BMJ Open

Sociodemographic differences in symptom severity and duration amongst women referred to secondary care for menorrhagia in England and Wales: a cohort study from the National Heavy Menstrual Bleeding Audit

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-018444
Article Type:	Research
Date Submitted by the Author:	29-Jun-2017
Complete List of Authors:	Kiran, Amit; London School of Hygiene & Tropical Medicine, Department of Health Services Research and Policy Geary, Rebecca; London School of Hygiene and Tropical Medicine Faculty of Public Health and Policy, Department of Health Services Research and Policy Gurol Urganci, Ipek; London School of Hygiene & Tropical Medicine, Health Services Research & Policy Cromwell, David; London School of Hygiene & Tropical Medicine, Health Services Research & Policy Bansi-Matharu, Loveleen; University College London, Institute for Global Health Shakespeare, Judy; Royal College of General Practitioners Mahmood, Tahir; Forth Park Hospital, Obstetrics and Gynaecology van der Meulen, Jan; London School of Hygiene and Tropical Medicine
Primary Subject Heading:	Obstetrics and gynaecology
Secondary Subject Heading:	Health services research, Patient-centred medicine
Keywords:	GYNAECOLOGY, EPIDEMIOLOGY, PRIMARY CARE

Sociodemographic differences in symptom severity and duration amongst women referred to secondary care for menorrhagia in England and Wales: a cohort study from the National Heavy Menstrual Bleeding Audit

Kiran A[1,2,ƚ], Geary RS[1,2,ƚ], Gurol-Urganci I[1,2], Cromwell DA[1,2], Bansi-Matharu L[3], Shakespeare J[4], Mahmood T[2], van der Meulen J[1,2]

[1]Department of Health Services Research and Policy, London School of Hygiene & Tropical Medicine, London, UK
[2]Lindsay Stewart Centre for Audit and Clinical Informatics, Royal College of Obstetricians and Gynaecologists, London, UK
[3]Institute of Epidemiology & Health, University College London, London, UK
[4]Royal College of General Practitioners, London, UK

ƚ A Kiran and RS Geary contributed equally to this paper

Corresponding author: Rebecca Geary, 15-17 Tavistock Place, London School of Hygiene & Tropical Medicine, London, WC1H 9SH. Email: rebecca.geary@lshtm.ac.uk Telephone: 02079272279

ABSTRACT

Objective To examine symptom severity and duration at time of referral to secondary care for heavy menstrual bleeding by socio-economic deprivation, age and ethnicity

Design Cohort analysis of data from the National Heavy Menstrual Bleeding Audit linked to Hospital Episode Statistics data

Setting English and Welsh National Health Services (secondary care): February 2011 to January 2012

Participants 15,325 women aged 18 to 60 years in England and Wales who had a new referral for heavy menstrual bleeding to a gynaecology outpatient department

Methods Multivariable linear regression to calculate adjusted differences in mean symptom severity and quality of life scores at first outpatient visit. Multivariable logistic regression to calculate adjusted odds ratios. Adjustment for body mass index, parity and co-morbidities.

Primary Outcome Measures Mean symptom severity score (0=best, 100=worst), mean condition-specific quality of life score (0=worst, 100=best) and symptom duration (≥1 year).

Results Women were on average 42 years old and 12% were non-white. Mean symptom severity and condition-specific quality of life scores were 61.8 and 34.7. Almost three-quarters of women (74%) reported having had symptoms for ≥1 year. Women from more deprived areas had more severe symptoms at their first outpatient visit (difference -6.1; 95%CI-7.2:-4.9, between least and most deprived quintile) and worse condition-specific quality of life (difference 6.3; 95%CI 5.1:7.5). Symptom severity declined with age whilst quality of life improved.

Conclusions Women living in more deprived areas reported more severe HMB symptoms and poorer quality of life at the start of treatment in secondary care. Providers should examine referral practices to explore if these differences reflect women's health-seeking behaviour or how providers decide whether or not to refer.

Funding The National Heavy Menstrual Bleeding (HMB) Audit was funded by the Healthcare Quality Improvement Partnership as part of the National Clinical Audit and Patient Outcomes Programme, contract number HQIP NCA 004.

Keywords heavy menstrual bleeding, deprivation, ethnicity, health inequalities, patient-reported outcomes, quality of life

Tweetable abstract Women from deprived areas referred with more severe heavy menstrual bleeding, potentially reflecting inequity

Strengths and limitations of this study

- This study is the first to examine Heavy Menstrual Bleeding symptom severity and duration at time of referral to secondary care
- The inclusion of patient-reported symptom severity and quality of life addresses a knowledge gap about how women feel about their heavy menstrual bleeding
- As the data were collected by a national audit in England and Wales the sample is relatively large, allowing comparisons between ethnic minority groups
- Even though the sample size is large, the National HMB Audit recruited approximately 30% of eligible women. However, the characteristics of the women recruited were broadly representative of the UK population in terms of ethnicity and age
- Linking audit data to administrative hospital data also allowed comparisons between socioeconomic groups

INTRODUCTION

Heavy menstrual bleeding (HMB) is a common condition that affects one in four women of reproductive age. In England and Wales, an estimated 50,000 women with HMB are referred to secondary care provided by the National Health Service (NHS) every year[1]. Menstrual disorders account for approximately 20% of referrals to specialist gynaecology services[2] and studies have found significant regional variations in use of surgical treatment within England[3].

Women with HMB have significantly worse quality of life than women with normal menstrual bleeding loss, in terms of their physical and mental health, as well as their emotional, social and material quality of life[4-7]. More than a third of women with HMB report severe pain[7]. HMB is also associated with morbidity, including anaemia and related fatigue[8, 9]. Women with HMB experience reduced participation in social activities and their personal relationships and attendance at work can be adversely affected[10].

In order to improve the quality of life of women with HMB, it is important to understand both the aetiology of this condition and its management in primary and secondary care[11]. The prevalence of HMB and conditions which affect symptom severity has been reported to vary by ethnicity[12-15]. In addition, cultural norms and patient choice for treatment may vary between different groups[16, 17].

In this study, we used data from the National HMB Audit to examine symptom severity, quality of life and symptom duration at women's first gynaecology outpatient visit for HMB. The National HMB Audit was a 4-year project (2010 - 2014) that assessed patient-reported outcomes and experiences of care for women with HMB in England and Wales. Our objective is to examine symptom severity and duration at the time of referral to secondary care by age, ethnicity and socio-economic deprivation to get a better understanding of the burden of disease at the start of treatment in secondary care.

METHODS

Data collection

Full details of the methods used in the National HMB Audit have been reported elsewhere[1, 4, 18, 19]. Women aged between 18 and 60 years in England and Wales who had a new referral for HMB to a gynaecology outpatient department were eligible to participate in the National HMB Audit. Women who had visited a gynaecology outpatient clinic for HMB within the previous 12 months were excluded. Recruitment took place between 1 February 2011 and 31 January 2012[1, 19].

Women who consented to participate completed a baseline questionnaire (58 questions) on age, ethnicity, duration of HMB symptoms, obstetric history, prior treatment received for HMB and co-morbidities. The questionnaire also collected patient-reported HMB-specific and generic quality of life measures. Scores for symptom severity and condition-specific health-related quality of life were adapted from the Uterine Fibroid Symptom and Quality of Life (UFS-QoL) questionnaire[20]. A generic health-related quality of life measure was derived from the EuroQol-5 (EQ-5D)[21]. Women completed the questionnaire in hospital before their consultation. Using multiple sources of data, the recruitment rate of the audit was estimated to be 31.9%[1]. Descriptive results from the National HMB Audit have been published elsewhere[1, 4, 18, 19].

Data from the prospective audit were linked at patient level to records from Hospital Episode Statistics (HES) and Patient Episode Database for Wales (PEDW), administrative databases that capture all inpatient and outpatient episodes in English and Welsh NHS hospitals. Data linkage was performed using deterministic linkage criteria that included NHS number, sex and date of birth.

Measures

Symptom severity, condition-specific quality of life and generic quality of life scores and the reported duration of symptoms at the first outpatient visit were used as outcomes in this study. The severity and quality of life scores were analysed as continuous variables. Symptom severity scores ranged from 0 (best possible score) to 100 (greatest symptom severity, worst possible score). Condition-specific quality of life ranged from 0 (poorest quality of life) to 100 (best quality of life). Generic quality of life is expressed on a scale with 0 representing death and 1 perfect health[22]. Women were asked “How long have you had symptoms of heavy menstrual bleeding”, with “2 months or less”, “more than 2 months but less than 1 year”, “more than 1 year” and “don’t know” as possible response categories. For analysis, duration of symptoms was grouped as “<1 year”, “≥1 year” with “don’t know” coded as missing. Levels of missing data on HMB symptoms and health-related quality of life were low (2.2% for severity, 4.8% for condition-specific and 9.9% for generic quality of life and 3.0% for symptom duration).

Age was categorised as 18-34, 35-39, 40-44, 45-49, ≥50 years for analysis. Women reported their ethnicity as “white”, “mixed”, “Asian or Asian British”, “black or black British”, “Chinese” or “other”. For analysis, the “mixed”, “Chinese” and “other” groups were combined as “other” due to small numbers of women reporting these ethnicities. Self-reported height and weight data were used to derive body mass index (BMI), categorised according to WHO groups as ≤25, 25-30, and ≥30[23]. Women reported how many times they had seen their GP for HMB in the year prior to their first outpatient visit, and this was grouped as 0, 1-2, 3-4,>4 for analysis (“don’t know” was coded as missing).

Women reported their parity, grouped for analysis as “nulliparous” or “parous”. Women were also asked “Have you been told by a doctor that you have any of the following: “heart disease (for example angina, heart attack or heart failure), high blood pressure, lung disease (for example chronic bronchitis or emphysema), diabetes, depression, thyroid disorder, kidney disease, cancer (within the last 5 years). For analysis, the number of co-morbidities reported was grouped as 0, 1, ≥2.

Information on socio-economic deprivation (Index of Multiple Deprivation (IMD)) was extracted from HES and PEDW. IMD is a relative measure of deprivation for small areas across a number of domains, including income, employment, education and housing. We used quintiles of IMD (level 1 = most deprived areas, level 5 = least deprived areas). The methods used to calculate IMD scores in each country in the UK are similar but not directly comparable[24]. For analysis, we generated a combined measure of deprivation for England and Wales by assigning those in each country-specific quintile to the same quintile in a combined measure. This preserved women’s relative deprivation position within each country.

Statistical analysis

Means and standard deviations (SD) and proportions were used to describe the cohort. Regression analyses were used to examine the relationship between age, ethnicity and socio-economic deprivation and each of the outcomes. For the scores representing symptom severity, condition specific and generic quality of life, multivariable linear regression was used to calculate adjusted differences in mean scores. For duration of symptoms (<1 year and ≥1 year), multivariable logistic regression was used to calculate adjusted odds ratios (OR). Regression models included BMI, parity and number of co-morbidities as potential confounders. Levels of missing data were low (<3%) for the majority of variables with the exception of ethnicity (7% missing) and BMI (approximately 23% missing, Table 1). Missing values for explanatory variables were imputed using multiple imputation by chained equations[25] and statistical coefficients were obtained using ten imputed datasets and combined using Rubin's rules[26].

FUNDING

The National Heavy Menstrual Bleeding (HMB) Audit was funded by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). The audit was led by the Royal College of Obstetricians and Gynaecologists. The authors declare no funding for the writing of this manuscript.

ETHICAL APPROVAL

The data are from the National Heavy Menstrual Bleeding (HMB) Audit. Based on the Health Research Authority's guidance, audits are regulated as standard clinical practice outside of the Research Ethics Service[27].

RESULTS

Patient Characteristics

15,325 eligible women completed the questionnaire at their first visit to a gynaecology outpatient department and 15,294 (99.8%) could be linked to HES or PEDW which provided information on socioeconomic deprivation. The women's mean age was 42.3 years (SD 7.6) and BMI 27.3 (SD 5.4) (Table 1). About one in five were nulliparous and one in three reported at least one co-morbidity. 11.7% of women reported a non-white ethnicity, with black or black British (5.4%) and Asian or Asian British (4.3%) being the largest non-white groups. Women in the two least socioeconomically deprived national quintile groups (18.7% in quintile 4 and 15.8% in quintile 5) were under-represented given that per definition 20% of women are expected to be in each group. The distribution of symptom severity, condition-specific and generic quality of life and symptom duration by level of deprivation did not vary significantly between women in England and Wales (data not shown).

Table 1: Patient characteristics at the first gynaecology outpatient visit for HMB (% and number unless otherwise stated)

The mean score for symptom severity was 61.8 (standard error (SE) 0.17) with 74.0% of women reporting that they had HMB symptoms for more than one year. The mean score for condition-specific quality of life was 34.7 (SE: 0.18) and for generic quality of life 0.65 (SE: 0.28) (Table 2).

Severity of symptoms and quality-of-life by socioeconomic deprivation

Symptom severity scores gradually increased with increasing socioeconomic deprivation (Table 2). Condition-specific and generic quality of life scores also showed a worsening gradient according to deprivation. In other words, women living in more deprived areas reported more severe symptoms and a poorer quality of life at their first gynaecology outpatient visit for HMB than those living in less deprived areas.

Severity of symptoms and quality-of-life by age and ethnicity

Symptom severity showed a gradual decrease with increasing age, indicating that older women reported less severe symptoms at their first outpatient visit for HMB (Table 2). Quality of life scores based on both the condition-specific and the generic measure increased with increasing age, which shows that older women reported better quality of life at their first HMB outpatient visit. Symptom severity also varied by ethnicity: black and Asian women reported less severe symptoms than white women (Table 2). Condition-specific quality of life did not vary significantly by ethnicity, whereas compared to white women, Asian woman reported lower generic quality of life scores (Table 2).

Duration of symptoms

Women living in the most deprived areas were slightly less likely to report having had HMB symptoms for ≥1 year than those living in the less deprived areas. Women aged between 35 and 49 years were more likely to report having experienced HMB symptoms for ≥1 year than those younger than 35. Compared to white women, black women were more likely than white women to report symptoms for ≥1 year and Asian women were less likely.

Table 2. Severity and duration of symptoms at the first outpatient visit, by age group, ethnicity and socioeconomic deprivation

DISCUSSION

Main Findings

Women living in more socioeconomically deprived areas reported more severe HMB symptoms and poorer quality of life at their first gynaecology outpatient visit. Older women reported less severe symptoms and better quality of life than younger women. Reported symptom severity also varied by ethnicity with black and Asian women reporting less severe symptoms than women from white ethnic backgrounds.

Three quarters of the women referred to secondary care reported that they had had symptoms of HMB for at least one year and women living in the most deprived areas were least likely to report having had HMB symptoms for ≥1 year.

Interpretation

More severe symptoms and poorer quality of life at first outpatient visit by socioeconomic deprivation, after adjustment for possible differences in age, ethnicity and body mass index, reflect that women from more deprived backgrounds report more severe problems at the start of treatment in secondary care but they were least likely to report that they had symptoms for ≥1 year. There is evidence that people from more socioeconomically deprived backgrounds may be more accepting of longstanding symptoms, chronic pain or poorer health-related quality of life[28], which is a possible explanation for these finding. Conversely, those from more affluent socioeconomic backgrounds have been found to report greater impact of health conditions on their health and their quality of life, which may be linked to their higher expectations about health and life in general[29].

Alternative explanations are that differences in symptom severity, quality of life and symptom reflect inequitable access as well as differences in the nature and causes of HMB. Age is often found to be associated with symptom severity[15, 16,30, 31]. Black women are 2-3 times more likely to have fibroids and endometriosis[31]. Accepting heavy periods as normal vary by ethnicity and other social factors, which in turn can also lead to reluctance to seek care for HMB[16]. Ethnographic research suggests that some women of South Asian ethnicity do not seek healthcare for HMB due to the belief that heavy periods cleanse the body[17]. We adjust for patient-level characteristics that may capture some of these differences but were unable to adjust for other unmeasured potential confounders.

The observation that women living in the most socio-economically deprived areas reported the most severe symptoms but were least likely to report having had symptoms for ≥1 year is more difficult to explain. However, the question wording can have had an impact. Women were asked “How long have you had symptoms of heavy menstrual bleeding?” and women whose symptom severity had worsened may have reported the duration of the most recent severity, rather than the overall duration.

A key question is whether the observed differences in symptom severity and condition-specific quality of life at the women’s first gynaecology outpatient visit are related to differences in women’s health seeking behaviour or to differences in how GPs and gynaecologists decide on whether to refer a woman with HMB. A study of self-reported health-care seeking behaviour in England did not find evidence that inequality in access to secondary care according to socioeconomic or ethnic backgrounds is related to patients being less likely to go to their GP or a hospital’s emergency department[33]. Similarly, a survey of patients with chronic joint pain found that the proportions of patients who said that they were seeking help from their GP did not differ according to their socioeconomic background[34]. On the other hand, a national study including 130,000 patients from more than 300 primary care practices in England found that older patients and those from more deprived areas were less likely to be referred to secondary care[35].

Implications for policy and practice

In the UK, national guidelines for the management of HMB have been developed by the National Institute for Health and Care Excellence and the Royal College of Obstetricians and Gynaecologists (RCOG)[11, 36, 37]. The National HMB Audit carried out a survey of NHS hospitals in England and Wales to find out how care for women with HMB is organised and delivered at local levels. It found that key systems such as the availability of local protocols, which specified local arrangements for patient referral and management in response to the NICE guidelines, were reported only by 30% of hospitals[38]. Wide variation in the investigations and treatments that were offered to women with HMB in primary care were also noted. The implementation of locally agreed referral pathways, recommended by the RCOG, will help to reduce this variation[39].

Recent NICE guidelines recommend that interventions should focus on improving women’s quality of life[11], although criteria for what constitutes a meaningful improvement in quality of life are less clear. In highlighting differences in symptom severity at their first gynaecology outpatient visit, our findings draw attention to the lack of an agreed threshold for referral of women with HMB to secondary care in terms of symptom severity and quality of life. Routine measurement of both symptom severity and quality of life may be required to stimulate greater consistency in referral thresholds but validated instruments specific to HMB are currently lacking. As there is no widely used condition-specific measure of condition-specific quality of life for HMB, the National HMB Audit used the Uterine Fibroid Symptom and Quality of Life (UFS-QOL) questionnaire, adapted for a UK population of women with HMB[18].

Strengths and Limitations

This study is the first to examine the relationship between sociodemographic factors and patient-reported HMB symptom severity, quality of life and symptom duration in an outpatient setting. It used data collected by a national audit carried out in England and Wales, which produced a relatively large sample. We estimated that the National HMB Audit recruited about 30% of all eligible women. There is no direct way to compare the characteristics of the women who were recruited and those who were not. However, the characteristics of the women who were recruited were broadly representative of the UK population in terms of the distributions of ethnicity and age[40, 41].

Survey questionnaires were only available in the English language, so non-English speakers are likely to be under-represented. On the other hand, case ascertainment varied by provider and women from providers with higher case ascertainment (ascertainment > 45%) were more often from a non-white ethnic background and a more deprived areas than those referred to providers with lower case ascertainment[4] which suggests that the impact of not having questionnaires in other languages is likely to be small.

CONCLUSION

About three in four women at their first visit to a gynaecological outpatient clinic for HMB in England and Wales reported that they had symptoms at least one year before they were referred to secondary care. Women from more deprived areas reported more severe HMB symptoms and a poorer quality of life, which demonstrates a higher burden of disease at the time of referral to secondary care. Primary and secondary care providers should examine to what extent these differences reflect barriers in access to gynaecological secondary care services or women's perceptions of their menstrual problems and health-seeking behaviour.

ACKNOWLEDGEMENTS

We would firstly like to thank all NHS providers and patients that participated in the National HMB Audit. We would also like to thank Healthcare Quality Improvement Partnership, Health and Social Care Information Centre and the Royal College of Surgeons of England for providing the authors with the data required for this study. This publication is based on data collected by or on behalf of the Healthcare Quality Improvement Partnership, who have no responsibility or liability for the accuracy, currency, reliability and/or correctness of this publication.

DATA SHARING STATEMENT

The data analysed were collected as part of a national clinical audit and linked to administrative hospital data (Hospital Episode Statistics). They were shared with the authors by the Healthcare Quality Improvement Partnership, Health and Social Care Information Centre and the Royal College of Surgeons of England. The data cannot be shared further without formal application to the data providers.

CONTRIBUTORS

The research question was derived by TM and JvdM. Data collection was supported directly by AK, IGU, DC, LBM and through advice by JS, TM, JvdM. Data analysis was performed by AK, IGU & RSG. All authors contributed to the writing of the manuscript.

COMPETING INTERESTS

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: all authors except RSG had financial support from the Healthcare Quality Improvement Partnership as part of the National Clinical Audit and Patient Outcomes Programme for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

REFERENCES

1. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Third Annual Report*. 2013, RCOG Press.
2. Coulter, A., et al., *Outcomes of referrals to gynaecology outpatient clinics for menstrual problems: an audit of general practice records.* British Journal of Obstatrics and Gynaecology, 1991. **98**(8): p. 789-796.
3. Cromwell, D., et al., *Surgery for menorrhagia within English regions: variation in rates of endometrial ablation and hysterectomy.* BJOG, 2009. **116**(10): p. 1373-9.
4. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Final Report*. 2014, RCOG Press.
5. Karlsson, T.S., L.B. Marions, and M.G. Edlund, *Heavy menstrual bleeding significantly affects quality of life.* Acta Obstet Gynecol Scand., 2014. **93**(1): p. 52-7. doi: 10.1111/aogs.12292. Epub 2013 Nov 25.
6. Shankar, M., C. Chi, and R.A. Kadir, *Review of quality of life: menorrhagia in women with or without inherited bleeding disorders.* Haemophilia., 2008. **14**(1): p. 15-20. Epub 2007 Oct 24.
7. Sule Gokyildiz, E.A., Nezihe Kizilkaya Beji, Meltem Mecdi *The Effects of Menorrhagia on Women's Quality of Life: A Case-Control Study.* ISRN Obstet Gynecol., 2013. **918179**.
8. Wang, W., et al., *Iron deficiency and fatigue in adolescent females with heavy menstrual bleeding.* Haemophilia, 2013. **19**(2): p. 225-230.
9. Cohen, B. and Y. Gibor, *Anemia and menstrual blood loss.* Obstetric and Gynecological Survery, 1980. **35**(10): p. 597-618.
10. Bitzer, J., M. Serrani, and A. Lahav, *Women's attitudes towards heavy menstrual bleeding, and their impact on quality of life.* Journal of Contraception, 2013. **4**: p. 21–28. .
11. National Collaborating Centre for Women's and Children's Health, National Institute for Health and Clinical Excellence (NICE), *Heavy Menstrual Bleeding. Clinical Guideline No. 44*. 2007, NICE.
12. Harlow, S.D. and B. Campbell, *Ethnic differences in the duration and amount of menstrual bleeding during the postmenarcheal period.* Am J Epidemiol., 1996. **144**(10): p. 980-8.
13. National Health Service (NHS) UK. *Heavy periods (menorrhagia) - Causes*. [cited 20/02/2015]; Available from: http://www.nhs.uk/Conditions/Periods-heavy/Pages/Causes.aspx.
14. Mayo Clinic. *Menorrhagia (heavy menstrual bleeding)*. [cited 20/02/2015]; Available from: http://www.mayoclinic.org/diseases-conditions/menorrhagia/basics/causes/con-20021959.
15. Barbara S. Apgar, A.H.K., Uche George-Nwogu, Anne Kittendorf, *Treatment of Menorrhagia*. 2007: American Family Physician. p. 1813-1819.
16. O'Flynn, N., *Menstrual symptoms: the importance of social factors in women's experiences.* British Journal of General Practice, 2006. **56**(533): p. 950-957.
17. Chapple, A., *Iron deficiency anaemia in women of South Asian descent: a qualitative study.* Ethnicity and Health, 1998. **3**(3): p. 199-212.
18. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: First Annual Report*. 2011, RCOG Press.
19. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Second Annual Report*. 2012, RCOG Press.
20. Spies, J., et al., *The UFS-QOL, a New Disease-Specific Symptom and Health-Related Quality of Life Questionnaire for Leiomyomata.* Obstetrics and Gynecology, 2002. **99**(2): p. 290-300.
21. The EuroQol Group, *EuroQol-a new facility for the measurement of health-related quality of life.* Health Policy, 1990. **16**(3): p. 199-208.

22. Kind, P., G. Hardman, and S. Macran, *UK Population Norms for EQ-5D: York Centre for Health Economics Discussion Paper 172*. 1992.
23. World Health Organisation. *BMI Classification*. Global Database on Body Mass Index [cited 06/10/2016]; Available from: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html.
24. Payne, R. and G. Abel, *UK indices of multiple deprivation - a way to make comparisons across constituent countries easier.* Health Statistics Quarterly, 2012. **53**.
25. Royston P, *Multiple imputation of missing values.* The Stata Journal, 2005 **5**: p. 527-36.
26. Rubin D, *Multiple imputation for non-response in surveys*. 1987, New York: John Wiley & Sons.
27. Health Research Authority, *Defining research*. 2016, Health Research Authority: London.
28. Delpierre, C., et al., *Using self-rated health for analysing social inequalities in health: a risk for underestimating the gap between socioeconomic groups?* Journal of Epidemiology and Community Health, 2009. **63**: p. 426-432.
29. Ross, C. and M. Van Willigen, *Education and the subjective quality of life.* Journal of Health and Social Behaviour, 1997. **38**: p. 275-297.
30. Janssen, C.A., P.C. Scholten, and A.P. Heintz, *Menorrhagia--a search for epidemiological risk markers.* Maturitas., 1997. **28**(1): p. 19-25.
31. National Institute for Health and Care Excellence (NICE), *NICE support for commissioning for heavy menstrual bleeding*. 2013.
32. Levesque, J.-F., M. Harris, and G. Russell, *Patient-centred access to health care: conceptualising access at the interface of health systems and populations.* International Journal for Equity in Health, 2013. **12**(18).
33. Adamson, J., et al., *Ethnicity, socioeconomic position and gender: do they affect reported health-care seeking behaviour.* Social Science and Medicine, 2003. **57**(5): p. 895-904.
34. Thorstensson, C., et al., *Help-seeking behaviour among people living with chronic hip or knee pain in the community.* BMC Musculoskeletal Disorders, 2009. **10**(153).
35. McBride, D., et al., *Explaining variation in referral from primary to secondary care: cohort study.* BMJ, 2010. **341**: p. c6267.
36. National Institute for Health and Care Excellence (NICE), *Heavy Menstrual Bleeding. NICE quality standard 47*. 2013, NICE.
37. Royal College of Obstetricians and Gynaecologists, *Standards for Gynaecology. Report of a Working Party*. 2008, RCOG.
38. Cox, S., et al., *The delivery of heavy menstrual bleeding services in England and Wales after publication of national guidelines: a survey of hospitals.* BMC Health Services Research, 2013. **13**: p. 491.
39. Royal College of Obstetricians and Gynaecologists, *Advice for Heavy Menstrual Bleeding (HMB) Services and Commissioners*. 2014.
40. Office for National Statistics, *Office for National Statistics, 2001 Census: Social Focus in Brief - Ethnicity 2002*. 2002.
41. Office for National Statistics, *Office for National Statistics, 2011 Census: Ethnicity and National Identity in England and Wales 2011*. 2012.

449 **Table 1: Patient characteristics at the first gynaecology outpatient visit for HMB**
450 **(% and number unless otherwise stated)**

	Full Cohort (n=15,325)
Age, mean (sd) in years	42.3 (7.6)
Age groups	
18-34	14.9 (2,283)
35-39	12.9 (1,971)
40-44	26.6 (4,071)
45-49	31.3 (4,794)
≥50	14.4 (2,206)
Body mass index, mean (sd) in kg/m^2	27.3 (5.4)
Body mass index, categories	
≤25	39.6 (4,681)
25-30	31.7 (3,739)
≥30	28.7 (3,392)
Missing	*3,513*
Parity	
Nulliparous	17.0 (2,530)
Parous	83.0 (12,338)
Missing	*457*
Number of reported comorbidities	
0	66.3 (10,165)
1	25.3 (3,878)
≥2	8.4 (1,282)
Ethnicity	
White	88.3 (12,614)
Asian or Asian British	4.3 (607)
Black or Black British	5.4 (770)
Other	2.0 (292)
Missing	*1,042*
Socioeconomic deprivation (IMD)	
Quintile 1 (most deprived)	23.5 (3,418)
Quintile 2	21.7 (3,159)
Quintile 3	20.2 (2,944)
Quintile 4	18.7 (2,720)
Quintile 5 (least deprived)	15.8 (2,304)
Missing	*780*

451

Table 2. Severity and duration of symptoms at the first outpatient visit, by age group, ethnicity and socioeconomic deprivation

	Severity score (0 best and 100 worst) (n=14,990)			Condition-specific quality of life (0 worst and 100 best) (n=14,586)			Generic quality of life (0 death and 1 perfect health) (n=13,802)			Symptoms ≥1 year (n=14,866)		
	Mean score (se)	Adjusted[i] difference (95% CI)	p-value	Mean score (se)	Adjusted[i] difference (95% CI)	p-value	Mean score (se)	Adjusted[i] difference(95% CI)	p-value	% (se)	Adjusted[i] OR (95% CI)	p-value
Total	61.8 (0.17)			34.7 (0.18)			0.65 (0.28)			74.0 (0.36)		
Age group												
18-34	63.1 (0.44)	-		33.2 (0.48)	-		0.61 (0.007)	-		70.7 (0.98)	-	
35-39	62.9 (0.49)	-1.59 (-2.89, -0.29)		33.3 (0.51)	1.75 (0.39, 3.10)		0.63 (0.008)	0.03 (0.01, 0.05)		74.8 (1.00)	1.25 (1.09, 1.44)	
40-44	62.5 (0.33)	-2.17 (-3.30, -1.04)	p<0.001	33.7 (0.35)	2.59 (1.40, 3.77)	p<0.001	0.64 (0.005)	0.04 (0.02, 0.06)	p<0.001	76.8 (0.67)	1.39 (1.23, 1.58)	p<0.001
45-49	61.3 (0.31)	-3.36 (-4.47, -2.51)		35.4 (0.33)	4.23 (3.06, 5.39)		0.67 (0.005)	0.07 (0.05, 0.08)		74.2 (0.64)	1.20 (1.06, 1.35)	
>=50	59.0 (0.47)	-5.88 (-7.19, -4.58)		38.2 (0.51)	7.31 (5.93, 8.68)		0.70 (0.007)	0.10 (0.07, 0.12)		70.9 (0.98)	1.01 (0.88, 1.16)	
Ethnicity												
White	61.9 (0.19)	-		34.8 (0.20)	-		0.66 (0.003)	-		74.1 (0.38)	-	
Black or Black British	61.5 (0.82)	-1.93 (-3.51, -0.35)		35.0 (0.86)	1.45 (-0.16, 3.06)		0.62 (0.01)	-0.01 (-0.08, 0.02)		79.4 (1.47)	1.34 (1.11, 1.62)	
Asian or Asian British	60.7 (1.02)	-2.38 (-4.25, -0.51)	P=0.011	34.2 (1.07)	1.32 (-0.59, 3.22)	0.1392	0.58 (0.02)	-0.05 (-0.88, -0.01)	p<0.001	66.1 (1.49)	0.70 (0.58, 0.85)	p<0.001
Other	61.5 (1.33)	-0.46 (-3.09, 2.16)		33.9 (1.41)	-1.01 (-3.54, 1.51)		0.60 (0.02)	-0.05 (-0.30, -0.20)		72.3 (2.67)	0.92 (0.70, 1.20)	
Socioeconomic deprivation (IMD)												
Quintile 1 (most deprived)	65.5 (0.37)	-		30.5 (0.39)	-		0.55 (0.007)	-		72.0 (0.78)	-	
Quintile 2	63.5 (0.38)	-1.53 (-2.57, 0.50)		33.1 (0.40)	1.82 (0.75, 2.90)		0.62 (0.006)	0.06 (0.05, 0.08)		73.6 (0.80)	1.11 (0.99, 1.24)	
Quintile 3	61.6 (0.39)	-4.22 (-4.30, -2.12)	p<0.001	35.0 (0.41)	3.44 (2.34, 4.54)	p<0.001	0.67 (0.006)	0.09 (0.08, 0.11)	p<0.001	75.1 (0.81)	1.20 (1.06, 1.34)	P=0.0091
Quintile 4	59.5 (0.41)	-6.02 (-6.02, -3.87)		36.8 (0.43)	4.78 (3.66, 5.90)		0.71 (0.006)	0.13 (0.12, 0.15)		74.5 (0.85)	1.16 (1.03, 1.31)	
Quintile 5 (least deprived)	58.2 (0.44)	-6.07 (-7.23, -4.91)		38.6 (0.46)	6.29 (5.10, 7.48)		0.73 (0.006)	0.14 (0.13, 0.16)		75.1 (0.91)	1.21 (1.07, 1.37)	

Footnote: All multivariable models were adjusted for body mass index, parity, and number of co-morbidities. P-values based on Wald test

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-6
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	5, 7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, explain how loss to follow-up was addressed	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	Only one stage
		(c) Consider use of a flow diagram	Only one stage
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8 and Table 1
		(b) Indicate number of participants with missing data for each variable of interest	8 (Table 1)
		(c) Summarise follow-up time (eg, average and total amount)	N/A (Baseline)
Outcome data	15*	Report numbers of outcome events or summary measures over time	N/A (Baseline results)
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-9 (Table 2)
		(*b*) Report category boundaries when continuous variables were categorized	8 (Table 2)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	7

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Sociodemographic differences in symptom severity and duration amongst women referred to secondary care for menorrhagia in England and Wales: a cohort study from the National Heavy Menstrual Bleeding Audit

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-018444.R1
Article Type:	Research
Date Submitted by the Author:	06-Nov-2017
Complete List of Authors:	Kiran, Amit; London School of Hygiene & Tropical Medicine, Department of Health Services Research and Policy Geary, Rebecca; London School of Hygiene and Tropical Medicine Faculty of Public Health and Policy, Department of Health Services Research and Policy Gurol Urganci, Ipek; London School of Hygiene & Tropical Medicine, Health Services Research & Policy Cromwell, David; London School of Hygiene & Tropical Medicine, Health Services Research & Policy Bansi-Matharu, Loveleen; University College London, Institute for Global Health Shakespeare, Judy; Royal College of General Practitioners Mahmood, Tahir; Forth Park Hospital, Obstetrics and Gynaecology van der Meulen, Jan; London School of Hygiene and Tropical Medicine
Primary Subject Heading:	Obstetrics and gynaecology
Secondary Subject Heading:	Health services research, Patient-centred medicine
Keywords:	GYNAECOLOGY, EPIDEMIOLOGY, PRIMARY CARE

Sociodemographic differences in symptom severity and duration amongst women referred to secondary care for menorrhagia in England and Wales: a cohort study from the National Heavy Menstrual Bleeding Audit

Kiran A[1,2,ƚ], Geary RS[1,2,ƚ], Gurol-Urganci I[1,2], Cromwell DA[1,2], Bansi-Matharu L[3], Shakespeare J[4], Mahmood T[2], van der Meulen J[1,2]

[1] *Department of Health Services Research and Policy, London School of Hygiene & Tropical Medicine, London, UK*
[2] *Lindsay Stewart Centre for Audit and Clinical Informatics, Royal College of Obstetricians and Gynaecologists, London, UK*
[3] *Institute of Epidemiology & Health, University College London, London, UK*
[4] *Royal College of General Practitioners, London, UK*

ƚ A Kiran and RS Geary contributed equally to this paper

Corresponding author: Rebecca Geary, 15-17 Tavistock Place, London School of Hygiene & Tropical Medicine, London, WC1H 9SH. Email: rebecca.geary@lshtm.ac.uk Telephone: 02079272279

ABSTRACT

Objective To examine symptom severity and duration at time of referral to secondary care for heavy menstrual bleeding by socio-economic deprivation, age and ethnicity

Design Cohort analysis of data from the National Heavy Menstrual Bleeding Audit linked to Hospital Episode Statistics data

Setting English and Welsh National Health Services (secondary care): February 2011 to January 2012

Participants 15,325 women aged 18 to 60 years in England and Wales who had a new referral for heavy menstrual bleeding to a gynaecology outpatient department

Methods Multivariable linear regression to calculate adjusted differences in mean symptom severity and quality of life scores at first outpatient visit. Multivariable logistic regression to calculate adjusted odds ratios. Adjustment for body mass index, parity and co-morbidities.

Primary Outcome Measures Mean symptom severity score (0=best, 100=worst), mean condition-specific quality of life score (0=worst, 100=best) and symptom duration (≥1 year).

Results Women were on average 42 years old and 12% were non-white. Mean symptom severity and condition-specific quality of life scores were 61.8 and 34.7. Almost three-quarters of women (74%) reported having had symptoms for ≥1 year. Women from more deprived areas had more severe symptoms at their first outpatient visit (difference -6.1; 95%CI-7.2:-4.9, between least and most deprived quintile) and worse condition-specific quality of life (difference 6.3; 95%CI 5.1:7.5). Symptom severity declined with age whilst quality of life improved.

Conclusions Women living in more deprived areas reported more severe HMB symptoms and poorer quality of life at the start of treatment in secondary care. Providers should examine referral practices to explore if these differences reflect women's health-seeking behaviour or how providers decide whether or not to refer.

Funding The National Heavy Menstrual Bleeding (HMB) Audit was funded by the Healthcare Quality Improvement Partnership as part of the National Clinical Audit and Patient Outcomes Programme, contract number HQIP NCA 004.

Keywords heavy menstrual bleeding, deprivation, ethnicity, health inequalities, patient-reported outcomes, quality of life

Tweetable abstract Women from deprived areas referred with more severe heavy menstrual bleeding, potentially reflecting inequity

Strengths and limitations of this study

- This study is the first to examine Heavy Menstrual Bleeding symptom severity and duration at time of referral to secondary care
- The inclusion of patient-reported symptom severity and quality of life addresses a knowledge gap about how women feel about their heavy menstrual bleeding
- As the data were collected by a national audit in England and Wales the sample is relatively large, allowing comparisons between ethnic minority groups
- Even though the sample size is large, the National HMB Audit recruited approximately 30% of eligible women. However, the characteristics of the women recruited were broadly representative of the UK population in terms of ethnicity and age
- Linking audit data to administrative hospital data also allowed comparisons between socioeconomic groups

INTRODUCTION

Heavy menstrual bleeding (HMB) is a common condition that affects one in four women of reproductive age. In England and Wales, an estimated 50,000 women with HMB are referred from primary care to secondary care gynaecology services provided by the National Health Service (NHS) every year[1]. Menstrual disorders account for approximately 20% of referrals to specialist gynaecology services[2] and studies have found significant regional variations in use of surgical treatment within England[3].

Women with HMB have significantly worse quality of life than women with normal menstrual bleeding loss, in terms of their physical and mental health, as well as their emotional, social and material quality of life[4-7]. More than a third of women with HMB report severe pain[7]. HMB is also associated with morbidity, including anaemia and related fatigue[8, 9]. Women with HMB experience reduced participation in social activities and their personal relationships and attendance at work can be adversely affected[10].

In order to improve the quality of life of women with HMB, it is important to understand both the aetiology of this condition and its management in primary and secondary care[11]. The prevalence of HMB and conditions which affect symptom severity has been reported to vary by ethnicity[12-15]. In addition, cultural norms and patient choice for treatment may vary between different groups[16, 17].

In this study, we used data from the National HMB Audit to examine symptom severity, quality of life and symptom duration at women's first gynaecology outpatient visit for HMB. The National HMB Audit was a 4-year project (2010 - 2014) that assessed patient-reported outcomes and experiences of care for women with HMB in England and Wales. Our objective is to examine symptom severity and duration at the time of referral to secondary care by age, ethnicity and socio-economic deprivation to get a better understanding of the burden of disease at the start of treatment in secondary care.

METHODS

Data collection

Full details of the methods used in the National HMB Audit have been reported elsewhere[1, 4, 18, 19]. Women aged between 18 and 60 years in England and Wales who had a new referral for HMB to a gynaecology outpatient department were eligible to participate in the National HMB Audit. Women who had visited a gynaecology outpatient clinic for HMB within the previous 12 months were excluded. Recruitment took place between 1 February 2011 and 31 January 2012[1, 19].

Women who consented to participate completed a baseline questionnaire (58 questions) on age, ethnicity, duration of HMB symptoms, obstetric history, prior treatment received for HMB and co-morbidities. The questionnaire also collected patient-reported HMB-specific and generic quality of life measures.

Scores for symptom severity and condition-specific health-related quality of life were adapted from the Uterine Fibroid Symptom and Quality of Life (UFS-QoL) questionnaire[20]. Of five candidate questionnaires evaluated, only the UFS-QOL could be used throughout the care pathway, measured HRQoL and was psychometrically strong[18]. The UFS-QOL was therefore adapted for HMB and a UK population. We conducted semi-structured interviews with women (*n* = 7) and clinicians (*n* = 5) and a mini focus group (*n* = 3) with local Heavy Menstrual Bleeding Audit coordinators to determine suitable alternative words to describe HMB, and to identify words not clearly understood in UK English. Based on this we changed the wording to refer to 'heavy menstrual bleeding' (i.e. heavy periods)' rather than 'fibroids', changed 'checking' to 'ticking'; 'soiling' to 'staining'; 'blue' to 'low'; and 'wiped out' to 'exhausted'. The adapted version performed acceptably in a psychometric evaluation. Overall, the symptom severity subscale and the HRQL subscale of the UFS-QOL used as outcomes demonstrated the strongest psychometric properties and have been used to report the audit data. The UFS-QOL consists of eight symptom items and 29 HRQoL items. The symptom items are scored to produce a severity subscale and the HRQoL items are scored into subscales (concern, activities, energy/mood, control, self-consciousness and sexual function). The HRQoL sub-scales can be used separately or combined into an overall HRQoL score. We use the overall HRQoL score in this paper.

A generic health-related quality of life measure was derived from the European Quality of Life-5 Dimensions (EuroQol-5 or EQ-5D)[21]. This generic measure was used because it is the instrument recommended by the Department of Health and allows comparisons with other national studies, such as the Patient Reported Outcome Measures study of common elective surgical procedures[21]. Women completed the questionnaire in hospital before their consultation. Using multiple sources of data, the recruitment rate of the audit was estimated to be 31.9%[1]. Descriptive results from the National HMB Audit have been published elsewhere[1, 4, 18, 19].

Data from the prospective audit were linked at patient level to records from Hospital Episode Statistics (HES) and Patient Episode Database for Wales (PEDW), administrative databases that capture all inpatient and outpatient episodes in English and Welsh NHS hospitals. Data linkage was performed using deterministic linkage criteria that included NHS number, sex and date of birth.

Measures

Symptom severity, condition-specific quality of life and generic quality of life scores and the reported duration of symptoms at the first outpatient visit were used as outcomes in this study. The severity and quality of life scores were analysed as continuous variables. Symptom severity scores ranged from 0 (best possible score) to 100 (greatest symptom severity, worst possible score). Condition-specific quality of life ranged from 0 (poorest quality of life) to 100 (best quality of life). Generic quality of life is expressed on a scale with 0 representing death and 1 perfect health[22]. Women were asked "How long have you had symptoms of heavy menstrual bleeding", with "2 months or less", "more than 2 months but less than 1 year", "more than 1 year" and "don't know" as possible response categories. For analysis, duration of symptoms was grouped as "<1 year", "≥1 year" with "don't know" coded as missing. Levels of missing data on HMB symptoms and health-related quality of life were low (2.2% for severity, 4.8% for condition-specific and 9.9% for generic quality of life and 3.0% for symptom duration).

Age was categorised as 18-34, 35-39, 40-44, 45-49, ≥50 years for analysis. Women reported their ethnicity as "white", "mixed", "Asian or Asian British", "black or black British", "Chinese" or "other". For analysis, the "mixed", "Chinese" and "other" groups were combined as "other" due to small numbers of women reporting these ethnicities. Self-reported height and weight data were used to derive body mass index (BMI), categorised according to WHO groups as ≤25, 25-30, and ≥30[23]. Women reported how many times they had seen their GP for HMB in the year prior to their first outpatient visit, and this was grouped as 0, 1-2, 3-4,>4 for analysis ("don't know" was coded as missing).

Women reported their parity, grouped for analysis as “nulliparous” or “parous”. Women were also asked “Have you been told by a doctor that you have any of the following: “heart disease (for example angina, heart attack or heart failure), high blood pressure, lung disease (for example chronic bronchitis or emphysema), diabetes, depression, thyroid disorder, kidney disease, cancer (within the last 5 years). For analysis, the number of co-morbidities reported was grouped as 0, 1, ≥2.

Information on socio-economic deprivation (Index of Multiple Deprivation (IMD)) was extracted from HES and PEDW. IMD is a relative measure of deprivation for small areas across a number of domains, including income, employment, education and housing. We used quintiles of IMD (level 1 = most deprived areas, level 5 = least deprived areas). The methods used to calculate IMD scores in each country in the UK are similar but not directly comparable[24]. For analysis, we generated a combined measure of deprivation for England and Wales by assigning those in each country-specific quintile to the same quintile in a combined measure. This preserved women’s relative deprivation position within each country.

Statistical analysis

Means and standard deviations (SD) and proportions were used to describe the cohort. Regression analyses were used to examine the relationship between age, ethnicity and socio-economic deprivation and each of the outcomes. For the scores representing symptom severity, condition specific and generic quality of life, multivariable linear regression was used to calculate adjusted differences in mean scores. For duration of symptoms (<1 year and ≥1 year), multivariable logistic regression was used to calculate adjusted odds ratios (OR). Regression models included BMI, parity and number of co-morbidities as potential confounders. Levels of missing data were low (<3%) for the majority of variables with the exception of ethnicity (7% missing) and BMI (approximately 23% missing, Table 1). Missing values for explanatory variables were imputed using multiple imputation by chained equations[25] and statistical coefficients were obtained using ten imputed datasets and combined using Rubin’s rules[26].

ETHICAL APPROVAL

The data are from the National Heavy Menstrual Bleeding (HMB) Audit. Based on the Health Research Authority’s guidance, audits are regulated as standard clinical practice outside of the Research Ethics Service[27].

RESULTS

Patient Characteristics

15,325 eligible women completed the questionnaire at their first visit to a gynaecology outpatient department and 15,294 (99.8%) could be linked to HES or PEDW which provided information on socioeconomic deprivation. The women's mean age was 42.3 years (SD 7.6) and BMI 27.3 (SD 5.4) (Table 1). About one in five were nulliparous and one in three reported at least one co-morbidity. 11.7% of women reported a non-white ethnicity, with black or black British (5.4%) and Asian or Asian British (4.3%) being the largest non-white groups. Women in the two least socioeconomically deprived national quintile groups (18.7% in quintile 4 and 15.8% in quintile 5) were under-represented given that per definition 20% of women are expected to be in each group. The distribution of symptom severity, condition-specific and generic quality of life and symptom duration by level of deprivation did not vary significantly between women in England and Wales (data not shown).

Table 1: Patient characteristics at the first gynaecology outpatient visit for HMB (% and number unless otherwise stated)

The mean score for symptom severity was 61.8 (standard error (SE) 0.17) with 74.0% of women reporting that they had HMB symptoms for more than one year. The mean score for condition-specific quality of life was 34.7 (SE: 0.18) and for generic quality of life 0.65 (SE: 0.28) (Table 2).

Severity of symptoms and quality-of-life by socioeconomic deprivation

Symptom severity scores gradually increased with increasing socioeconomic deprivation (Table 2). Condition-specific and generic quality of life scores also showed a worsening gradient according to deprivation. In other words, women living in more deprived areas reported more severe symptoms (difference -6.1; 95%CI-7.2 to -4.9, between least and most deprived quintile) and a poorer quality of life (difference 6.3; 95%CI 5.1 to 7.5) at their first gynaecology outpatient visit for HMB than those living in less deprived areas.

Severity of symptoms and quality-of-life by age and ethnicity

Symptom severity showed a gradual decrease with increasing age, indicating that older women reported less severe symptoms at their first outpatient visit for HMB (difference -5.9; 95% CI: -7.2 to -4.6 between oldest and youngest age groups, Table 2). Quality of life scores based on both the condition-specific and the generic measure increased with increasing age, which shows that older women reported better quality of life at their first HMB outpatient visit (difference 7.3; 95% CI: 5.9 to 8.7) between oldest and youngest age groups). Symptom severity also varied by ethnicity: black and Asian women reported less severe symptoms than white women (difference compared to white women -1.9 and -2.4 respectively, Table 2). Condition-specific quality of life did not vary significantly by ethnicity, whereas compared to white women, Asian woman reported lower generic quality of life scores (Table 2).

Duration of symptoms

Women living in the most deprived areas were slightly less likely to report having had HMB symptoms for ≥1 year than those living in the less deprived areas. Women aged between 35 and 49 years were more likely to report having experienced HMB symptoms for ≥1 year than those younger than 35. Compared to white women, black women were more likely than white women to report symptoms for ≥1 year and Asian women were less likely.

Table 2. Severity and duration of symptoms at the first outpatient visit, by age group, ethnicity and socioeconomic deprivation

DISCUSSION

Main Findings

Women living in more socioeconomically deprived areas reported more severe HMB symptoms and poorer quality of life at their first gynaecology outpatient visit. Older women reported less severe symptoms and better quality of life than younger women. Reported symptom severity also varied by ethnicity with black and Asian women reporting less severe symptoms than women from white ethnic backgrounds.

Three quarters of the women referred to secondary care reported that they had had symptoms of HMB for at least one year and women living in the most deprived areas were least likely to report having had HMB symptoms for ≥1 year.

Interpretation

More severe symptoms and poorer quality of life at first outpatient visit by socioeconomic deprivation, after adjustment for possible differences in age, ethnicity and body mass index, reflect that women from more deprived backgrounds report more severe problems at the start of treatment in secondary care but they were least likely to report that they had symptoms for at least one year. The difference in the symptom severity score between women from the least and the most deprived areas of about 6 is likely to be clinically significant, given that women who completed a questionnaire one year after their first outpatient visit and reported that their symptoms were 'a little better' had severity scores that were, on average, approximately 10 lower than women who reported (in response to same questionnaire) that their symptoms were 'about the same'. There is evidence that people from more socioeconomically deprived backgrounds may be more accepting of symptoms, chronic pain or poorer health-related quality of life[28], which is a possible explanation for these finding. Conversely, those from more affluent socioeconomic backgrounds have been found to report greater impact of health conditions on their health and their quality of life, which may be linked to their higher expectations about health and life in general[29].

Alternative explanations are that differences in symptom severity, quality of life and symptom reflect inequitable access as well as differences in the nature and causes of HMB. Age is often found to be associated with symptom severity[15, 16,][30, 31]. Black women are 2-3 times more likely to have fibroids and endometriosis[31]. Accepting heavy periods as normal vary by ethnicity and other social factors, which in turn can also lead to reluctance to seek care for HMB[16]. Ethnographic research suggests that some women of South Asian ethnicity do not seek healthcare for HMB due to the belief that heavy periods cleanse the body[17]. We adjust for patient-level characteristics that may capture some of these differences but were unable to adjust for other unmeasured potential confounders.

The observation that women living in the most socio-economically deprived areas reported the most severe symptoms but were least likely to report having had symptoms for ≥1 year may reflect the wording of the question; women were asked "How long have you had symptoms of heavy menstrual bleeding?" and women whose symptom severity had worsened may have reported the duration of the most recent severity, rather than the overall duration.

A key question is whether the observed differences in symptom severity and condition-specific quality of life at the women's first gynaecology outpatient visit are related to differences in women's health seeking behaviour or to differences in how GPs and gynaecologists decide on whether to refer a woman with HMB. A study of self-reported health-care seeking behaviour in England did not find evidence that inequality in access to secondary care according to socioeconomic or ethnic backgrounds is related to patients being less likely to go to their GP or a hospital's emergency department[32]. Similarly, a survey of patients with chronic joint pain found that the proportions of patients who said that they were seeking help from their GP did not differ according to their socioeconomic background[33]. On the other hand, a national study including 130,000 patients from more than 300 primary care practices in England found that older patients and those from more deprived areas were less likely to be referred to secondary care[34].

Implications for policy and practice

In the UK, national guidelines for the management of HMB have been developed by the National Institute for Health and Care Excellence and the Royal College of Obstetricians and Gynaecologists (RCOG)[11, 35, 36]. The National HMB Audit carried out a survey of NHS hospitals in England and Wales to find out how care for women with HMB is organised and delivered at local levels. It found that key systems such as the availability of local protocols, which specified local arrangements for patient referral and management in response to the NICE guidelines, were reported only by 30% of hospitals[37]. Wide variation in the investigations and treatments that were offered to women with HMB in primary care were also noted. The implementation of locally agreed referral pathways, recommended by the RCOG, will help to reduce this variation[38].

Women with HMB in this study reported substantially worse QoL (EQ-5D mean: 0.65, SD: 0.33) than the population average for women in England (mean: 0.85, SD: 0.003), and compared to women with incontinence (mean: 0.73, SD: 0.26)[39, 40]. This reinforces the need for interventions to focus on improving women's quality of life, as recommended by recent NICE guidelines[11]. Obesity can be associated with HMB so health promotion interventions around diet and exercise could supplement HMB-specific interventions. Criteria for what constitutes a meaningful improvement in quality of life are less clear. Awareness raising activities relating to the availability of treatments for HMB could increase healthcare seeking before symptoms become severe. This may be particularly beneficial for those from more deprived background who may be more accepting of chronic pain and worse quality-of-life. In highlighting differences in symptom severity at their first gynaecology outpatient visit, our findings draw attention to the lack of an agreed threshold for referral of women with HMB to secondary care in terms of symptom severity and quality of life. Routine measurement of both symptom severity and quality of life may be required to stimulate greater consistency in referral thresholds but validated instruments specific to HMB are currently lacking. As there is no widely used condition-specific measure of condition-specific quality of life for HMB, the National HMB Audit used the Uterine Fibroid Symptom and Quality of Life (UFS-QOL) questionnaire, adapted for a UK population of women with HMB[18].

Strengths and Limitations

This study is the first to examine the relationship between sociodemographic factors and patient-reported HMB symptom severity, quality of life and symptom duration in an outpatient setting. It used data collected by a national audit carried out in England and Wales, which produced a relatively large sample. We estimated that the National HMB Audit recruited about 30% of all eligible women. There is no direct way to compare the characteristics of the women who were recruited and those who were not. However, the characteristics of the women who were recruited were broadly representative of the UK population in terms of the distributions of ethnicity and age[41, 42].

Survey questionnaires were only available in the English language, so non-English speakers are likely to be under-represented. On the other hand, case ascertainment varied by provider and women from providers with higher case ascertainment (ascertainment > 45%) were more often from a non-white ethnic background and a more deprived areas than those referred to providers with lower case ascertainment[4] which suggests that the impact of not having questionnaires in other languages is likely to be small.

CONCLUSION

About three in four women at their first visit to a gynaecological outpatient clinic for HMB in England and Wales reported that they had symptoms at least one year before they were referred to secondary care. Women from more deprived areas reported more severe HMB symptoms and a poorer quality of life, which demonstrates a higher burden of disease at the time of referral to secondary care. Primary and secondary care providers should examine to what extent these differences reflect barriers in access to gynaecological secondary care services or women’s perceptions of their menstrual problems and health-seeking behaviour.

ACKNOWLEDGEMENTS

We would firstly like to thank all NHS providers and patients that participated in the National HMB Audit. We would also like to thank Healthcare Quality Improvement Partnership, Health and Social Care Information Centre and the Royal College of Surgeons of England for providing the authors with the data required for this study. This publication is based on data collected by or on behalf of the Healthcare Quality Improvement Partnership, who have no responsibility or liability for the accuracy, currency, reliability and/or correctness of this publication.

DATA SHARING STATEMENT

The data analysed were collected as part of a national clinical audit and linked to administrative hospital data (Hospital Episode Statistics). They were shared with the authors by the Healthcare Quality Improvement Partnership, Health and Social Care Information Centre and the Royal College of Surgeons of England. The data cannot be shared further without formal application to the data providers.

CONTRIBUTORS

The research question was derived by TM and JvdM. Data collection was supported directly by AK, IGU, DC, LBM and through advice by JS, TM, JvdM. Data analysis was performed by AK, IGU & RSG. All authors contributed to the writing of the manuscript.

COMPETING INTERESTS

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: all authors except RSG had financial support from the Healthcare Quality Improvement Partnership as part of the National Clinical Audit and Patient Outcomes Programme for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

FUNDING

The authors declare no funding for the writing of this manuscript. The National Heavy Menstrual Bleeding (HMB) Audit was funded by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). The audit was led by the Royal College of Obstetricians and Gynaecologists.

REFERENCES

1. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Third Annual Report*. 2013, RCOG Press.
2. Coulter, A., et al., *Outcomes of referrals to gynaecology outpatient clinics for menstrual problems: an audit of general practice records.* British Journal of Obstatrics and Gynaecology, 1991. **98**(8): p. 789-796.
3. Cromwell, D., et al., *Surgery for menorrhagia within English regions: variation in rates of endometrial ablation and hysterectomy.* BJOG, 2009. **116**(10): p. 1373-9.
4. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Final Report*. 2014, RCOG Press.
5. Karlsson, T.S., L.B. Marions, and M.G. Edlund, *Heavy menstrual bleeding significantly affects quality of life.* Acta Obstet Gynecol Scand., 2014. **93**(1): p. 52-7. doi: 10.1111/aogs.12292. Epub 2013 Nov 25.
6. Shankar, M., C. Chi, and R.A. Kadir, *Review of quality of life: menorrhagia in women with or without inherited bleeding disorders.* Haemophilia., 2008. **14**(1): p. 15-20. Epub 2007 Oct 24.
7. Sule Gokyildiz, E.A., Nezihe Kizilkaya Beji, Meltem Mecdi *The Effects of Menorrhagia on Women's Quality of Life: A Case-Control Study.* ISRN Obstet Gynecol., 2013. **918179**.
8. Wang, W., et al., *Iron deficiency and fatigue in adolescent females with heavy menstrual bleeding.* Haemophilia, 2013. **19**(2): p. 225-230.
9. Cohen, B. and Y. Gibor, *Anemia and menstrual blood loss.* Obstetric and Gynecological Survery, 1980. **35**(10): p. 597-618.
10. Bitzer, J., M. Serrani, and A. Lahav, *Women's attitudes towards heavy menstrual bleeding, and their impact on quality of life.* Journal of Contraception, 2013. **4**: p. 21–28. .
11. National Collaborating Centre for Women's and Children's Health, National Institute for Health and Clinical Excellence (NICE), *Heavy Menstrual Bleeding. Clinical Guideline No. 44*. 2007, NICE.
12. Harlow, S.D. and B. Campbell, *Ethnic differences in the duration and amount of menstrual bleeding during the postmenarcheal period.* Am J Epidemiol., 1996. **144**(10): p. 980-8.
13. National Health Service (NHS) UK. *Heavy periods (menorrhagia) - Causes*. 20/02/2015]; Available from: http://www.nhs.uk/Conditions/Periods-heavy/Pages/Causes.aspx.
14. Mayo Clinic. *Menorrhagia (heavy menstrual bleeding)*. 20/02/2015]; Available from: http://www.mayoclinic.org/diseases-conditions/menorrhagia/basics/causes/con-20021959.
15. Barbara S. Apgar, A.H.K., Uche George-Nwogu, Anne Kittendorf, *Treatment of Menorrhagia*. 2007: American Family Physician. p. 1813-1819.
16. O'Flynn, N., *Menstrual symptoms: the importance of social factors in women's experiences.* British Journal of General Practice, 2006. **56**(533): p. 950-957.
17. Chapple, A., *Iron deficiency anaemia in women of South Asian descent: a qualitative study.* Ethnicity and Health, 1998. **3**(3): p. 199-212.
18. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: First Annual Report*. 2011, RCOG Press.
19. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Second Annual Report*. 2012, RCOG Press.
20. Spies, J., et al., *The UFS-QOL, a New Disease-Specific Symptom and Health-Related Quality of Life Questionnaire for Leiomyomata.* Obstetrics and Gynecology, 2002. **99**(2): p. 290-300.
21. The EuroQol Group, *EuroQol-a new facility for the measurement of health-related quality of life.* Health Policy, 1990. **16**(3): p. 199-208.

22. Kind, P., G. Hardman, and S. Macran, *UK Population Norms for EQ-5D: York Centre for Health Economics Discussion Paper 172*. 1992.
23. World Health Organisation. *BMI Classification*. Global Database on Body Mass Index 06/10/2016]; Available from: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html.
24. Payne, R. and G. Abel, *UK indices of multiple deprivation - a way to make comparisons across constituent countries easier.* Health Statistics Quarterly, 2012. **53**.
25. Royston P, *Multiple imputation of missing values.* The Stata Journal, 2005 **5**: p. 527-36.
26. Rubin D, *Multiple imputation for non-response in surveys*. 1987, New York: John Wiley & Sons.
27. Health Research Authority, *Defining research*. 2016, Health Research Authority: London.
28. Delpierre, C., et al., *Using self-rated health for analysing social inequalities in health: a risk for underestimating the gap between socioeconomic groups?* Journal of Epidemiology and Community Health, 2009. **63**: p. 426-432.
29. Ross, C. and M. Van Willigen, *Education and the subjective quality of life.* Journal of Health and Social Behaviour, 1997. **38**: p. 275-297.
30. Janssen, C.A., P.C. Scholten, and A.P. Heintz, *Menorrhagia--a search for epidemiological risk markers.* Maturitas., 1997. **28**(1): p. 19-25.
31. National Institute for Health and Care Excellence (NICE), *NICE support for commissioning for heavy menstrual bleeding*. 2013.
32. Adamson, J., et al., *Ethnicity, socioeconomic position and gender: do they affect reported health-care seeking behaviour.* Social Science and Medicine, 2003. **57**(5): p. 895-904.
33. Thorstensson, C., et al., *Help-seeking behaviour among people living with chronic hip or knee pain in the community.* BMC Musculoskeletal Disorders, 2009. **10**(153).
34. McBride, D., et al., *Explaining variation in referral from primary to secondary care: cohort study.* BMJ, 2010. **341**: p. c6267.
35. National Institute for Health and Care Excellence (NICE), *Heavy Menstrual Bleeding. NICE quality standard 47*. 2013, NICE.
36. Royal College of Obstetricians and Gynaecologists, *Standards for Gynaecology. Report of a Working Party*. 2008, RCOG.
37. Cox, S., et al., *The delivery of heavy menstrual bleeding services in England and Wales after publication of national guidelines: a survey of hospitals.* BMC Health Services Research, 2013. **13**: p. 491.
38. Royal College of Obstetricians and Gynaecologists, *Advice for Heavy Menstrual Bleeding (HMB) Services and Commissioners*. 2014.
39. The EuroQol Group, *Self-Reported Population Health: An International Perspective based on EQ-5D*, A. Szende, B. Janssen, and J. Cabases, Editors. 2014, Springer Netherlands.
40. Harvie, H.S., et al., *Validity of utility measures for women with urge, stress, and mixed urinary incontinence.* Am J Obstet Gynecol., 2014. **210**(1): p. 85.e1-6. doi: 10.1016/j.ajog.2013.09.025. Epub 2013 Sep 18.
41. Office for National Statistics, *Office for National Statistics, 2001 Census: Social Focus in Brief - Ethnicity 2002*. 2002.
42. Office for National Statistics, *Office for National Statistics, 2011 Census: Ethnicity and National Identity in England and Wales 2011*. 2012.

Table 1: Patient characteristics at the first gynaecology outpatient visit for HMB (% and number unless otherwise stated)

	Full Cohort (n=15,325)
Age, mean (sd) in years	42.3 (7.6)
Age groups	
18-34	14.9 (2,283)
35-39	12.9 (1,971)
40-44	26.6 (4,071)
45-49	31.3 (4,794)
≥50	14.4 (2,206)
Body mass index, mean (sd) in kg/m^2	27.3 (5.4)
Body mass index, categories	
≤25	39.6 (4,681)
25-30	31.7 (3,739)
≥30	28.7 (3,392)
Missing	*3,513*
Parity	
Nulliparous	17.0 (2,530)
Parous	83.0 (12,338)
Missing	*457*
Number of reported comorbidities	
0	66.3 (10,165)
1	25.3 (3,878)
≥2	8.4 (1,282)
Ethnicity	
White	88.3 (12,614)
Asian or Asian British	4.3 (607)
Black or Black British	5.4 (770)
Other	2.0 (292)
Missing	*1,042*
Socioeconomic deprivation (IMD)	
Quintile 1 (most deprived)	23.5 (3,418)
Quintile 2	21.7 (3,159)
Quintile 3	20.2 (2,944)
Quintile 4	18.7 (2,720)
Quintile 5 (least deprived)	15.8 (2,304)
Missing	*780*

Table 2. Severity and duration of symptoms at the first outpatient visit, by age group, ethnicity and socioeconomic deprivation

	Severity score (0 best and 100 worst) (n=14,990)			Condition-specific quality of life (0 worst and 100 best) (n=14,586)			Generic quality of life (0 death and 1 perfect health) (n=13,802)			Symptoms ≥1 year (n=14,866)		
	Mean score (se)	Adjusted[i] difference (95% CI)	p-value	Mean score (se)	Adjusted[i] difference (95% CI)	p-value	Mean score (se)	Adjusted[i] difference(95% CI)	p-value	% (se)	Adjusted[i] OR (95% CI)	p-value
Total	61.8 (0.17)			34.7 (0.18)			0.65 (0.28)			74.0 (0.36)		
Age group												
18-34	63.1 (0.44)	-		33.2 (0.48)	-		0.61 (0.007)	-		70.7 (0.98)	-	
35-39	62.9 (0.49)	-1.59 (-2.89, -0.29)		33.3 (0.51)	1.75 (0.39, 3.10)		0.63 (0.008)	0.03 (0.01, 0.05)		74.8 (1.00)	1.25 (1.09, 1.44)	
40-44	62.5 (0.33)	-2.17 (-3.30, -1.04)	p<0.001	33.7 (0.35)	2.59 (1.40, 3.77)	p<0.001	0.64 (0.005)	0.04 (0.02, 0.06)	p<0.001	76.8 (0.67)	1.39 (1.23, 1.58)	p<0.001
45-49	61.3 (0.31)	-3.36 (-4.47, -2.51)		35.4 (0.33)	4.23 (3.06, 5.39)		0.67 (0.005)	0.07 (0.05, 0.08)		74.2 (0.64)	1.20 (1.06, 1.35)	
>=50	59.0 (0.47)	-5.88 (-7.19, -4.58)		38.2 (0.51)	7.31 (5.93, 8.68)		0.70 (0.007)	0.10 (0.07, 0.12)		70.9 (0.98)	1.01 (0.88, 1.16)	
Ethnicity												
White	61.9 (0.19)	-		34.8 (0.20)	-		0.66 (0.003)	-		74.1 (0.38)	-	
Black or Black British	61.5 (0.82)	-1.93 (-3.51, -0.35)		35.0 (0.86)	1.45 (-0.16, 3.06)		0.62 (0.01)	-0.01 (-0.08, 0.02)		79.4 (1.47)	1.34 (1.11, 1.62)	
Asian or Asian British	60.7 (1.02)	-2.38 (-4.25, -0.51)	P=0.011	34.2 (1.07)	1.32 (-0.59, 3.22)	0.1392	0.58 (0.02)	-0.05 (-0.88, -0.01)	p<0.001	66.1 (1.49)	0.70 (0.58, 0.85)	p<0.001
Other	61.5 (1.33)	-0.46 (-3.09, 2.16)		33.9 (1.41)	-1.01 (-3.54, 1.51)		0.60 (0.02)	-0.05 (-0.30, -0.20)		72.3 (2.67)	0.92 (0.70, 1.20)	
Socioeconomic deprivation (IMD)												
Quintile 1 (most deprived)	65.5 (0.37)	-		30.5 (0.39)	-		0.55 (0.007)	-		72.0 (0.78)	-	
Quintile 2	63.5 (0.38)	-1.53 (-2.57, 0.50)		33.1 (0.40)	1.82 (0.75, 2.90)		0.62 (0.006)	0.06 (0.05, 0.08)		73.6 (0.80)	1.11 (0.99, 1.24)	
Quintile 3	61.6 (0.39)	-4.22 (-4.30, -2.12)	p<0.001	35.0 (0.41)	3.44 (2.34, 4.54)	p<0.001	0.67 (0.006)	0.09 (0.08, 0.11)	p<0.001	75.1 (0.81)	1.20 (1.06, 1.34)	P=0.0091
Quintile 4	59.5 (0.41)	-6.02 (-6.02, -3.87)		36.8 (0.43)	4.78 (3.66, 5.90)		0.71 (0.006)	0.13 (0.12, 0.15)		74.5 (0.85)	1.16 (1.03, 1.31)	
Quintile 5 (least deprived)	58.2 (0.44)	-6.07 (-7.23, -4.91)		38.6 (0.46)	6.29 (5.10, 7.48)		0.73 (0.006)	0.14 (0.13, 0.16)		75.1 (0.91)	1.21 (1.07, 1.37)	

Footnote: All multivariable models were adjusted for body mass index, parity, and number of co-morbidities. P-values based on Wald test

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-6
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	5, 7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, explain how loss to follow-up was addressed	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	Only one stage
		(c) Consider use of a flow diagram	Only one stage
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8 and Table 1
		(b) Indicate number of participants with missing data for each variable of interest	8 (Table 1)
		(c) Summarise follow-up time (eg, average and total amount)	N/A (Baseline)
Outcome data	15*	Report numbers of outcome events or summary measures over time	N/A (Baseline results)
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-9 (Table 2)
		(*b*) Report category boundaries when continuous variables were categorized	8 (Table 2)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	7

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Sociodemographic differences in symptom severity and duration amongst women referred to secondary care for menorrhagia in England and Wales: a cohort study from the National Heavy Menstrual Bleeding Audit

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-018444.R2
Article Type:	Research
Date Submitted by the Author:	11-Dec-2017
Complete List of Authors:	Kiran, Amit; London School of Hygiene & Tropical Medicine, Department of Health Services Research and Policy Geary, Rebecca; London School of Hygiene and Tropical Medicine Faculty of Public Health and Policy, Department of Health Services Research and Policy Gurol Urganci, Ipek; London School of Hygiene & Tropical Medicine, Health Services Research & Policy Cromwell, David; London School of Hygiene & Tropical Medicine, Health Services Research & Policy Bansi-Matharu, Loveleen; University College London, Institute for Global Health Shakespeare, Judy; Royal College of General Practitioners Mahmood, Tahir; Forth Park Hospital, Obstetrics and Gynaecology van der Meulen, Jan; London School of Hygiene and Tropical Medicine
Primary Subject Heading:	Obstetrics and gynaecology
Secondary Subject Heading:	Health services research, Patient-centred medicine
Keywords:	GYNAECOLOGY, EPIDEMIOLOGY, PRIMARY CARE

Sociodemographic differences in symptom severity and duration amongst women referred to secondary care for menorrhagia in England and Wales: a cohort study from the National Heavy Menstrual Bleeding Audit

Kiran A[1,2,ƚ], Geary RS[1,2,ƚ], Gurol-Urganci I[1,2], Cromwell DA[1,2], Bansi-Matharu L[3], Shakespeare J[4], Mahmood T[2], van der Meulen J[1,2]

[1] *Department of Health Services Research and Policy, London School of Hygiene & Tropical Medicine, London, UK*
[2] *Lindsay Stewart Centre for Audit and Clinical Informatics, Royal College of Obstetricians and Gynaecologists, London, UK*
[3] *Institute of Epidemiology & Health, University College London, London, UK*
[4] *Royal College of General Practitioners, London, UK*

ƚ A Kiran and RS Geary contributed equally to this paper

Corresponding author: Rebecca Geary, 15-17 Tavistock Place, London School of Hygiene & Tropical Medicine, London, WC1H 9SH. Email: rebecca.geary@lshtm.ac.uk Telephone: 02079272279

ABSTRACT

Objective To examine symptom severity and duration at time of referral to secondary care for heavy menstrual bleeding by socio-economic deprivation, age and ethnicity

Design Cohort analysis of data from the National Heavy Menstrual Bleeding Audit linked to Hospital Episode Statistics data

Setting English and Welsh National Health Services (secondary care): February 2011 to January 2012

Participants 15,325 women aged 18 to 60 years in England and Wales who had a new referral for heavy menstrual bleeding to a gynaecology outpatient department

Methods Multivariable linear regression to calculate adjusted differences in mean symptom severity and quality of life scores at first outpatient visit. Multivariable logistic regression to calculate adjusted odds ratios. Adjustment for body mass index, parity and co-morbidities.

Primary Outcome Measures Mean symptom severity score (0=best, 100=worst), mean condition-specific quality of life score (0=worst, 100=best) and symptom duration (≥1 year).

Results Women were on average 42 years old and 12% were non-white. Mean symptom severity and condition-specific quality of life scores were 61.8 and 34.7. Almost three-quarters of women (74%) reported having had symptoms for ≥1 year. Women from more deprived areas had more severe symptoms at their first outpatient visit (difference -6.1; 95%CI-7.2:-4.9, between least and most deprived quintile) and worse condition-specific quality of life (difference 6.3; 95%CI 5.1:7.5). Symptom severity declined with age whilst quality of life improved.

Conclusions Women living in more deprived areas reported more severe HMB symptoms and poorer quality of life at the start of treatment in secondary care. Providers should examine referral practices to explore if these differences reflect women's health-seeking behaviour or how providers decide whether or not to refer.

Funding The National Heavy Menstrual Bleeding (HMB) Audit was funded by the Healthcare Quality Improvement Partnership as part of the National Clinical Audit and Patient Outcomes Programme, contract number HQIP NCA 004.

Keywords heavy menstrual bleeding, deprivation, ethnicity, health inequalities, patient-reported outcomes, quality of life

Tweetable abstract Women from deprived areas referred with more severe heavy menstrual bleeding, potentially reflecting inequity

Strengths and limitations of this study

- This study is the first to examine Heavy Menstrual Bleeding symptom severity and duration at time of referral to secondary care
- The inclusion of patient-reported symptom severity and quality of life addresses a knowledge gap about how women feel about their heavy menstrual bleeding
- As the data were collected by a national audit in England and Wales the sample is relatively large, allowing comparisons between ethnic minority groups
- Even though the sample size is large, the National HMB Audit recruited approximately 30% of eligible women. However, the characteristics of the women recruited were broadly representative of the UK population in terms of ethnicity and age
- Linking audit data to administrative hospital data also allowed comparisons between socioeconomic groups

INTRODUCTION

Heavy menstrual bleeding (HMB) is a common condition that affects one in four women of reproductive age. In England and Wales, an estimated 50,000 women with HMB are referred from primary care to secondary care gynaecology services provided by the National Health Service (NHS) every year[1]. Menstrual disorders account for approximately 20% of referrals to specialist gynaecology services[2] and studies have found significant regional variations in use of surgical treatment within England[3].

Women with HMB have significantly worse quality of life than women with normal menstrual bleeding loss, in terms of their physical and mental health, as well as their emotional, social and material quality of life[4-7]. More than a third of women with HMB report severe pain[7]. HMB is also associated with morbidity, including anaemia and related fatigue[8, 9]. Women with HMB experience reduced participation in social activities and their personal relationships and attendance at work can be adversely affected[10].

In order to improve the quality of life of women with HMB, it is important to understand both the aetiology of this condition and its management in primary and secondary care[11]. The prevalence of HMB and conditions which affect symptom severity has been reported to vary by ethnicity[12-15]. In addition, cultural norms and patient choice for treatment may vary between different groups[16, 17].

In this study, we used data from the National HMB Audit to examine symptom severity, quality of life and symptom duration at women's first gynaecology outpatient visit for HMB. The National HMB Audit was a 4-year project (2010 - 2014) that assessed patient-reported outcomes and experiences of care for women with HMB in England and Wales. Our objective is to examine symptom severity and duration at the time of referral to secondary care by age, ethnicity and socio-economic deprivation to get a better understanding of the burden of disease at the start of treatment in secondary care.

METHODS

Data collection

Full details of the methods used in the National HMB Audit have been reported elsewhere[1, 4, 18, 19]. Women aged between 18 and 60 years in England and Wales who had a new referral for HMB to a gynaecology outpatient department were eligible to participate in the National HMB Audit. Women who had visited a gynaecology outpatient clinic for HMB within the previous 12 months were excluded. Recruitment took place between 1 February 2011 and 31 January 2012[1, 19].

Women who consented to participate completed a baseline questionnaire (58 questions) on age, ethnicity, duration of HMB symptoms, obstetric history, prior treatment received for HMB and co-morbidities. The questionnaire also collected patient-reported HMB-specific and generic quality of life measures.

Scores for symptom severity and condition-specific health-related quality of life were adapted from the Uterine Fibroid Symptom and Quality of Life (UFS-QoL) questionnaire[20]. Of five candidate questionnaires evaluated, only the UFS-QOL could be used throughout the care pathway, measured HRQoL and was psychometrically strong[18]. The UFS-QOL was therefore adapted for HMB and a UK population. We conducted semi-structured interviews with women (*n* = 7) and clinicians (*n* = 5) and a mini focus group (*n* = 3) with local Heavy Menstrual Bleeding Audit coordinators to determine suitable alternative words to describe HMB, and to identify words not clearly understood in UK English. Based on this we changed the wording to refer to 'heavy menstrual bleeding' (i.e. heavy periods)' rather than 'fibroids', changed 'checking' to 'ticking'; 'soiling' to 'staining'; 'blue' to 'low'; and 'wiped out' to 'exhausted'. The adapted version performed acceptably in a psychometric evaluation. Overall, the symptom severity subscale and the HRQL subscale of the UFS-QOL used as outcomes demonstrated the strongest psychometric properties and have been used to report the audit data. The UFS-QOL consists of eight symptom items and 29 HRQoL items. The symptom items are scored to produce a severity subscale and the HRQoL items are scored into subscales (concern, activities, energy/mood, control, self-consciousness and sexual function). The HRQoL sub-scales can be used separately or combined into an overall HRQoL score. We use the overall HRQoL score in this paper.

A generic health-related quality of life measure was derived from the European Quality of Life-5 Dimensions (EuroQol-5 or EQ-5D)[21]. This generic measure was used because it is the instrument recommended by the Department of Health and allows comparisons with other national studies, such as the Patient Reported Outcome Measures study of common elective surgical procedures[21]. Women completed the questionnaire in hospital before their consultation. Using multiple sources of data, the recruitment rate of the audit was estimated to be 31.9%[1]. Descriptive results from the National HMB Audit have been published elsewhere[1, 4, 18, 19].

Data from the prospective audit were linked at patient level to records from Hospital Episode Statistics (HES) and Patient Episode Database for Wales (PEDW), administrative databases that capture all inpatient and outpatient episodes in English and Welsh NHS hospitals. Data linkage was performed using deterministic linkage criteria that included NHS number, sex and date of birth.

Measures

Symptom severity, condition-specific quality of life and generic quality of life scores and the reported duration of symptoms at the first outpatient visit were used as outcomes in this study. The severity and quality of life scores were analysed as continuous variables. Symptom severity scores ranged from 0 (best possible score) to 100 (greatest symptom severity, worst possible score). Condition-specific quality of life ranged from 0 (poorest quality of life) to 100 (best quality of life). Generic quality of life is expressed on a scale with 0 representing death and 1 perfect health[22]. Women were asked "How long have you had symptoms of heavy menstrual bleeding", with "2 months or less", "more than 2 months but less than 1 year", "more than 1 year" and "don't know" as possible response categories. For analysis, duration of symptoms was grouped as "<1 year", "≥1 year" with "don't know" coded as missing. Levels of missing data on HMB symptoms and health-related quality of life were low (2.2% for severity, 4.8% for condition-specific and 9.9% for generic quality of life and 3.0% for symptom duration).

Age was categorised as 18-34, 35-39, 40-44, 45-49, ≥50 years for analysis. Women reported their ethnicity as "white", "mixed", "Asian or Asian British", "black or black British", "Chinese" or "other". For analysis, the "mixed", "Chinese" and "other" groups were combined as "other" due to small numbers of women reporting these ethnicities. Self-reported height and weight data were used to derive body mass index (BMI), categorised according to WHO groups as ≤25, 25-30, and ≥30[23]. Women reported how many times they had seen their GP for HMB in the year prior to their first outpatient visit, and this was grouped as 0, 1-2, 3-4,>4 for analysis ("don't know" was coded as missing).

Women reported their parity, grouped for analysis as “nulliparous” or “parous”. Women were also asked “Have you been told by a doctor that you have any of the following: “heart disease (for example angina, heart attack or heart failure), high blood pressure, lung disease (for example chronic bronchitis or emphysema), diabetes, depression, thyroid disorder, kidney disease, cancer (within the last 5 years). For analysis, the number of co-morbidities reported was grouped as 0, 1, ≥2.

Information on socio-economic deprivation (Index of Multiple Deprivation (IMD)) was extracted from HES and PEDW. IMD is a relative measure of deprivation for small areas across a number of domains, including income, employment, education and housing. We used quintiles of IMD (level 1 = most deprived areas, level 5 = least deprived areas). The methods used to calculate IMD scores in each country in the UK are similar but not directly comparable[24]. For analysis, we generated a combined measure of deprivation for England and Wales by assigning those in each country-specific quintile to the same quintile in a combined measure. This preserved women’s relative deprivation position within each country.

Statistical analysis

Means and standard deviations (SD) and proportions were used to describe the cohort. Regression analyses were used to examine the relationship between age, ethnicity and socio-economic deprivation and each of the outcomes. For the scores representing symptom severity, condition specific and generic quality of life, multivariable linear regression was used to calculate adjusted differences in mean scores. For duration of symptoms (<1 year and ≥1 year), multivariable logistic regression was used to calculate adjusted odds ratios (OR). Regression models included BMI, parity and number of co-morbidities as potential confounders. Levels of missing data were low (<3%) for the majority of variables with the exception of ethnicity (7% missing) and BMI (approximately 23% missing, Table 1). Missing values for explanatory variables were imputed using multiple imputation by chained equations[25] and statistical coefficients were obtained using ten imputed datasets and combined using Rubin’s rules[26].

ETHICAL APPROVAL

The data are from the National Heavy Menstrual Bleeding (HMB) Audit. Based on the Health Research Authority’s guidance, audits are regulated as standard clinical practice outside of the Research Ethics Service[27].

RESULTS

Patient Characteristics

15,325 eligible women completed the questionnaire at their first visit to a gynaecology outpatient department and 15,294 (99.8%) could be linked to HES or PEDW which provided information on socioeconomic deprivation. The women's mean age was 42.3 years (SD 7.6) and BMI 27.3 (SD 5.4) (Table 1). About one in five were nulliparous and one in three reported at least one co-morbidity. 11.7% of women reported a non-white ethnicity, with black or black British (5.4%) and Asian or Asian British (4.3%) being the largest non-white groups. Women in the two least socioeconomically deprived national quintile groups (18.7% in quintile 4 and 15.8% in quintile 5) were under-represented given that per definition 20% of women are expected to be in each group. The distribution of symptom severity, condition-specific and generic quality of life and symptom duration by level of deprivation did not vary significantly between women in England and Wales (data not shown).

Table 1: Patient characteristics at the first gynaecology outpatient visit for HMB (% and number unless otherwise stated)

The mean score for symptom severity was 61.8 (standard error (SE) 0.17) with 74.0% of women reporting that they had HMB symptoms for more than one year. The mean score for condition-specific quality of life was 34.7 (SE: 0.18) and for generic quality of life 0.65 (SE: 0.28) (Table 2).

Severity of symptoms and quality-of-life by socioeconomic deprivation

Symptom severity scores gradually increased with increasing socioeconomic deprivation (Table 2). Condition-specific and generic quality of life scores also showed a worsening gradient according to deprivation. In other words, women living in more deprived areas reported more severe symptoms (difference -6.1; 95%CI-7.2 to -4.9, between least and most deprived quintile) and a poorer quality of life (difference 6.3; 95%CI 5.1 to 7.5) at their first gynaecology outpatient visit for HMB than those living in less deprived areas.

Severity of symptoms and quality-of-life by age and ethnicity

Symptom severity showed a gradual decrease with increasing age, indicating that older women reported less severe symptoms at their first outpatient visit for HMB (difference -5.9; 95% CI: -7.2 to -4.6 between oldest and youngest age groups, Table 2). Quality of life scores based on both the condition-specific and the generic measure increased with increasing age, which shows that older women reported better quality of life at their first HMB outpatient visit (difference 7.3; 95% CI: 5.9 to 8.7) between oldest and youngest age groups). Symptom severity also varied by ethnicity: black and Asian women reported less severe symptoms than white women (difference compared to white women -1.9 and -2.4 respectively, Table 2). Condition-specific quality of life did not vary significantly by ethnicity, whereas compared to white women, Asian woman reported lower generic quality of life scores (Table 2).

Duration of symptoms

Women living in the most deprived areas were slightly less likely to report having had HMB symptoms for ≥1 year than those living in the less deprived areas. Women aged between 35 and 49 years were more likely to report having experienced HMB symptoms for ≥1 year than those younger than 35. Compared to white women, black women were more likely than white women to report symptoms for ≥1 year and Asian women were less likely.

Table 2. Severity and duration of symptoms at the first outpatient visit, by age group, ethnicity and socioeconomic deprivation

DISCUSSION

Main Findings

Women living in more socioeconomically deprived areas reported more severe HMB symptoms and poorer quality of life at their first gynaecology outpatient visit. Older women reported less severe symptoms and better quality of life than younger women. Reported symptom severity also varied by ethnicity with black and Asian women reporting less severe symptoms than women from white ethnic backgrounds.

Three quarters of the women referred to secondary care reported that they had had symptoms of HMB for at least one year and women living in the most deprived areas were least likely to report having had HMB symptoms for ≥1 year.

Interpretation

More severe symptoms and poorer quality of life at first outpatient visit by socioeconomic deprivation, after adjustment for possible differences in age, ethnicity and body mass index, reflect that women from more deprived backgrounds report more severe problems at the start of treatment in secondary care but they were least likely to report that they had symptoms for at least one year. The difference in the symptom severity score between women from the least and the most deprived areas of about 6 is likely to be clinically significant, given that a difference of 5 points or more has been specified as clinically important in clinical trials[28]. There is evidence that people from more socioeconomically deprived backgrounds may be more accepting of symptoms, chronic pain or poorer health-related quality of life[29], which is a possible explanation for these finding. Conversely, those from more affluent socioeconomic backgrounds have been found to report greater impact of health conditions on their health and their quality of life, which may be linked to their higher expectations about health and life in general[30].

Alternative explanations are that differences in symptom severity, quality of life and symptom reflect inequitable access as well as differences in the nature and causes of HMB. Age is often found to be associated with symptom severity[15, 16,][31, 32]. Black women are 2-3 times more likely to have fibroids and endometriosis[32]. Accepting heavy periods as normal vary by ethnicity and other social factors, which in turn can also lead to reluctance to seek care for HMB[16]. Ethnographic research suggests that some women of South Asian ethnicity do not seek healthcare for HMB due to the belief that heavy periods cleanse the body[17]. We adjust for patient-level characteristics that may capture some of these differences but were unable to adjust for other unmeasured potential confounders.

The observation that women living in the most socio-economically deprived areas reported the most severe symptoms but were least likely to report having had symptoms for ≥1 year may reflect the wording of the question; women were asked “How long have you had symptoms of heavy menstrual bleeding?” and women whose symptom severity had worsened may have reported the duration of the most recent severity, rather than the overall duration.

A key question is whether the observed differences in symptom severity and condition-specific quality of life at the women’s first gynaecology outpatient visit are related to differences in women’s health seeking behaviour or to differences in how GPs and gynaecologists decide on whether to refer a woman with HMB. A study of self-reported health-care seeking behaviour in England did not find evidence that inequality in access to secondary care according to socioeconomic or ethnic backgrounds is related to patients being less likely to go to their GP or a hospital’s emergency department[33]. Similarly, a survey of patients with chronic joint pain found that the proportions of patients who said that they were seeking help from their GP did not differ according to their socioeconomic background[34]. On the other hand, a national study including 130,000 patients from more than 300 primary care practices in England found that older patients and those from more deprived areas were less likely to be referred to secondary care[35].

Implications for policy and practice

In the UK, national guidelines for the management of HMB have been developed by the National Institute for Health and Care Excellence and the Royal College of Obstetricians and Gynaecologists (RCOG)[11, 36, 37]. The National HMB Audit carried out a survey of NHS hospitals in England and Wales to find out how care for women with HMB is organised and delivered at local levels. It found that key systems such as the availability of local protocols, which specified local arrangements for patient referral and management in response to the NICE guidelines, were reported only by 30% of hospitals[38]. Wide variation in the investigations and treatments that were offered to women with HMB in primary care were also noted. The implementation of locally agreed referral pathways, recommended by the RCOG, will help to reduce this variation[39].

Women with HMB in this study reported substantially worse QoL (EQ-5D mean: 0.65, SD: 0.33) than the population average for women in England (mean: 0.85, SD: 0.003), and compared to women with incontinence (mean: 0.73, SD: 0.26)[40, 41]. This reinforces the need for interventions to focus on improving women's quality of life, as recommended by recent NICE guidelines[11]. Obesity can be associated with HMB so health promotion interventions around diet and exercise could supplement HMB-specific interventions. Criteria for what constitutes a meaningful improvement in quality of life are less clear. Awareness raising activities relating to the availability of treatments for HMB could increase healthcare seeking before symptoms become severe. This may be particularly beneficial for those from more deprived background who may be more accepting of chronic pain and worse quality-of-life. In highlighting differences in symptom severity at their first gynaecology outpatient visit, our findings draw attention to the lack of an agreed threshold for referral of women with HMB to secondary care in terms of symptom severity and quality of life. Routine measurement of both symptom severity and quality of life may be required to stimulate greater consistency in referral thresholds but validated instruments specific to HMB are currently lacking. As there is no widely used condition-specific measure of condition-specific quality of life for HMB, the National HMB Audit used the Uterine Fibroid Symptom and Quality of Life (UFS-QOL) questionnaire, adapted for a UK population of women with HMB[18].

Strengths and Limitations

This study is the first to examine the relationship between sociodemographic factors and patient-reported HMB symptom severity, quality of life and symptom duration in an outpatient setting. It used data collected by a national audit carried out in England and Wales, which produced a relatively large sample. We estimated that the National HMB Audit recruited about 30% of all eligible women. There is no direct way to compare the characteristics of the women who were recruited and those who were not. However, the characteristics of the women who were recruited were broadly representative of the UK population in terms of the distributions of ethnicity and age[42, 43].

Survey questionnaires were only available in the English language, so non-English speakers are likely to be under-represented. On the other hand, case ascertainment varied by provider and women from providers with higher case ascertainment (ascertainment > 45%) were more often from a non-white ethnic background and a more deprived areas than those referred to providers with lower case ascertainment[4] which suggests that the impact of not having questionnaires in other languages is likely to be small.

CONCLUSION

About three in four women at their first visit to a gynaecological outpatient clinic for HMB in England and Wales reported that they had symptoms at least one year before they were referred to secondary care. Women from more deprived areas reported more severe HMB symptoms and a poorer quality of life, which demonstrates a higher burden of disease at the time of referral to secondary care. Primary and secondary care providers should examine to what extent these differences reflect barriers in access to gynaecological secondary care services or women's perceptions of their menstrual problems and health-seeking behaviour.

ACKNOWLEDGEMENTS

We would firstly like to thank all NHS providers and patients that participated in the National HMB Audit. We would also like to thank Healthcare Quality Improvement Partnership, Health and Social Care Information Centre and the Royal College of Surgeons of England for providing the authors with the data required for this study. This publication is based on data collected by or on behalf of the Healthcare Quality Improvement Partnership, who have no responsibility or liability for the accuracy, currency, reliability and/or correctness of this publication.

DATA SHARING STATEMENT

The data analysed were collected as part of a national clinical audit and linked to administrative hospital data (Hospital Episode Statistics). They were shared with the authors by the Healthcare Quality Improvement Partnership, Health and Social Care Information Centre and the Royal College of Surgeons of England. The data cannot be shared further without formal application to the data providers.

CONTRIBUTORS

The research question was derived by TM and JvdM. Data collection was supported directly by AK, IGU, DC, LBM and through advice by JS, TM, JvdM. Data analysis was performed by AK, IGU & RSG. All authors contributed to the writing of the manuscript.

COMPETING INTERESTS

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: all authors except RSG had financial support from the Healthcare Quality Improvement Partnership as part of the National Clinical Audit and Patient Outcomes Programme for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

FUNDING

The authors declare no funding for the writing of this manuscript. The National Heavy Menstrual Bleeding (HMB) Audit was funded by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). The audit was led by the Royal College of Obstetricians and Gynaecologists.

REFERENCES

1. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Third Annual Report*. 2013, RCOG Press.
2. Coulter, A., et al., *Outcomes of referrals to gynaecology outpatient clinics for menstrual problems: an audit of general practice records.* British Journal of Obstatrics and Gynaecology, 1991. **98**(8): p. 789-796.
3. Cromwell, D., et al., *Surgery for menorrhagia within English regions: variation in rates of endometrial ablation and hysterectomy.* BJOG, 2009. **116**(10): p. 1373-9.
4. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Final Report*. 2014, RCOG Press.
5. Karlsson, T.S., L.B. Marions, and M.G. Edlund, *Heavy menstrual bleeding significantly affects quality of life.* Acta Obstet Gynecol Scand., 2014. **93**(1): p. 52-7. doi: 10.1111/aogs.12292. Epub 2013 Nov 25.
6. Shankar, M., C. Chi, and R.A. Kadir, *Review of quality of life: menorrhagia in women with or without inherited bleeding disorders.* Haemophilia., 2008. **14**(1): p. 15-20. Epub 2007 Oct 24.
7. Sule Gokyildiz, E.A., Nezihe Kizilkaya Beji, Meltem Mecdi *The Effects of Menorrhagia on Women's Quality of Life: A Case-Control Study.* ISRN Obstet Gynecol., 2013. **918179**.
8. Wang, W., et al., *Iron deficiency and fatigue in adolescent females with heavy menstrual bleeding.* Haemophilia, 2013. **19**(2): p. 225-230.
9. Cohen, B. and Y. Gibor, *Anemia and menstrual blood loss.* Obstetric and Gynecological Survery, 1980. **35**(10): p. 597-618.
10. Bitzer, J., M. Serrani, and A. Lahav, *Women's attitudes towards heavy menstrual bleeding, and their impact on quality of life.* Journal of Contraception, 2013. **4**: p. 21–28. .
11. National Collaborating Centre for Women's and Children's Health, National Institute for Health and Clinical Excellence (NICE), *Heavy Menstrual Bleeding. Clinical Guideline No. 44*. 2007, NICE.
12. Harlow, S.D. and B. Campbell, *Ethnic differences in the duration and amount of menstrual bleeding during the postmenarcheal period.* Am J Epidemiol., 1996. **144**(10): p. 980-8.
13. National Health Service (NHS) UK. *Heavy periods (menorrhagia) - Causes*. 20/02/2015]; Available from: http://www.nhs.uk/Conditions/Periods-heavy/Pages/Causes.aspx.
14. Mayo Clinic. *Menorrhagia (heavy menstrual bleeding)*. 20/02/2015]; Available from: http://www.mayoclinic.org/diseases-conditions/menorrhagia/basics/causes/con-20021959.
15. Barbara S. Apgar, A.H.K., Uche George-Nwogu, Anne Kittendorf, *Treatment of Menorrhagia*. 2007: American Family Physician. p. 1813-1819.
16. O'Flynn, N., *Menstrual symptoms: the importance of social factors in women's experiences.* British Journal of General Practice, 2006. **56**(533): p. 950-957.
17. Chapple, A., *Iron deficiency anaemia in women of South Asian descent: a qualitative study.* Ethnicity and Health, 1998. **3**(3): p. 199-212.
18. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: First Annual Report*. 2011, RCOG Press.
19. Royal College of Obstetricians and Gynaecologists, London School of Hygiene & Tropical Medicine, Ipsos MORI, *National Heavy Menstrual Bleeding Audit: Second Annual Report*. 2012, RCOG Press.
20. Spies, J., et al., *The UFS-QOL, a New Disease-Specific Symptom and Health-Related Quality of Life Questionnaire for Leiomyomata.* Obstetrics and Gynecology, 2002. **99**(2): p. 290-300.
21. The EuroQol Group, *EuroQol-a new facility for the measurement of health-related quality of life.* Health Policy, 1990. **16**(3): p. 199-208.

22. Kind, P., G. Hardman, and S. Macran, *UK Population Norms for EQ-5D: York Centre for Health Economics Discussion Paper 172*. 1992.

23. World Health Organisation. *BMI Classification*. Global Database on Body Mass Index 06/10/2016]; Available from: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html.

24. Payne, R. and G. Abel, *UK indices of multiple deprivation - a way to make comparisons across constituent countries easier.* Health Statistics Quarterly, 2012. **53**.

25. Royston P, *Multiple imputation of missing values.* The Stata Journal, 2005 **5**: p. 527-36.

26. Rubin D, *Multiple imputation for non-response in surveys*. 1987, New York: John Wiley & Sons.

27. Health Research Authority, *Defining research*. 2016, Health Research Authority: London.

28. Gibbons, R., et al., *A structured review of patient-reported outcome measures for people undergoing elective procedures for benign gynaecological conditions of the uterus. Report to the Department of Health*. 2010, University of Oxford: Oxford.

29. Delpierre, C., et al., *Using self-rated health for analysing social inequalities in health: a risk for underestimating the gap between socioeconomic groups?* Journal of Epidemiology and Community Health, 2009. **63**: p. 426-432.

30. Ross, C. and M. Van Willigen, *Education and the subjective quality of life.* Journal of Health and Social Behaviour, 1997. **38**: p. 275-297.

31. Janssen, C.A., P.C. Scholten, and A.P. Heintz, *Menorrhagia--a search for epidemiological risk markers.* Maturitas., 1997. **28**(1): p. 19-25.

32. National Institute for Health and Care Excellence (NICE), *NICE support for commissioning for heavy menstrual bleeding*. 2013.

33. Adamson, J., et al., *Ethnicity, socioeconomic position and gender: do they affect reported health-care seeking behaviour.* Social Science and Medicine, 2003. **57**(5): p. 895-904.

34. Thorstensson, C., et al., *Help-seeking behaviour among people living with chronic hip or knee pain in the community.* BMC Musculoskeletal Disorders, 2009. **10**(153).

35. McBride, D., et al., *Explaining variation in referral from primary to secondary care: cohort study.* BMJ, 2010. **341**: p. c6267.

36. National Institute for Health and Care Excellence (NICE), *Heavy Menstrual Bleeding. NICE quality standard 47*. 2013, NICE.

37. Royal College of Obstetricians and Gynaecologists, *Standards for Gynaecology. Report of a Working Party*. 2008, RCOG.

38. Cox, S., et al., *The delivery of heavy menstrual bleeding services in England and Wales after publication of national guidelines: a survey of hospitals.* BMC Health Services Research, 2013. **13**: p. 491.

39. Royal College of Obstetricians and Gynaecologists, *Advice for Heavy Menstrual Bleeding (HMB) Services and Commissioners*. 2014.

40. The EuroQol Group, *Self-Reported Population Health: An International Perspective based on EQ-5D*, A. Szende, B. Janssen, and J. Cabases, Editors. 2014, Springer Netherlands.

41. Harvie, H.S., et al., *Validity of utility measures for women with urge, stress, and mixed urinary incontinence.* Am J Obstet Gynecol., 2014. **210**(1): p. 85.e1-6. doi: 10.1016/j.ajog.2013.09.025. Epub 2013 Sep 18.

42. Office for National Statistics, *Office for National Statistics, 2001 Census: Social Focus in Brief - Ethnicity 2002*. 2002.

43. Office for National Statistics, *Office for National Statistics, 2011 Census: Ethnicity and National Identity in England and Wales 2011*. 2012.

Table 1: Patient characteristics at the first gynaecology outpatient visit for HMB (% and number unless otherwise stated)

	Full Cohort (n=15,325)
Age, mean (sd) in years	42.3 (7.6)
Age groups	
18-34	14.9 (2,283)
35-39	12.9 (1,971)
40-44	26.6 (4,071)
45-49	31.3 (4,794)
≥50	14.4 (2,206)
Body mass index, mean (sd) in kg/m^2	27.3 (5.4)
Body mass index, categories	
≤25	39.6 (4,681)
25-30	31.7 (3,739)
≥30	28.7 (3,392)
Missing	*3,513*
Parity	
Nulliparous	17.0 (2,530)
Parous	83.0 (12,338)
Missing	*457*
Number of reported comorbidities	
0	66.3 (10,165)
1	25.3 (3,878)
≥2	8.4 (1,282)
Ethnicity	
White	88.3 (12,614)
Asian or Asian British	4.3 (607)
Black or Black British	5.4 (770)
Other	2.0 (292)
Missing	*1,042*
Socioeconomic deprivation (IMD)	
Quintile 1 (most deprived)	23.5 (3,418)
Quintile 2	21.7 (3,159)
Quintile 3	20.2 (2,944)
Quintile 4	18.7 (2,720)
Quintile 5 (least deprived)	15.8 (2,304)
Missing	*780*

Table 2. Severity and duration of symptoms at the first outpatient visit, by age group, ethnicity and socioeconomic deprivation

	Severity score (0 best and 100 worst) (n=14,990)			Condition-specific quality of life (0 worst and 100 best) (n=14,586)			Generic quality of life (0 death and 1 perfect health) (n=13,802)			Symptoms ≥1 year (n=14,866)		
	Mean score (se)	Adjusted^{i} difference (95% CI)	p-value	Mean score (se)	Adjusted^{i} difference (95% CI)	p-value	Mean score (se)	Adjusted^{i} difference(95% CI)	p-value	% (se)	Adjusted^{i} OR (95% CI)	p-value
Total	61.8 (0.17)			34.7 (0.18)			0.65 (0.28)			74.0 (0.36)		
Age group												
18-34	63.1 (0.44)	-		33.2 (0.48)	-		0.61 (0.007)	-		70.7 (0.98)	-	
35-39	62.9 (0.49)	-1.59 (-2.89, -0.29)		33.3 (0.51)	1.75 (0.39, 3.10)		0.63 (0.008)	0.03 (0.01, 0.05)		74.8 (1.00)	1.25 (1.09, 1.44)	
40-44	62.5 (0.33)	-2.17 (-3.30, -1.04)	p<0.001	33.7 (0.35)	2.59 (1.40, 3.77)	p<0.001	0.64 (0.005)	0.04 (0.02, 0.06)	p<0.001	76.8 (0.67)	1.39 (1.23, 1.58)	p<0.001
45-49	61.3 (0.31)	-3.36 (-4.47, -2.51)		35.4 (0.33)	4.23 (3.06, 5.39)		0.67 (0.005)	0.07 (0.05, 0.08)		74.2 (0.64)	1.20 (1.06, 1.35)	
>=50	59.0 (0.47)	-5.88 (-7.19, -4.58)		38.2 (0.51)	7.31 (5.93, 8.68)		0.70 (0.007)	0.10 (0.07, 0.12)		70.9 (0.98)	1.01 (0.88, 1.16)	
Ethnicity												
White	61.9 (0.19)	-		34.8 (0.20)	-		0.66 (0.003)	-		74.1 (0.38)	-	
Black or Black British	61.5 (0.82)	-1.93 (-3.51, -0.35)		35.0 (0.86)	1.45 (-0.16, 3.06)		0.62 (0.01)	-0.01 (-0.08, 0.02)		79.4 (1.47)	1.34 (1.11, 1.62)	
Asian or Asian British	60.7 (1.02)	-2.38 (-4.25, -0.51)	P=0.011	34.2 (1.07)	1.32 (-0.59, 3.22)	0.1392	0.58 (0.02)	-0.05 (-0.88, -0.01)	p<0.001	66.1 (1.49)	0.70 (0.58, 0.85)	p<0.001
Other	61.5 (1.33)	-0.46 (-3.09, 2.16)		33.9 (1.41)	-1.01 (-3.54, 1.51)		0.60 (0.02)	-0.05 (-0.30, -0.20)		72.3 (2.67)	0.92 (0.70, 1.20)	
Socioeconomic deprivation (IMD)												
Quintile 1 (most deprived)	65.5 (0.37)	-		30.5 (0.39)	-		0.55 (0.007)	-		72.0 (0.78)	-	
Quintile 2	63.5 (0.38)	-1.53 (-2.57, 0.50)		33.1 (0.40)	1.82 (0.75, 2.90)		0.62 (0.006)	0.06 (0.05, 0.08)		73.6 (0.80)	1.11 (0.99, 1.24)	
Quintile 3	61.6 (0.39)	-4.22 (-4.30, -2.12)	p<0.001	35.0 (0.41)	3.44 (2.34, 4.54)	p<0.001	0.67 (0.006)	0.09 (0.08, 0.11)	p<0.001	75.1 (0.81)	1.20 (1.06, 1.34)	P=0.0091
Quintile 4	59.5 (0.41)	-6.02 (-6.02, -3.87)		36.8 (0.43)	4.78 (3.66, 5.90)		0.71 (0.006)	0.13 (0.12, 0.15)		74.5 (0.85)	1.16 (1.03, 1.31)	
Quintile 5 (least deprived)	58.2 (0.44)	-6.07 (-7.23, -4.91)		38.6 (0.46)	6.29 (5.10, 7.48)		0.73 (0.006)	0.14 (0.13, 0.16)		75.1 (0.91)	1.21 (1.07, 1.37)	

Footnote: All multivariable models were adjusted for body mass index, parity, and number of co-morbidities. P-values based on Wald test

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	**Item #**	**Recommendation**	**Reported on page #**
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-6
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	5, 7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	7
		(*d*) If applicable, explain how loss to follow-up was addressed	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	Only one stage
		(c) Consider use of a flow diagram	Only one stage
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8 and Table 1
		(b) Indicate number of participants with missing data for each variable of interest	8 (Table 1)
		(c) Summarise follow-up time (eg, average and total amount)	N/A (Baseline)
Outcome data	15*	Report numbers of outcome events or summary measures over time	N/A (Baseline results)
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-9 (Table 2)
		(*b*) Report category boundaries when continuous variables were categorized	8 (Table 2)
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	7

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.