**Factors associated with reporting classic menopausal symptoms differ- evidence for not grouping hot flushes and night sweats as “vasomotor symptoms”.**

**Short running title**

Associations with classic menopausal symptoms

O.K. DuffyPhD1, L. Iversen PhD1 and P.C. Hannaford MD1

1Academic Primary Care, Division of Applied Health Sciences, University of Aberdeen.

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Address for correspondence:

 Dr. Lisa Iversen,

Academic Primary Care,

Division of Applied Health Sciences,

Foresterhill,

Aberdeen, AB25 2ZD.

United Kingdom

Tel: +44 (0)1224 437212

E-mail: l.iversen@abdn.ac.uk

**Factors associated with reporting classic menopausal symptoms differ- evidence for not grouping hot flushes and night sweats as “vasomotor symptoms”.**

O.K. Duffy, L. Iversen and P.C. Hannaford

Primary Care, Division of Applied Health Sciences, University of Aberdeen.

**Objective**: To investigate how symptoms experienced in midlife cluster and identify factors independently associated with *hot flushes*, *night sweats*, and *vaginal dryness*.

**Methods**: A questionnaire was sent to 8,206 women aged 45-54 years, recruited from family practices in north east Scotland, UK. Using data collected about 23 symptoms we conducted factor analysis for premenopausal, perimenopausal, postmenopausal and surgically menopausal women. Forward stepwise logistic regression was used to identify socio-demographic, lifestyle and psychological variables independently associated with the classic menopausal symptoms.

**Results**: Overall, 4,407 women responded. *Hot flushes* were experienced by 46.7% (95% CI 45.2-48.2) of women, *night sweats* 46.4% (44.9-47.9) and *vaginal dryness* 28.2% (26.9-29.6). Seven factors including 20 symptoms emerged from factor analysis. *Hot flushes* were associated with: being perimenopausal or postmenopausal; low education; obesity; low social support; reporting night sweats, musculo-skeletal, bloating, menstrual and sexual symptoms; using complementary alternative medicines, lifestyle (e.g. exercising) or psychological management strategies (e.g. talking to family or friends) for menopausal symptoms. *Night sweats* were associated with: lower body weight; smoking; possible depression; reporting sleep difficulties, hot flushes and sexual symptoms; using lifestyle strategies for menopausal symptoms. *Vaginal dryness* was associated with: being postmenopausal; high education; high social support; below average physical health, reporting hot flushes, somatic symptoms and decreased sexual interest; using psychological or lifestyle strategies for menopausal symptoms.

**Conclusion**: It is important to investigate each classic menopausal symptom separately. Combining menopausal symptoms into categories such as vasomotor symptoms may lead to inaccurate conclusions about variables associated with these symptoms.

**Key words**: Community, menopause, hot flushes, night sweats, vaginal dryness

**Introduction**

A number of physical, psychological and somatic symptoms are experienced by women at midlife and attributed to the menopause1. There is much debate as to which symptoms are related to declining levels of oestrogen, and therefore are directly associated with the menopause, and which symptoms occur as a result of the aging process or secondary to *hot flushes* or *night sweats*2-3. Generally, *hot flushes*, *night sweats* and, to a lesser extent, *vaginal dryness* are attributed to the menopausal transition and thus can be considered the classic menopausal symptoms 1-5.

Women will experience symptoms differently depending on socio-demographic, lifestyle, and psychological factors. Evidence from previous research supports the existence of a significant association between socio-economic status6-8, employment9-11, body mass index (BMI)6,8,12-13, exercise 8,10-11, smoking8,10-11,14, history of hysterectomy and/or oophorectomy11,15-16, health related quality of life (HRQOL) 6,17-18 and reporting of classic menopausal symptoms.

Evidence for a relationship between alcohol consumption, educational attainment and the classic menopausal symptoms does not appear to be as strong. Some studies show that alcohol is associated with an increased risk of *hot flushes* and/or *night sweats*11, 19-20, others a decreased risk13, 21, and others have found no association with the classic menopausal symptoms22-23. Similarly, some studies have found that lower levels of educational attainment are associated with an increased risk of *hot flushes* and *night sweats*7,11, whereas others have found no significant associations with the classic menopausal symptoms9, 22-23.

Some studies have suggested a link between the reporting of classic menopausal symptoms and marital status, past medical history, self-rated health, attitudes to menopause, social support and illness perceptions although the number of such studies is small6-8,11,19-20, 23-27. These relationships should be considered when studying the menopause as they may be important determinants in modulating symptom experience 11, 14.

Adding to the complexity of research investigating factors associated with menopausal symptoms is the differing terminology used by investigators. Vasomotor symptoms, climacteric symptoms, hot flushes, hot flashes and night sweats have been used, sometimes interchangeably, to describe symptoms experienced by women during the menopause transition, although the descriptors for the terms can differ28-29. For example, the term vasomotor symptom is most frequently used to encompass *hot flushes* and *night sweats*30-35. However, some studies have included *sleep disturbance* in this term36-37. It also can be difficult to establish which factors are associated with individual classic symptoms, as many studies have combined *hot flushes* and *night sweats*6-7. Combining *hot flushes* and *night sweats* into a single category during analysis may lose some of the richness of the data as associations between socio-demographic, lifestyle and psychological factors, and individual symptoms may differ 20, 38.

Using data collected from 4407 women participating in a cross-sectional community-based survey, we initially investigated how symptoms commonly experienced in midlife cluster. We then determined what socio-demographic, lifestyle and psychological factors were independently associated with reporting *hot flushes*, *night sweats* and *vaginal dryness,* after allowing forsymptom clustering.

**Methods**

In 2009, 16 general (family) practices across north east Scotland randomly sampled just over 500 (to allow for exclusions) women aged 45 to 54 years from their list of registered patients. A general practitioner (GP) in each practice was asked to remove any women they felt it would be inappropriate to contact. The GPs excluded a total of 93 women for reasons unrelated to menopause. A study pack containing an invitation letter signed by the GP, information sheet, consent form, self-completion questionnaire entitled “Women’s Health in Midlife”, and a postage prepaid envelope, was sent to 8,206 eligible women between July and October 2009. Non-respondents were sent an identical study pack three weeks after the initial mailing. The age and socio-economic status (as determined by the Scottish Index of Multiple Deprivation: SIMD39) of all eligible women were obtained from the practice lists to allow comparison of respondents versus non-respondents. Ethical approval for the study was granted from the East of Scotland Research Ethics Service (reference 08-S1401-129).

The questionnaire collected data about age, marital status, educational level, employment status, current height and weight (to allow calculation of BMI), menopausal status, previous hysterectomy and/or ovarian surgery, and other significant medical history. Other items were: a six item version of the Multidimensional Scale of Perceived Social Support (MSPSS)40; the Short Form-12 Health Survey, version 2 (SF-12v2)41; the Hospital Anxiety and Depression Scale (HADS)42; the Attitude Towards Menopause checklist (ATM)43, a symptom checklist, questions about frequency of hot flush and night sweats44; questions relating to social support; a management strategy checklist; and a 14-item version of the Illness Perception Questionnaire-Revised (IPQ-R)45.

The symptom checklist included 23 symptoms commonly experienced around the menopause. Respondents were asked to indicate whether they had experienced each symptom in the last month, and if yes, the level of bother from each symptom experienced and whether they attributed the symptom to the menopause.

**Statistical analysis**

The data were analysed mainly using SPSS (version 17). The age and SIMD of respondents was compared to non-respondents using Mann Whitney U-tests. Frequencies and associated 95% confidence intervals (CIs) for symptoms were calculated using Confidence Interval Analysis version 2.0.046.

In accordance with the staging system of menses recommended by the Stages of Reproductive Aging Workshop (STRAW)47, respondents were classified as: *premenopausal* if they reported that their menstrual periods had not changed in the last few years, *perimenopausal* if they reported that they were experiencing menstrual cycle irregularities but had not gone 12 months in a row without a period, and *postmenopausal* if they had not had a period in the last 12 months. Respondents who reported having had a hysterectomy and/or oopherectomy were classified as having a surgical menopause (*surgically menopausal*). Women who were using the intrauterine system (Mirena), who began HRT whilst still menstruating, who had an endometrial ablation and who had missing data about menstrual periods were regarded as “*unclassifiable*” with respect to menopausal status.

A number of covariates were categorised for subsequent use in the regression models. Education was categorised into: no education or O levels, highers or college qualification, degree or postgraduate qualification. Employment was categorised into: not employed, part-time employment, self-employed, full-time employment. BMI was divided into: <25kg/m2, 25-30kg/m2, >30kg/m2. Smoking status was classified as: never, current, ex-smokers. Alcohol consumption was divided into: <7, 7-14, >14 units per week. Frequency of exercise and strenuous exercise was categorised into: rarely or <once a week, once or 2-3 times a week, 4-6 times a week or every day. Self-assessed health was categorised into: excellent, very good, good, fair or poor (combined). Mental and physical health summary scores from the SF-12v2 were categorised into: ≤median, >median value. Social support from friends, family or a significant other were categorised into: low, moderate, high social support- based on the distribution of scores from the MSPSS. Scores of ≥8 on the anxiety (HADS-A) or depression (HADS-D) subscales of the HADS were used to categorise respondents into those who had a possible case of anxiety or depression, respectively. Attitudes towards menopause were categorised into: positive, neutral, negative. Scores on the illness perceptions scale were categorised according to score-tertiles: high, moderate, low illness perceptions.

Symptom management strategies were categorised into four groups- psychological strategies: currently talking to family and friends, talking to a health professional, relaxation; prescription strategies: currently using HRT, anti-depressants, clonidine, oestrogen creams; complementary alternative medicine (CAM) strategies: currently using herbal remedies, vitamins, acupuncture or reflexology; and lifestyle strategies: avoiding caffeine, wearing cotton clothes, sleeping in a cool room, exercising, using lubricants.

In order to group the data about the 23 symptoms, we first conducted factor analysis for each of the four menopausal groups (premenopausal, perimenopausal, naturally postmenopausal and surgically menopausal). We used the principal components method with varimax rotation48. A factor loading of ≥0.4 was used to determine whether or not individual symptoms belonged to the same underlying factor. Emerging factors with an eigenvalue of ≥1 were retained.

The number and type of factors to emerge from the factor analysis sometimes varied across the different menopausal groups. When this occurred the most common pattern of grouping symptoms was adopted. Thus, a symptom was grouped into a particular factor if it clustered in the same way in two or more menopausal groups. Factors were given names based on the general characteristics of symptoms included in it.

To identify variables associated with the reporting of each of the classic menopausal symptoms, Chi-squared or Mann-Whitney tests were initially carried out to determine statistically significant associations for any of the variables included in the questionnaire. Variables showing a significant association (p<0.05) with any of the classic menopausal symptoms were then entered into forward stepwise logistic regression models to identify the socio-demographic, physical and psychological variables independently associated with the reporting of each of the classic menopausal symptoms.

The factor “*vasomotor symptoms*” was not included in the analysis exploring variables associated with reporting of *hot flushes* or *night sweats* since “*vasomotor symptoms*” comprised of *hot flushes*, *night sweats* and *sleep difficulties*. Similarly, the factor “*sexual symptoms*” was not included in analysis of variables associated with *vaginal dryness*, since this factor comprised of *vaginal dryness* and *decreased sexual interest*. To overcome this issue of overlap, symptoms grouped in the “*vasomotor symptoms*” factor were entered separately in the univariate and multivariate analyses investigating *hot flushes* and *night sweats*. For example,when investigating variables associated with *hot flushes*, *night sweats* and *sleep difficulties* were each entered into the model as single symptoms, with the other symptoms entered into the model in the groups identified by the factor analysis. When investigating *vaginal dryness*, decreased sexual interest was entered into the model as a single symptom, all of the other symptoms were entered as groups determined by factor analysis.

**Results**

The corrected response rate to the postal questionnaire was 55% (4445/8111). After exclusions data were available for 4407 women. Data regarding the prevalence of the 23 symptoms and management strategies employed have been published elsewhere.49

There was no significant difference in the age of respondents (median 49 years, inter quartile range (IQR) 47 to 52) and non-respondents (median 49, IQR 47 to 51), (p=0.44). Respondents were significantly more affluent (median SIMD 4, IQR 3 to 5) than non-respondents (median SIMD 3, IQR 2 to 4), (p<0.001).

Roughly two fifths of the respondents had three or more pregnancies (40%) and two children (43%, Table 1). Most of the sample (78%) was married or cohabiting; 11% were divorced or separated. Almost a third of respondents were educated to degree level (29%), or secondary school level (26%). Nearly half of the women were in full time paid employment (49%).

A quarter of the respondents were premenopausal; 28% perimenopausal; 22% postmenopausal; 14% surgically menopausal; and 12% “unclassifiable”. The median age at natural menopause was 48.0 years (IQR 45.0 to 50.0; data not shown). *Hot flushes*, *night sweats*, and *vaginal dryness* was experienced by 46.7% (95% CI 45.2 to 48.2), 46.4% (95% CI 44.9 to 47.9) and 28.2% (95% CI 26.9 to 29.6) of women, respectively49.

***Factor analysis of symptoms***

Twenty symptoms reached the cut off point of ≥0.4 for inclusion in the factor analysis. Seven factors emerged. The first factor comprised of high scores on psychological symptoms and explained 11% of the variance. Six other factors explained, in roughly equal proportions, a further 37% of the variance: sexual difficulties; general somatic; vasomotor; musclo-skeletal; menstrual and bloating symptoms.

Table 2 shows that when examining the clustering of symptoms across the different menopausal groups 20 out of 23 symptoms showed consistency in the seven common factors i.e. the symptom contributed to a particular factor in at least two of the four menopause groups. *Memory loss*, *skin problems* and *tiredness* failed to show consistency.

***Variables independently associated with hot flushes, night sweats and vaginal dryness***

Numerous variables showed a significant univariate association with the classic menopausal symptoms. Older women; perimenopausal, postmenopausal and surgically menopausal respondents, those reporting >1 pregnancies; current and ex-smokers; women with a BMI ≥30kg/m2; those who reported being bothered by their menstrual periods in the past; those rating their self-assessed health as less than excellent; women with low physical health and mental health SF-12v2 summary scores; women with possible anxiety or depression; those with good social support from a significant other; women reporting a history or presence of rheumatic troubles or arthritis, osteoporosis, high blood pressure, chronic bronchitis or COPD, stomach or digestive problems, cancer, mental health problems; women reporting psychological, somatic, musculo-skeletal, sexual, vasomotor or bloating symptoms in the last month; those who perceived their symptoms as having high consequences on their lives, and those using CAMs, lifestyle strategies, prescription drugs and psychological strategies for managing menopausal symptoms were all more likely to report *hot flushes*, *night sweats* and/or *vaginal dryness* (data not shown: a table of univariate associations can be obtained by contacting the authors). In contrast, respondents with high levels of education and social support from friends and family, those in employment and those with positive attitudes towards menopause were less likely to report these symptoms.

After adjustment for the covariates that were significant in the univariate analysis, perimenopausal respondents were significantly more likely to report *hot flushes* than their reference group, as were: postmenopausal and surgically menopausal respondents; those with a BMI of ≥30kg/m2; those who reported experiencing two musculo-skeletal, two bloating, two menstrual symptoms, or two sexual symptoms; those with night sweats; and those using CAM, lifestyle or psychological strategies to manage their symptoms (Table 3). In contrast, women with a degree or postgraduate level of education were significantly less likely to report *hot flushes*, as were women with moderate levels of social support from their friends.

Respondents who were current smokers were significantly more likely to report *night sweats* than their reference group, as were: those with possible depression; those reporting one or two sexual symptoms, sleep difficulties or hot flushes; and those using lifestyle strategies to manage their symptoms. In contrast, women with a BMI ≥30kg/m2 were less likely to report *night sweats* than those in the reference group (BMI of < 25kg/m2).

Respondents who were postmenopausal were significantly more likely to report *vaginal dryness* than their reference group, as were: surgically menopausal respondents; those with higher/college or; degree/postgraduate qualifications; those with a SF-12v2 physical health summary score below the median; women with moderate or high levels of social support from a significant other; women reporting somatic symptoms, hot flushes or decreased sexual interest; and those using lifestyle or psychological strategies to manage their symptoms.

Box 1 summarises the variables shown to be independently associated with *hot flushes*, *night sweats* and *vaginal dryness*. Although the variables differed depending on which symptom was being investigated, some similarities emerged. For example, being postmenopausal or surgically menopausal was associated with *hot flushes* and *vaginal dryness*; reporting sexual symptoms were associated with both *hot flushes* and *night sweats*; *hot flushes* was associated with both *night sweats* and *vaginal dryness*; and using lifestyle strategies to manage symptoms was associated with all of the classic symptoms. In contrast, a high BMI was associated with being more likely to report *hot flushes*,but less likely to report *night sweats*. Similarly, social support from friends was associated with a decreased likelihood of reporting *hot flushes*, whilst social support from a significant other was associated with increased likelihood of reporting *vaginal dryness*.

**Discussion**

Results from this cross-sectional community based survey identified a number of modifiable variables such as current smoking, BMI and social support, associated with women experiencing one or more of the classic menopausal symptoms. We found that although *hot flushes* and *night sweats* clustered together in the factor analysis (labelled as vasomotor symptoms), variables independently associated with each symptom varied depending on the symptom investigated. Similarly, variables associated with *vaginal dryness*, also a symptom of oestrogen decline, differed from those of *hot flushes* and *night sweats*.

***Menopausal status***

We found that menopausal status was independently associated with the reporting of *hot flushes* and *vaginal dryness*, but not *night sweats*. Perimenopausal, postmenopausal and surgically menopausal women were all more likely to report *hot flushes* than premenopausal women. In contrast, only postmenopausal and surgically menopausal respondents were more likely to report *vaginal dryness*. Although during the first phase of the Study of Women’s Health Across the Nation (SWAN)8 over half of the participants were premenopausal or in early perimenopause, both early and late perimenopausal women together with postmenopausal and surgically menopausal women were more likely to report *vaginal dryness*. However, Dennerstein and colleagues found that the prevalence of vaginal dryness increased exponentially with time from the late perimenopause suggesting that this symptom was a later consequence of hormonal changes occurring during the menopause transition.50 Our findings concur with this theory. A narrative literature review of 12 community-based longitudinal studies found the peak prevalence of *hot flushes* to be during the late perimenopause and early postmenopause period, and the peak prevalence of *vaginal dryness* in the postmenopause period51. A meta-analysis of 10 studies found that vasomotor symptoms (*hot flushes* and *night sweats* combined) peaked approximately one year after final menstrual period33. However, few studies have investigated the association between *night sweats* and menopausal status.

***Socio-demographic characteristics***

Whilst it has been reported that women in full-time employment may be less likely to experience the classic menopausal symptoms, compared to those who are unemployed or in part-time employment9-11, in accordance with the SWAN 8 we did not find a significant relationship between employment and the classic menopausal symptoms.

In our study, women with a high level of educational attainment were significantly less likely to report *hot flushes*,compared to women with low educational attainment. In contrast, women with moderate or high level of educational attainment were more likely to report *vaginal dryness*. Although others have suggested an association between *hot flushes* and educational attainment7, 11, 36, we have been unable to identify other studies that have found a significant relationship between high educational attainment and reporting of *vaginal dryness*.

***Lifestyle***

Two conflicting theories have been used to explain a possible relationship between BMI and *hot flushes* or *night sweats*. The “thin hypothesis” proposes that women with a higher body weight have a reduced risk of experiencing vasomotor symptoms because they have higher oestrogen concentrations (produced in adipose tissue) than lighter women38. In contrast, the “thermoregulatory model” proposes that adipose tissue acts as an insulator preventing heat dissipation, so heavier women might experience more *hot flushes* and/or *night sweats* than lighter women52. The relationship between BMI and these symptoms in our study was conflicting. A high BMI (≥30kg/m2) was associated with women being more likely to report *hot flushes*, thereby supporting the “thermoregulatory model” 6, 12-13, 16,23,31,38. On the other hand, a high BMI was associated with a reduced likelihood of reporting *night sweats*, supporting the “thin hypothesis” 53. Similar to other studies, no significant association was found between *vaginal dryness* and BMI 8, 11, 23.

Similar to Gallicchio and colleagues23, we failed to find a significant relationship between exercise and the classic menopausal symptoms. Neither, like some others, did we find an association between alcohol consumption and *hot flushes*, *night sweats*22 or *vaginal dryness*11,23.

In general previous studies have suggested a significant association between past and current smoking and the reporting of: *hot flushes*10, 11, 14; *hot flushes* or *night sweats*8; and *hot flushes*, *night sweats* or *sleep difficulties*36. In our study, current smoking was only associated with *night sweats.*

***Experience of other symptoms***

Previous studies have often failed to investigate the relationship between menopausal symptoms and other symptoms7-8,13-14,16,23,27. Furthermore, few studies have looked at the relationship between experiencing one classic menopausal symptom and the reporting of another. In our study women experiencing bloating, musculo-skeletal, menstrual and sexual symptoms, or night sweats, were more likely to report *hot flushes* than women not experiencing these symptoms. Similarly, women experiencing sexual symptoms, sleep difficulties or hot flushes were more likely to report *night sweats*;and women experiencing decreased sexual interest, somatic symptoms, or hot flushes were more likely to report *vaginal dryness*.

***Anxiety and depression***

Some studies have shown that anxiety and depression scores are significantly higher in women reporting *hot flushes*, compared with those not doing so54-55. Others have found no significant association between *hot flushes*, *night sweats* and depression56. In our study, we only observed an association between possibly having depression and *night sweats*.

***Attitudes towards menopause***

Previous studies have shown an association between negative attitudes to the menopause and increased reporting of menopausal symptoms 26, 57-59. We did not find this to be the case in our multivariate analysis.

***Social support***

The role of social support in symptom experience appears complex. We found that good social support from friends was associated with a decreased likelihood of reporting *hot flushes*, whilst good social support from a significant other was associated with an increased likelihood of reporting *vaginal dryness*. Although the evidence base for social support and menopausal symptoms is thin, other studies have suggested an association between good social support and a decreased likelihood of reporting *hot flushes* and menopausal complaints19, 60. We have not identified any other study that has found an association between good levels of social support from a significant other and increased reporting of *vaginal dryness*. It may be that the significant other of our respondents was a sexual partner, leading women to be more aware of *vaginal dryness*.

***Illness perceptions***

Studies have shown that lower perceived levels of control, higher self-rated levels of distress and negative beliefs are associated with increased likelihood of reporting *hot flushes*26-27. After adjustment, the illness perceptions of participants in our study were not associated with any of the classic menopausal symptoms.

***HRQOL***

We found that below average physical health was independently associated with an increased likelihood of reporting *vaginal dryness*. In contrast to our findings, a significant association between impaired function in the vitality domain (a component of the mental health domain) and increased reporting of *vaginal dryness* was reported in the Study of Women’s health Across the Nation (SWAN) 17. We have not been able to replicate the findings of others studies reporting a significant independent association between HRQOL and *hot flushes* or *night sweats* 6, 17-18.

***Management strategies***

Studies of management strategies used to treat menopause symptoms tend to focus on the prevalence of use of individual approaches61-62, or on lifestyle and socio-demographic factors associated with the use of each management strategy63-64. Few studies have looked at the relationship between the reporting of classic menopausal symptoms and management strategies used. In our study, *hot flushes* were independently associated with greater use of CAM, lifestyle and psychological strategies to manage menopause attributed symptoms. *Night sweats* was independently associated with use of lifestyle strategies; and *vaginal dryness* with use of psychological and lifestyle strategies. Similar to our findings, a telephone survey in the US found that *hot flushes* were associated with an increased likelihood of alternative therapy use, but not *night sweats*65. No statistically significant associations were found between the reporting of vasomotor symptoms and use of herbal remedies in the SWAN study66.

***Methodological strengths and weaknesses***

Response bias may have occurred in our study as respondents were significantly more affluent than non-respondents. Studies have suggested that socio-economic status is associated with symptom reporting, with women from lower socio-economic groups experiencing more menopausal symptoms6-8. It could be possible, therefore, that women experiencing a greater number of symptoms may have been under represented in our study.

One of the main strengths of our study was the community sample. Results from this study are more likely to be representative of women living in Scotland than those using samples from healthcare settings, such as gynaecological clinics67-69. However, we acknowledge that a higher proportion of respondents had degree level or professional qualifications than would be expected in the north east of Scotland (39% vs. 20%)70 and the proportion of respondents with an overweight, obese or morbidly obese BMI was lower than found among similarly aged women in the 2010 Scottish Health Survey (56% vs. 68%)71 which may limit the generalisability of our findings. A strength of the study was its size, giving greater power to the statistical tests, especially in different menopausal subgroups.

Symptom grouping (cluster analysis) has been carried out in other studies investigating the menopause36, 72-74 and has been advocated as a more robust method than grouping symptoms into arbitrary categories for subsequent analysis75. Another strength of our study was the separate analyses of factors associated with *hot flushes*, *night sweats* and *vaginal dryness*. Although factors analysis showed that *hot flushes* and *night sweats* contributed to the same factor, and numerous studies have explored variables associated with the reporting of vasomotor symptoms6-8, 36, other studies have shown that variables associated with *hot flushes* and *nights sweats* differ when symptoms are examined individually20, 38. Our results provide a further caution against the combining of menopausal symptoms into a single category such as “vasomotor symptom”.

Our study adds to the few studies have looked at variables associated with the reporting of *vaginal dryness*8, 11, 23, 76-77.

A limitation of our work is the cross-sectional nature of the survey. Whilst it was possible to investigate different patterns of associations, the temporal sequence of cause and effect could not be established. Although a wide range of socio-demographic, physical and psychological variables were assessed in the questionnaire, some, such as diet and ethnicity, were not because of space constraints. Some of the associations, therefore, may be due to residual confounding. A further limitation was the investigation of numerous variables, making the study prone to type I error.

**Conclusion**

We have demonstrated that whilst *hot flushes* and *night sweats* cluster, the socio-demographic, lifestyle and psychological variables independently associated with these symptoms vary. This study highlights the importance of investigating each of the classic menopausal symptoms separately. Combining symptoms into categories such as vasomotor symptoms may lead to inaccurate conclusions about variables associated with the underlying symptoms. Our results also suggest that a single approach to managing menopausal symptoms is unlikely to be successful.

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**Table 1. Socio-demographic characteristics of respondents**

|  |  |  |
| --- | --- | --- |
| **Characteristic** | **n** | **(%)[[1]](#footnote-1)** |
| Age (N = 4407) |   |  |
| 45 | 400 | (9.1) |
|  46 | 496 | (11.3) |
| 47 | 464 | (10.5) |
| 48 | 464 | (10.5) |
| 49 | 463 | (10.5) |
| 50 | 511 | (11.6) |
| 51 | 497 | (11.2) |
| 52 | 501 | (11.4) |
| 53 | 474 | (10.8) |
| 54 | 137 | (3.1) |
|  |  |  |
| Number of pregnancies (N = 4217) |  |  |
| 0 | 600 | (14.2)  |
| 1 | 488 | (11.6) |
| 2 | 1443 | (34.2) |
| ≥3 | 1686 | (40.0) |
|  |  |  |
| Number of children (N = 4314) |  |  |
| 0 | 732 | (17.0) |
| 1 | 618 | (14.3) |
| 2 | 1847 | (42.8) |
| ≥3 | 1117 | (25.9) |
|  |  |  |
| Marital status (N = 4369) |  |  |
| Single | 243 | (5.6) |
| Partner, not living together | 128 | (2.9) |
| Married / cohabiting | 3421 | (78.3) |
| Divorced / separated | 498 | (11.4) |
| Widowed | 79 | (1.8) |
|  |  |  |
| Body Mass Index (BMI), kg/m2 (N= 4111) |  |  |
| <18.5 (Underweight) | 48  | (1.2) |
| 18.5-24.9 (Normal weight) | 1756 | (42.7) |
| 25.0 -29.9 (Overweight) | 1319 | (32.1) |
| ≥30.0 (Obese) | 988 | (24.0) |

**Table 1. (cont.) Socio-demographic characteristics of respondents**

|  |  |  |
| --- | --- | --- |
| **Characteristic** | **n** | **(%)[[2]](#footnote-2)** |
| Educational attainment (N= 4338) |  |  |
| No educational qualifications | 525 | (12.1) |
| ‘O’ Grade / ‘O’ Level / Standard Grade | 1132 | (26.1) |
| Higher / ‘A’ Level / National Grade | 728 | (16.8) |
| College qualification | 262 | (6.0) |
| Degree / professional qualification | 1248 | (28.8) |
| Post-graduate qualification | 443 | (10.2) |
|  |  |  |
| Employment status (N= 4372) |  |  |
| Full-time job (≥30 hrs a week) | 2132 | (48.8) |
| Part-time job (<30 hrs a week) | 1251 | (28.6) |
| Self-employed | 299 | (6.8) |
| Unable to work owing to illness or disability | 225 | (5.1) |
| Not in paid employment | 465 | (10.6) |
| Unemployed and looking for work | 84 | (1.9) |
| At home and not looking for paid employment | 283 | (6.5) |
| Carer | 48 | (1.1) |
| Volunteer | 13 | (0.3) |
| Student | 13 | (0.3) |
| Retired | 24 | (0.5) |
|  |  |  |
| Menopause status (N=4407) |  |  |
| Premenopausal | 1101 | (25.0) |
| Perimenopausal | 1225 | (27.8) |
| Postmenopausal | 955 | (21.7) |
| Surgical | 617 | (14.0) |
| Unclassifiable[[3]](#footnote-3) | 509 | (11.5) |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symptom | Psychological symptoms | General somatic symptoms | Vasomotor symptoms | Musclo-skeletal symptoms | Menstrual symptoms | Sexual symptoms | Bloating symptoms |
| Pr | Pe | Po | S | Pr | Pe | Po | S | Pr | Pe | Po | S | Pr | Pe | Po | S | Pr | Pe | Po | S | Pr | Pe | Po | S | Pr | Pe | Po | S |
| Depression | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tearfulness | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mood swings | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Anxiety | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Memory loss |  |  |  | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Breathlessness |  |  |  |  | \* |  |  | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* |  |  |
| Passing urine> frequently |  |  |  |  | \* |  |  | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Increased weight |  |  |  |  |  |  |  | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* | \* | \* |  |
| Headaches/migraine |  |  |  |  |  | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dizziness |  |  |  |  | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Leakage of urine |  |  |  |  | \* |  |  | \* |  |  |  |  |  |  |  |  |  |  |  |  |  | \* |  |  |  |  |  |  |
| Night sweats |  |  |  |  |  |  |  |  | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hot flushes |  |  |  |  |  |  |  |  | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Stiff joints |  |  |  |  |  |  |  |  |  |  |  |  | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |
| Aches and pains |  |  |  |  |  |  |  |  |  |  |  |  | \* | \* | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |
| Irregular periods |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* | \* | \* |  |  |  |  |  |  |  |  |
| Heavy periods |  |  |  |  |  |  |  |  | \* |  |  |  |  |  |  |  |  | \* | \* | \* |  |  |  |  |  |  |  |  |
| Vaginal dryness |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* | \* | \* | \* |  |  |  |  |
| Decreased sexual interest |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* | \* | \* | \* |  |  |  |  |
| Skin problems |  |  |  |  |  |  | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tiredness |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* |  |  |  |  |  |  |  |  |  |  |  |  | \* |
| Sleep difficulties | \* |  |  |  |  |  |  |  |  | \* | \* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* |
| Feeling bloated |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \* | \* | \* | \* |
| Pr= premenopausal women; Pe= perimenopausal women; Po= postmenopausal women; S= surgically menopausal women |

**Table 2**. **Factor analysis of symptoms common to all menopausal groups**

Table 3. Factors independently associated with the reporting of classic menopausal symptoms (N=4407)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Hot flushes** |  | **Night sweats** |  | **Vaginal dryness** |
| **Factors investigated** | **n[[4]](#footnote-4)**  | **Adjusted ORs****(95% CI)** |  | **n1**  | **Adjusted ORs****(95% CI)** |  | **n1** | **Adjusted ORs****(95% CI)** |
| **Menopausal status** |  |  |  |  |  |  |  |  |
| Premenopausal2 | 818  | 1.00 |  | - | - |  | 818 | 1.00 |
| Perimenopausal | 891 | 3.18 (2.29 to 4.43) |  | - | - |  | 891 | 1.16 (0.86 to 1.55) |
| Postmenopausal | 635  | 7.32 (4.91 to 10.89) |  | - | - |  | 635 | 2.16 (1.60 to 2.91) |
| Surgically menopausal | 376  | 4.87 (3.23 to 7.34) |  | - | - |  | 376 | 1.72 (1.22 to 2.41) |
|  |  |  |  |  |  |  |  |  |
| **Educational attainment** |  |  |  |  |  |  |  |  |
| No education/ O levels2 | 952 | 1.00 |  | - | - |  | 952 | 1.00 |
| Highers/ college qualification | 631  | 0.83 (0.64 to 1.10) |  | - | - |  | 631 | 1.38 (1.06 to 1.78) |
| Degree/ postgraduate qualification | 1137  | 0.63 (0.49 to 0.82) |  | - | - |  | 1137 | 1.28 (1.02 to 1.60) |
|  |  |  |  |  |  |  |  |  |
| **Body Mass Index (BMI), kg/m2** |  |  |  |  |  |  |  |  |
| <252 (Underweight & normal weight) | 1216  | 1.00 |  | 1216 | 1.00 |  | - | - |
| 25 to 30 (Overweight) | 870 | 1.19 (0.92 to 1.54) |  | 870  | 0.88 (0.69 to 1.11) |  | - | - |
| >30 (Obese) | 634  | 1.45 (1.09 to 1.92) |  | 634 | 0.64 (0.49 to 0.84) |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Smoking status** |  |  |  |  |  |  |  |  |
| Never2 | - | - |  | 1583  | 1.00 |  | - | - |
| Current | - | - |  | 492  | 1.49 (1.13 to 1.97) |  | - | - |
| Ex | - | - |  | 645  | 0.91 (0.71 to 1.67) |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Depression** |  |  |  |  |  |  |  |  |
| Absence2 | - | - |  | 2007  | 1.00 |  | - | - |
| Possible presence | - | - |  | 713  | 1.31 (1.03 to 1.67) |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Physical health summary score** |  |  |  |  |  |  |  |  |
| Above the median2 | - | - |  | - | - |  | 1405 | 1.00 |
| Below the median | - | - |  | - | - |  | 1315 | 1.31 (1.03 to 1.65) |
|  |  |  |  |  |  |  |  |  |
| **Perceived level of social support from friends** |  |  |  |  |  |  |  |  |
| Low2 | 495  | 1.00 |  | - | - |  | - | - |
| Moderate | 727 | 0.68 (0.49 to 0.94) |  | - | - |  | - | - |
| High | 1498  | 0.93 (0.70 to 1.24) |  | - | - |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Perceived level of social support from significant other** |  |  |  |  |  |  |  |  |
| Low2 | - | - |  | - | - |  | 488 | 1.00 |
| Moderate | - | - |  | - | - |  | 403 | 1.78 (1.25 to 2.56) |
| High | - | - |  | - | - |  | 1829 | 1.58 (1.17 to 2.14) |
|  |  |  |  |  |  |  |  |  |
| **Reporting somatic symptoms** |  |  |  |  |  |  |  |  |
| 0 symptoms2 | - | - |  | - | - |  | 724 | 1.00 |
| 1 symptom | - | - |  | - | - |  | 855 | 1.40 (1.06 to 1.84) |
| 2 symptoms | - | - |  | - | - |  | 597 | 1.36 (1.01 to 1.84) |
| 3 symptoms | - | - |  | - | - |  | 333 | 1.09 (0.77 to 1.55) |
| 4 symptoms | - | - |  | - | - |  | 147 | 1.82 (1.17 to 2.84) |
| 5 symptoms | - | - |  | - | - |  | 64 | 2.78 (1.49 to 5.19) |
|  |  |  |  |  |  |  |  |  |
| **Reporting musculo-skeletal symptoms** |  |  |  |  |  |  |  |  |
| 0 symptoms2 | 708  | 1.00 |  | - | - |  | - | - |
| 1 symptom | 692  | 1.32 (0.97 to 1.78) |  | - | - |  | - | - |
| 2 symptoms | 1320 | 1.61 (1.22 to 2.12) |  | - | - |  | - | - |
| **Reporting bloating symptoms** |  |  |  |  |  |  |  |  |
| 0 symptoms2 | 912  | 1.00 |  | - | - |  | - | - |
| 1 symptom | 999  | 0.88 (0.67 to 1.13) |  | - | - |   | - | - |
| 2 symptom | 809  | 1.36 (1.02 to 1.81) |  | - | - |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Reporting menstrual symptoms** |  |  |  |  |  |  |  |  |
| 0 symptoms2 | 1552  | 1.00 |  | - | - |  | - | - |
| 1 symptom | 748  | 1.41 (0.93 to 2.14) |  | - | - |  | - | - |
| 2 symptom | 420  | 1.71 (1.20 to 2.43) |  | - | - |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Reporting sexual symptoms** |  |  |  |  |  |  |  |  |
| 0 symptoms2 | 1385  | 1.00 |  | 1385  | 1.00 |  | - | - |
| 1 symptom | 815  | 0.97 (0.76 to 1.25) |  | 815  | 1.56 (1.23 to 1.97) |  | - | - |
| 2 symptom | 520  | 1.49 (1.10 to 2.02) |  | 520 | 1.49 (1.12 to 1.99) |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Reporting sleep difficulties** |  |  |  |  |  |  |  |  |
| No2 | - | - |  | 1056 | 1.00 |  | - | - |
| Yes | - | - |  | 1664 | 2.58 (2.08 to 3.20) |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Reporting night sweats** |  |  |  |  |  |  |  |  |
| No2 | 1489  | 1.00 |  | - | - |  | - | - |
| Yes | 1231 | 12.20 (9.75 to 15.27) |  | - | - |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Reporting hot flushes** |  |  |  |  |  |  |  |  |
| No2 | - | - |  | 1487  | 1.00 |  | 1487 | 1.00 |
| Yes | - | - |  | 1233  | 12.13 (9.72 to 15.14) |  | 1233 | 1.31 (1.05 to 1.64) |
|  |  |  |  |  |  |  |  |  |
| **Reporting decreased sexual interest** |  |  |  |  |  |  |  |  |
| No2 | - | - |  | - | - |  | 1579 | 1.00 |
| Yes | - | - |  | - | - |  | 1141 | 4.59 (3.73 to 5.65) |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Use of CAM for managing symptoms attributed to the menopause** |  |  |  |  |  |  |  |  |
| Not currently using2 | 2215  | 1.00 |  | - | - |  | - | - |
| Currently using | 505 | 1.53 (1.13 to 2.07) |  | - | - |  | - | - |
|  |  |  |  |  |  |  |  |  |
| **Use of lifestyle strategies for managing symptoms attributed to the menopause** |  |  |  |  |  |  |  |  |
| Not currently using2 | 1608  | 1.00 |  | 1608  | 1.00 |  | 1608 | 1.00 |
| Currently using | 1112 | 1.47 (1.13 to 1.92) |  | 1112  | 3.04 (2.45 to 3.78) |  | 1112 | 1.71 (1.34 to 2.17) |
|  |  |  |  |  |  |  |  |  |
| **Use of psychological strategies for managing symptoms attributed to the menopause** |  |  |  |  |  |  |  |  |
| Not currently using2 | 1760  | 1.00 |  | - | - |  | 1760 | 1.00 |
| Currently using | 960  | 1.99 (1.53 to 2.60) |  | - | - |  | 960 | 1.28 (1.01 to 1.63) |

1 Excludes women with missing information

2 Reference group

Box 1. Summary of factors independently associated with an increased [↑] or decreased [↓] chance of reporting hot flushes, night sweats and vaginal dryness

|  |  |  |
| --- | --- | --- |
| **Hot flushes** | **Night sweats** | **Vaginal dryness** |
| * ↑ Being perimenopausal, postmenopausal or surgically menopausal
* ↑ Having a BMI of ≥30kg/m2 (obese)
* ↑ Reporting two musculoskeletal, two bloating, two menstrual or two sexual symptoms
* ↑ Reporting night sweats
* ↑ Currently using a CAM, lifestyle or psychological strategy to manage symptoms attributed to the menopause
* ↓ Having good social support from friends
* ↓ Having a high level of educational attainment (degree or postgraduate qualification)
 | * ↑ Being a smoker
* ↑ Possibly having depression
* ↑Reporting one or two sexual symptoms
* ↑ Reporting hot flushes
* ↑Reporting sleep difficulties
* ↑ Currently using a lifestyle strategy to manage symptoms attributed to the menopause
* ↓ Having a BMI of ≥30kg/m2 (obese)
 | * ↑ Being postmenopausal or surgically menopausal
* ↑Reporting a moderate or high level of education(higher/college, or degree/postgraduate qualifications)
* ↑ Having good social support from a significant other
* ↑Below median physical health
* ↑ Reporting one, two, four or five somatic symptoms
* ↑ Reporting hot flushes
* ↑Reporting decreased sexual interest
* ↑ Currently using a lifestyle or psychological strategy to manage symptoms attributed to the menopause
 |

1. Denominator excludes women with missing data [↑](#footnote-ref-1)
2. Denominator excludes women with missing data [↑](#footnote-ref-2)
3. Mirena users; women who began HRT whilst still menstruating; those who have had an endometrial ablation; missing data [↑](#footnote-ref-3)
4. [↑](#footnote-ref-4)