>14 years) was associated with a 2.2-times greater chance of experiencing TGS >14 (95% CI = 1.3–3.6, $p < 0.001$). With respect to menopausal status, perimenopausal women had 1.2-times (95% CI = 0.4–3.5, $p < 0.05$), and post-menopausal women had 1.1-

times (95% CI = 0.3–2.1, $p < 0.05$) higher risk of having psychological symptoms.

A comparative account of women in three menopausal stages revealed that perimenopausal women had a significantly greater possibility of having psychological symptoms. Results of the multivariate model presented a ~ 1.9-fold greater risk of having anxiety among perimenopausal women than pre-menopausal women. The possibility of developing depression was 1.1-times (95% CI = 0.3–1.9, $p < 0.05$) higher in perimenopausal women compared with pre-menopausal women. Somatic symptoms were 1.6-times (95% CI = 0.9–2.7, $p < 0.05$) more strongly associated with perimenopausal women in contrast to pre-menopausal women, while post-menopausal women were 2.2-times (95% CI = 1.3–3.8, $p < 0.002$) more likely to be associated with somatic symptoms. Both the perimenopausal and post-menopausal women showed a statistically significant risk of developing somatic symptoms. In the multivariate model, somatic symptoms were 1.2-times (95% CI = 0.4–3.4, $p < 0.05$) more strongly associated with post-menopausal women in contrast to their pre-menopausal counterparts. Perimenopausal

Table 4. Multivariate regression analysis for severity of menopausal symptoms with respect to socio-demographic, reproductive factors and anthropometric variables among rural women.

Variables	OR (95% CI)							
	Psychological > 8 (median) ^a	Anxiety > 4 (median) ^a	Depression > 4 (median) ^a	Somatic > 3 (median) ^a	Vasomotor > 0 (median) ^a	Loss of interest in sex > 2 (median) ^a	Total Greene climacteric scale (TGS) > 14 (median) ^a	
Age (years) ^a								
>45 years ^R	1 (0.5–1.9) 0.9	1.0 (0.5–1.9) 0.9	0.8 (0.4–1.7) 0.7	1.1 (0.5–2.1) 0.7	1.1 (0.5–2.2) 0.7	5.0 (1.0–23.7)*	0.9 (0.4–1.8) 0.9	
≤45 years ^R	1	1	1	1	1	1	1	
Education								
Illiterate ^R	2.4 (1.3–4.4)**	1.2 (0.7–2.1) 0.4	1.9 (1.1–3.3)**	1.0 (0.5–1.7) 0.9	1.2 (0.7–2.1) 0.3	0.5 (0.1–1.6) 0.2	0.5 (0.3–1.0) 0.06	
Literate ^R	1	1	1	1	1	1	1	
Socio-economic status (SES)								
Poor	0.6 (0.2–1.7) 0.4	1.4 (0.5–4.0) 0.4	0.4 (0.1–1.1) 0.1	1.2 (0.4–3.2) 0.7	3.4 (1.0–10.9)*	1.2 (0.2–6.2) 0.7	1.0 (0.3–2.7) 0.9	
Lower middle class ^R	0.4 (0.1–1.1) 0.1	1.4 (0.5–3.5) 0.4	0.6 (0.2–1.6) 0.3	0.8 (0.3–2.0) 0.6	2.0 (0.7–6.2) 0.1	1.1 (0.2–5.3) 0.8	1.7 (0.7–4.5) 0.2	
Upper middle class	1	1	1	1	1	1	1	
Age at menarche (years) ^a								
>14 years	1.6 (1.0–2.6)	0.6 (0.4–1.1) 0.1	0.7 (0.4–1.1) 0.1	1.2 (0.7–1.9) 0.3	1.2 (0.6–2.3) 0.4	0.6 (0.3–1.2) 0.1	2.2 (1.3–3.6)***	
≤14 years ^R	1	1	1	1	1	1	1	
Age of marriage (years) ^a								
<16 years	2.0 (1.2–3.3)**	1.2 (0.7–1.9) 0.4	1.2 (0.7–2.0) 0.3	1.1 (0.6–1.7) 0.6	1.1 (0.6–1.9) 0.6	1.5 (0.7–2.9) 0.2	1.5 (0.9–2.5) 0.1	
≥16 years	1	1	1	1	1	1	1	
Menopausal status								
Pre-menopause ^R	1	1	1	1	1	1	1	
Peri-menopause	1.2 (0.4–3.5)*	1.9 (0.4–2.2)*	1.1 (0.3–1.9)*	0.5 (0.2–1.2) 0.1	8.7 (4.3–16.6)***	—	2.6 (0.9–7.4)*	
Post-menopause	1.1 (0.3–2.1)**	—	—	1.2 (0.4–3.4)*	1.7 (0.8–3.4) 0.1	25.2 (7.4–85.5)***	2.1 (1.1–3.9)*	
Body mass index (kg/m ²)								
Normal ^R	1	1	1	1	1	1	1	
Underweight	1.3 (0.6–2.4) 0.4	0.9 (0.4–1.6) 0.7	0.6 (0.3–1.2) 0.1	1.1 (0.6–2.0) 0.7	1.5 (0.9–2.7) 0.09	1.1 (0.4–3.4) 0.7	1.1 (0.5–2.1) 0.7	
Overweight	1.4 (0.8–2.4) 0.1	1.3 (0.9–2.7)*	1.0 (0.6–1.6) 0.9	1.0 (0.6–1.7) 0.7	3.8 (1.1–2.7)*	1.0 (0.5–2.2) 0.8	1.2 (0.7–2.0) 0.3	

OR: odd ratios; 95% CI: confidence interval; R: Reference category.

^amedian.**p* < 0.05; ***p* < 0.01; ****p* < 0.001.

women displayed 8.7-times (95% CI = 4.3–16.6, $p < 0.000$) greater likelihood of showing vasomotor symptoms in comparison to pre-menopausal women, while post-menopausal women did not show any statistically significant association with vasomotor symptoms. Post-menopausal women depicted a 25.2-times (95% CI = 7.4–85.5, $p > 0.000$) greater risk of losing interest in sex than pre-menopausal women. Moreover, perimenopausal women estimated a 2.6-fold higher probability (95% CI = 0.9–7.4, $p > 0.05$) and post-menopausal women presented 2.1-times (95% CI = 1.1–3.9, $p > 0.05$) more risk of having increased TGS scores (> 14 median) than pre-menopausal women. Women in the overweight category of BMI were found to be 1.3-times (95% CI = 0.9–2.7, $p > 0.05$) and 3.8-times (95% CI = 1.1–2.7, $p > 0.05$) more associated with anxiety symptoms and vasomotor symptoms, respectively.

Discussion

Menopausal transition is a crucial phase in women's midlife which is associated with a number of regressive changes in ovarian function, reproductive capacity and hormonal levels long before menstruation terminates completely (Walker and Herndon, 2008). The objectives of the present study were to understand the frequency and severity of symptoms related to menopausal transition and determinants of the severity of menopausal symptoms which were assessed using the Greene Climacteric Scale. This scale has been used to understand menopausal symptoms among different populations (Barentsen et al. 2001; Anderson et al. 2004; Sierra et al. 2005; Kapur et al. 2009; Rülü et al. 2016). In the present study prevalence and intensity of most of the menopausal symptoms suddenly increased in the perimenopause stage.

Psychological symptoms

In the present study women in the three menopausal stages showed significant differences with one another in most of the psychological symptoms. The most prevalent symptoms reported by all women were 'feeling tired or lacking in energy' (68.9%), followed by 'cry spell' (60.9%) and 'irritability' (60.3%), which is consistent with the reports of some other studies (Sierra et al. 2005, Kapur et al. 2009; Li et al. 2012; da Silva and d'Andretta Tanaka 2013; Rülü et al. 2016) carried out on different populations. Anderson et al. (2004) extensively studied menopausal symptoms and found Japanese women were more likely to experience feeling tense or nervous, have panic attacks, difficulty concentrating and feel unhappy or depressed, while Australian women experienced fewer psychological symptoms. Another study from Turkey (Neslihan et al. 1998) also revealed that psychological symptoms such as irritability, decreased concentration, anxiety, depression and fast heartbeat were most frequently reported among women.

According to the results of the present study 'difficulty in sleeping' in post-menopausal women and 'feeling tired or lacking in energy' as well as 'irritability' in pre-menopausal women were highly prevalent symptoms. Frequency of heart

beating quickly or strongly, excitable, difficulty in concentrating, loss of interest in most things, feeling unhappy or depressed and irritability were high and the most prevalent symptoms among perimenopausal women. Recent evidence from Kim et al. (2018) describes that prevalence of poor sleep quality was significantly higher in post-menopausal than in pre-menopausal women. They noted the rates of poor sleep quality in pre-menopausal, perimenopausal and post-menopausal women were 14.4%, 18.2% and 30.2%, respectively. Although the reasons for sleep disturbance during menopause remain to be understood, the most plausible explanations could include vasomotor symptoms, changing hormone levels, mood disorders, coexistent medical conditions and lifestyle factors (Ameratunga et al. 2012).

Studies conducted by Barentsen et al. (2001) on Dutch women and Kakkar et al. (2007) on Indian women, highlighted the significantly higher frequency of most of the psychological symptoms among perimenopausal women. Similarly Rahman et al. (2010) showed that perimenopausal Sarawakian women in Malaysia experienced higher prevalence of depressive mood, irritability, anxiety and physical and mental exhaustion than the post-menopausal women and the least symptoms were reported among pre-menopausal women. A cross-sectional study conducted by Li et al. (2012) among Chinese middle aged women found insomnia was the most frequently occurring psychological symptom among post-menopausal women, whereas 'difficulty in concentrating' was the most reported psychological symptom among Ecuadorian post-menopausal women (Sierra et al. 2005). It is believed that psychological symptoms occur due to the influence of the normal ageing process (Jahanfar et al. 2006). The occurrence of severe psychological symptoms during the transition phase might be associated with psycho-social factors such as physiological changes (Assoc and Adam 1992), cultural variation (Jones et al. 2012) and current life incidence and also some family issues (Deeks 2003). Therefore, recognising and addressing these factors could reduce physical and mental stress levels and improve the quality-of-life.

Somatic symptoms

In the present study, there was an increasing trend in somatic symptoms from the pre-menopausal to the post-menopausal stage which corroborates with the reports of previous studies (Brown et al. 2002; Sierra et al. 2005). Muscle and joint pain (50.1%) and headache (44.4%) were the most prevalent somatic symptoms among rural women under study. The most occurring symptom was 'muscle and joint discomfort', which was noted among 57.7% of post-menopausal women. A previous study by Sierra et al. (2005) reported 'muscle and joint pain' symptoms in 59.7% of Ecuadorian post-menopausal women. In other studies, muscle and joint pain was reported in 76.7% of Sri Lankan post-menopausal women (Waidyasekera et al. 2009), 80.4% of Omani post-menopausal women (El Shafie et al. 2011), 84.3% of Malaysian post-menopausal women (Jahanfar et al. 2006) and 40.5% of rural post-menopausal women of

Mangalore (Avin and Chethan 2016). Several other cross-sectional studies have also illustrated that musculoskeletal pains were more frequently reported symptoms during menopause (Sievert and Goode-Null 2005; Dugan et al. 2006). Symptoms of headache, backache, pain in joints and body-aches were also reported by women from Gujarat, India (Nagar and Dave 2005) and Punjab, India (Sidhu et al. 2005). According to WHO (1996) the most important symptoms among physical and psychological clusters were headache, insomnia and backache. Headache is one the screening measures for somatic symptoms and its prevalence was highest among postmenopausal women. Similarly, a study conducted in Japanese women noted headache was the most prevalent symptom and it was associated with depression (Terauchi et al. 2012). Rural women of Kanpur documented that prevalence of headache was highest in post-menopausal women as compared to their perimenopausal and pre-menopausal counterparts. A study of Martin et al. (2016) elucidated that, compared with pre-menopausal women, the adjusted odds of being in the category of high frequency of headache was 1.62 (95% CI = 1.23–2.12) in perimenopausal and 1.76 (95% CI = 1.23–2.52) in postmenopausal women.

Vasomotor symptoms

Regarding the severity of menopausal symptoms in the vasomotor cluster, hot flushes and night sweats were the most prevalent symptoms among perimenopausal women. A study of Joseph et al. (2014) also noted that perimenopausal women experienced more vasomotor symptoms than women from the other menopausal phases, although these differences were not statistically significant. It is believed that vasomotor symptoms are the result of decreases in ovarian hormonal fluctuations during the perimenopausal phase (Deecher and Dorries 2007). In our study, the presence of hot flushes (69.2%) and night sweats (67.5%) among perimenopausal women corroborates with other studies (Sidhu et al. 2005; Sierra et al. 2005). Menopausal symptoms across two cultural groups (Anderson et al. 2004) showed that Australian women had greater vasomotor symptoms than Japanese women, indicating the role of cultural factors in the severity of the menopausal symptoms experienced. Findings of Melby et al. (2005) evaluated that western societies had higher prevalence of hot flushes than Asian societies. Several studies have shown low prevalence of hot flushes in Hong-Kong (10%) (Ho et al. 1999), Thail (26.6%) (Punyahotra et al. 1997) and Chandigarh women (17.1%) (Kaur et al. 2004). A higher occurrence of 'hot flushes' symptoms was witnessed in 53.8% of women in Jammu (Sharma et al. 2007), 55% of women in Amritsar (Sidhu et al. 2005), 33.3% of women in Uttrakhand (Kapur et al. 2009) and 51.9% of Lotha women in Nagaland (Rülu et al. 2016). 'Night sweats' is another important indicator of the vasomotor cluster. In the present study, the maximum prevalence of night sweats was reported among perimenopausal women. In contrast to these findings, Rülu et al. (2016) have reported that Lotha women of Nagaland showed hot flushes and night sweats as more frequently occurring symptoms in

postmenopausal women. Travers et al. (2005) also evaluated that vasomotor symptoms were common during the menopausal transition phase and continued to be elevated for a few years after menopause.

Loss of interest in sex

Findings of the present study demonstrated high scores for the 'loss of interest in sex' symptom in all three menopausal stages; the score of 'loss of interest in sex' was observed in 82.3% of women, which was higher than the study on Ecuadorian women (53.2%) (Sierra et al. 2005). 'Loss of interest in sex' gradually increased with the menopausal transition and became more prevalent among postmenopausal women, followed by perimenopausal women. It was discussed by Simon (2011) that, during menopause, 'sexual dysfunction' occurs due to the sudden decline of oestrogen, which causes the physiological changes. Oestrogen deficiency can also affect sexual activity due to vaginal dryness, irritation, reduced lubrication, painful intercourse, and vaginal bleeding. In our findings, 99.1% of postmenopausal women reported the loss of interest in sex, while Li et al. (2012) found sexual problems in 57.05% of postmenopausal Chinese women, which was lower than the prevalence of this symptom in the present report. Previous studies conducted among Iranian women (69.8%) (Moghassemi et al. 2011), Thail women (18.8%) (Peeyanarjassri et al. 2008) and Ecuadorian women (53.2%) (Sierra et al. 2005) have shown prevalence of this symptom. According to Laumann et al. (1994), mood, quality-of-life and self-esteem are significantly affected by the loss of interest in sex and this can cause emotional distress and lead to relationship problems.

When compared with the results of other studies, our study revealed that the prevalence of all clusters and sub-clusters of symptoms of the Greene Climacteric Scale were lower than in Ecuadorian women (Sierra et al. 2005), but higher than for Australian and Japanese women (Anderson et al. 2004). Factor analysis of Greene's Climacteric Scale for Indian women carried out by Chattha et al. (2008) also exhibited a higher prevalence of all the clusters of menopausal symptoms.

The current cross-sectional study identified various determinants associated with severity of menopausal symptoms. It was observed that women of advancing age (more than 45 years) were 7.5-times more likely to experience a loss of interest in sex. Earlier researchers also found from different studies that age was an independent risk factor for low sexual desires (Verit et al. 2009; Lianjun et al. 2011). As per the multivariate logistic analysis, illiterate women displayed an association with psychological symptoms, particularly with depression; the results revealed a 2.2-fold higher occurrence of depression in women with no education.

Similarly, a study performed on Finnish women (Moilanen et al. 2010) also reported an association between lower educational attainment and more psychological symptoms. But this finding was not universal among different populations, as studies conducted by Kuh et al. (1997) and Li et al. (2003)

indicated that women with lower education had a higher prevalence of vasomotor and somatic symptoms. In contrast to the present study, Karmakar et al. (2017) found an association between education and physical symptoms among women from West Bengal, India. In the current findings, the multivariate model identified that low socio-economic status was significantly associated with vasomotor symptoms. Consistent with the findings of the present study, results of earlier studies (Gold et al. 2006; Jabeen et al. 2015) also reported a potential association of low socio-economic status with high risk of vasomotor symptoms.

The perimenopausal stage is considered to be a transitional period from the reproductive to the non-reproductive phase, where oestrogen levels suddenly decline and this affects the physiology of women. Hormonal fluctuations and low levels of hormones occur during the menopausal transition (Utian 2005). Perimenopausal women of the present study were found to have higher risk for psychological, anxiety, depression, somatic, and vasomotor symptoms and total Greene Climacteric scale (TGS) score. These findings corroborate with the reports of other studies (Dennerstein et al. 2000; da Silva and d'Andretta Tanaka 2013). Post-menopausal status was found to be a risk factor for psychological and somatic symptoms, and was highly associated with loss of interest in sex, which is endorsed by other studies (Simon 2011; Li et al. 2012; Dalal and Agarwal 2015).

Early age at menarche in the present study was associated with a higher total Greene Climacteric Scale. Similar findings were observed in another study conducted in Indonesia (Muharam et al. 2017). In contrast to our study, a few studies also found an association between late age at menarche and depression symptoms (Bisaga et al. 2002; Herva et al. 2004; Trepanier et al. 2013). In the present study, early marriage (<16 years) had a 2-fold stronger association with severity of psychological symptoms. To the best of our knowledge no previous study of this type has been conducted, although Pimenta et al. (2012) conducted a study concerning a positive association of marital status with menopausal symptoms such as depression, sexual symptoms and vasomotor symptoms. In the present study, multivariate logistic analysis showed that the overweight category of body mass index was related to the severity of anxiety and vasomotor symptoms. In convergence with the present study, past studies also indicated association of obesity with the vasomotor symptoms (Greendale and Gold 2005; Daley et al. 2007; Fernandez-Alonso et al. 2010). Observations of Fernandez-Alonso et al. (2010) illustrated the relationship between higher body mass and hot flushes, but the exact mechanisms regarding the association of severity of menopausal symptoms and obesity is not clear. In a study of Schilling et al. (2007), it was found that women with higher body mass had lower oestradiol, progesterone and oestrone levels, which was responsible for more hot flushes among obese women, while another study highlighted that adiposity can stop the heat dissipation and trigger more menopausal symptoms (Savastano et al. 2009).

Conclusion

Menopausal health is acquiring greater importance in India because of increased life-expectancy and greater awareness and also a supportive cultural environment that encourages discussion on it. However, there is a marked difference in awareness and quality of healthcare available to women in the rural and urban areas. Women coming from the rural and lower-socio-economic strata continue to suffer because of lack of education, financial resources and early marriage. It is, thus, imperative that scientific studies on menopausal symptoms are documented with rigour to lead to policy inputs and direction for intervention for providing care to menopausal women. Rural areas of Kanpur in the state of Uttar Pradesh require much better outreach programmes for a healthy society. This study is a step towards providing that support in ensuring better quality-of-life for the rural women in the area. Health education is recommended through primary healthcare systems which can be focused on multidisciplinary approaches to understand the menopausal problems in their cultural context. Healthy dietary intake, hormonal replacement therapy and yoga should be introduced to improve quality-of-life.

The results of the present study are of particular significance as the sample is drawn from a rural area from a state that qualifies as one of the most populated and under-developed. Health services are dismal and under these circumstances women's health is neglected. Results of the study report that psychological and vasomotor symptoms were higher amongst perimenopausal women, whereas somatic symptoms were higher amongst post-menopausal women. All the clusters of menopausal symptoms of the Greene Climacteric Scale were statistically significant. Respondents confirmed that these symptoms were noticeable and they considered them as an inevitable part of ageing. Hence, there is an urgency for many more studies using the Greene Climacteric Scale not only in India, but also across the world, to provide better quality of healthcare and support services to women experiencing these symptoms.

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Disclosure statement

Monika Thakur, Dr Maninder Kaur and Professor Anil Kishore Sinha declare that they have no conflicts of interest.

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