Postmenopausal bleeding (PMB) is defined as "any bleeding that occurs from the genital tract after one year of amenorrhea in a woman who is not receiving Hormone Replacement Therapy (HRT)" (pp: 116). Women with PMB has a 10% risk of having genital malignancies such as cervical cancer, endometrial cancer, vaginal, ovarian, and vulval cancers along with a 10% risk of significant pathology. Although PMB is often associated with benign pathologies, the possibility of having an underlying malignancy makes it a sinister complaint requiring thorough clinical work up. Evidence has shown that early detection of cervical and endometrial cancer improves the cure rate and reduces mortality. However, unfortunately, like the cervical cancer, there are no effective screening tests available for early detection of endometrial cancer. The first evident symptom in almost all cases of endometrial cancer is PMB, which provokes women to seek medical help and getting detected at early stages of endometrial cancer. Hence, the identification of PMB in community setting provides an opportunity to detect these women at early stages of these cancers.

Cervical cancer is the fourth most common cancer in the world and India alone accounts for 25% of its burden worldwide. Nearly 70% of the women with cervical cancer presents to the hospital at advanced stages where the 5-year survival rate is only 50%. In spite of the availability of effective screening tests and efforts by the governments for opportunistic cervical cancer screening through the National Programme for the prevention and control of cancer, diabetes, cardiovascular diseases and stroke, and state level programs, studies done
in various states of India still reported low uptake of cervical cancer screening services.\textsuperscript{[10,11]} Hence, the exploration of reasons for its poor uptake can help to improve the program and also the survival rate of cervical cancer patients. There are limited community-based studies in India to identify the magnitude of PMB, its determinants and reasons for poor uptake of screening services. Hence, the present study was planned with the following objectives: (1) To find out the prevalence of PMB in a community setting, (2) To find out the determinants associated with PMB, and (3) To find out the reasons for the poor uptake of cervical cancer screening services.

**Materials and Methods**

**Study setting**

The present study was undertaken in the field practice area of Rural Health Training Centre of the Department of Community Medicine, Sri Manakula Vinayagar Medical College and Hospital, Puducherry. It consists of 34 villages of two primary health centers in Villupuram district of Tamil Nadu, having a total population of 63,921 in 12,788 households.

**Study design and participants**

It was a sequential exploratory mixed methods study, where a minor qualitative (group interviews) phase followed the major quantitative (survey) phase in the community [Figure 1].\textsuperscript{[12]} The study participants were postmenopausal women (>30 years of age). The data were collected between February 2016 and June 2016.

**Phase I**

This phase consisted of two group interviews with eight women (age >30 years) in each group.\textsuperscript{[13]} Participants for group interviews were purposively selected and a trained female postgraduate conducted the group interviews using the semi-structured guidelines. The purpose was to explore the local terms for PMB and reasons for poor uptake of screening service which was used to develop the context-specific questionnaire. Terminologies in local Tamil language obtained from the group interviews such as “theetu ninnu pochu/uthira pooku/ssoothagam ninnu pochu” for the term menopause and “theetu ninra pinbu theetu paduthal/theetu ninra pinbu uthiram paduthal/ssoothagam udaithal” for the term PMB were included in questions of the survey questionnaire.

The draft questionnaire was then shared with two female social workers and a gynecologist to specifically check its content, cultural appropriateness and overall suitability to the local context. Finally, the questionnaire was pre-tested on a convenient sample of 100 postmenopausal women (aged >30 years) by using a conventional pilot testing technique.\textsuperscript{[14]} The sample for pre-test was selected in the area other than the study site. The questionnaire was then revised to improve the comprehension of questions, response options, order, and wordings in the questions. The questionnaire was used in subsequent quantitative phase consisting of a community survey.

**Phase II**

It consisted of a community-based survey. Considering the prevalence of PMB reported in a community setting to be 7.7%,\textsuperscript{[15]} design effect-2, absolute precision of 2%, error of 5% and 10% nonresponse rate, the sample size was 1,530 (calculated by Epi_info version 6.04 d). Two-stage cluster sampling was adapted to select the representative sample of 1,530 participants. At first stage, 30 clusters were selected by population proportional to size method from the list of 34 villages.\textsuperscript{[16]} At the second stage, 51 respondents (women >30 years who have attained menopause) were selected from each selected cluster by the “random walk” method.\textsuperscript{[16]} If there were two or more eligible women in the same household all women in the household were included in the study.

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**Figure 1: Visual diagram**
After obtaining informed consent, the data were collected by a trained female postgraduate and a team of female medical interns by house-to-house visit. The following operational definitions were used for the purpose of the study. Menopause is defined as “cessation of periods for 12 months, resulting in permanent amenorrhea (pp: I)"[15] and PMB is defined as “any bleeding that occurs from the genital tract after one year of amenorrhea in a woman who is not receiving HRT (pp: 116).”[1] The WHO-STEPS Standards of anthropometric measurement guidelines were used for the measurement of height, weight, waist circumference, and hip circumference of the respondents.[17] To ensure the availability of the participants, the survey was done in the morning and evening hours. Women with PMB were referred to the higher center for free treatment and management.

The data were entered by using Epi Data Entry software (version 3.1, EpiData Association, Odense, Denmark) package and analyzed in SPSS 24 software (SPSS Inc., Chicago, Illinois, USA) package. Bivariate and multivariate analysis was performed to find out the determinants of PMB. At first stage, bivariate analysis was done to find out the associations (Odds Ratio) between “development of PMB” (dependent variable) and 14 independent variables such as menopausal age groups, educational status, occupation, socioeconomic class, marital status, grading of menstrual hygiene, number of live births, frequency of abortions, use of contraceptives, reproductive tract infection, family history, chronic morbidity, body mass index (BMI) category, and waist–hip ratio.

In the second stage multicollinearity, i.e., intercorrelations among independent variables was tested using tolerance measure. At this stage, Logistic regression analysis was used to identify the combination of variables that best predict the risk of the development of PMB. Fourteen predictors were entered into the model using the “Enter” selection method. The multiple coefficient of determination ($R^2$) was used as the goodness-of-fit statistic for the model: It represents the proportion of variance in the outcome variable that can be accounted for by the predictors in the model. Statistical significance was set at 5% ($P < 0.05$).

The study was approved by the Research Committee and Institutional Ethics Committee (Human studies) (IEC approval number: 37/2015) of SMVMCH, Pondicherry.

**Results**

Table 1 shows that out of 1,530 women, 27 (1.8%, confidence interval: 1.11–2.42) women reported at least one episode of PMB. Out of 27 women, 6 (22.2%) had their last PMB episode within 1 month before the date of interview, 4 (14.8%) had experienced it 1–6 months back, and three (11.1%) women had bleeding episode 6–12 months back and remaining 14 (51.9%) of them had their last episode before 1 year of the interview. Of 27 women who had bleeding, 12 (44.4%) had only one episode and 15 (55.6%) of them presented with more than one episode after they attained the menopause. Noteworthy, out of 27 women with PMB, 16 (59.3%) did not seek any medical help for their last episode, 6 (22.2%) went to a private hospital, and five (18.5%) approached government facility.

As shown in Table 2, of the 1530 women, only 86 (5.6%) of them had undergone cervical cancer screening after menopause and out of 1444 women who had not undergone screening, majority of them 951 (65.9%) stated lack of awareness about the availability of screening test and 349 (24.2%) reported the absence of any symptoms and fear of negative results (13%) as the reasons for not undergoing screening.

In multivariate analysis, six factors such as women working as daily wage laborers had three or more

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**Table 1: Prevalence of postmenopausal bleeding, details of the last episode of postmenopausal bleeding and treatment seeking behavior among women with postmenopausal bleeding (n=1530)**

| Variables                                      | n (%) |
|------------------------------------------------|-------|
| “Ever” episode of postmenopausal bleeding      |       |
| Yes                                            | 27 (1.8) |
| No                                             | 1503 (98.2) |
| Last episode of postmenopausal bleeding (n=27) |       |
| Less than a month                              | 6 (22.2) |
| 1–6 month                                      | 4 (14.8) |
| 6–12 month                                     | 3 (11.1) |
| More than a year                               | 14 (51.9) |
| Frequency of bleeding episodes (n=27)          |       |
| Single episode                                 | 12 (44.4) |
| Recurrent episode                              | 15 (55.6) |
| Place of treatment (n=27)                      |       |
| No where                                       | 16 (59.3) |
| Private hospital                               | 6 (22.2) |
| Government hospital                            | 5 (18.5) |
| Indian system of medicine                      | 0 (0) |
| Home remedies                                  | 0 (0) |

**Table 2: Reported practice of screening and the reasons for not undergoing cervical cancer screening after menopause (multiple response) (n=1530)**

| Variables                                      | n (%) |
|------------------------------------------------|-------|
| Screening “ever” done after menopause          |       |
| Yes                                            | 86 (5.6) |
| No                                             | 1444 (94.4) |
| Reasons (n=1444)                               |       |
| Lack of awareness about the availability of screening test | 951 (65.9) |
| No symptoms                                    | 349 (24.2) |
| Fear of negative results                       | 188 (13.0) |
| Feeling uncomfortable due to exposure of private part | 122 (8.4) |
| No one to take/ accompany her to the facility  | 54 (3.7) |
| Due to routine household works                 | 40 (2.8) |
| Loss of daily wages                            | 23 (1.6) |
| Stigma and fear of disclosure                  | 16 (1.1) |
| Husband’s poor cooperation                     | 11 (0.8) |

Figures in parenthesis are percentages
abortions, used oral contraceptive pills (OCPs) at least for 1 year, had more than 10 episodes of reproductive tract infection in their lifetime, underweight, and abnormal waist–hip ratio emerged as predictors for PMB. The Nagelkerke pseudo-$R^2$ value for the final model was 25.1% [Table 3].

| Table 3: Bivariate and multivariate analysis of determinants of postmenopausal bleeding ($n=1530$) |
|-------------------------------------------------|----------|----------------|-----------------|-----------------|
| Variables                                        | $n$ (%)  | PMB             | Unadjusted OR (95% CI) | Adjusted OR (95% CI) |
| Menopausal age (years)                           |          |                 |                 |                  |
| 35–44                                           | 486 (31.8) | 12 (2.5)       | 2.73 (0.35–21.25) |                  |
| 45–54                                           | 935 (61.1) | 14 (1.5)       | 1.64 (0.21–12.61) |                  |
| >55                                              | 109 (7.1)  | 1 (0.9)        |                  |                  |
| Education status                                 |          |                 |                 |                  |
| Illiterate                                       | 375 (24.5) | 8 (2.1)        | 1.30 (0.57–3.00)  |                  |
| Literate                                         | 1155 (75.5) | 19 (1.6)      | 1                  |                  |
| Occupation                                       |          |                 |                 |                  |
| Daily wage laborer                               | 382 (25)  | 13 (3.4)       | 3.12 (1.41–6.89)* | 3.16 (1.30–7.71)* |
| Employed                                         | 74 (4.8)  | 2 (2.7)        | 2.46 (0.54–11.19) | 1.42 (0.24–8.30) |
| Homemaker                                        | 1074 (70.2) | 12 (1.1)      | 1                  |                  |
| Socioeconomic class                              |          |                 |                 |                  |
| Class IV, V                                      | 1173 (76.7) | 23 (2.0)      | 1.77 (0.61–5.14)  |                  |
| Class I, II and III                              | 357 (23.3) | 4 (1.1)        | 1                  |                  |
| Marital status                                   |          |                 |                 |                  |
| Others                                           | 565 (36.9) | 10 (1.8)       | 1.01 (0.46–2.21)  |                  |
| Married                                          | 965 (63.1) | 17 (1.8)       | 1                  |                  |
| Grading of menstrual hygiene                     |          |                 |                 |                  |
| Poor                                             | 671 (43.9) | 13 (1.9)       | 1.19 (0.55–2.59)  |                  |
| Good to moderate                                  | 859 (56.1) | 14 (1.6)       | 1                  |                  |
| Number of live births                            |          |                 |                 |                  |
| Nulliparous                                      | 53 (3.5)  | 1 (1.9)        | 1.08 (0.14–8.19)  |                  |
| >5 children                                      | 335 (21.9) | 6 (1.8)        | 1.02 (0.41–2.57)  |                  |
| 1–4 children                                     | 1142 (74.6) | 20 (1.8)      | 1                  |                  |
| Frequency of abortions                            |          |                 |                 |                  |
| 1–2 abortions                                     | 124 (8.1)  | 1 (0.8)        | 0.46 (0.06–3.44)  | 0.56 (0.07–4.58) |
| >3 abortions                                      | 20 (1.3)   | 2 (1.0)        | 6.31 (1.39–28.7)* | 14.42 (2.09–99.39)* |
| No abortions                                      | 1386 (90.6) | 24 (1.7)      | 1                  |                  |
| Use of contraceptives                             |          |                 |                 |                  |
| OCPs (at least for 1 year)                       | 48 (3.1)   | 4 (8.3)        | 8.06 (2.39–27.20)* | 13.75 (2.79–67.92)* |
| Other contraceptives                              | 675 (44.1) | 14 (2.1)       | 1.88 (0.81–4.37)  | 2.05 (0.66–6.38) |
| None                                             | 807 (52.8) | 9 (1.1)        | 1                  |                  |
| Reproductive tract infections                     |          |                 |                 |                  |
| 1–10 episodes                                     | 236 (15.4) | 7 (3.0)        | 3.03 (1.18–7.77)* | 2.40 (0.86–6.72) |
| >10 episodes                                      | 94 (6.1)   | 8 (8.5)        | 9.21 (3.67–23.13)* | 8.20 (2.78–24.18)* |
| No episodes                                       | 1200 (78.4) | 12 (1.0)      | 1                  |                  |
| Family history                                    |          |                 |                 |                  |
| Yes                                              | 12 (0.8)   | 1 (8.3)        | 5.22 (0.65–41.90) |                  |
| No                                               | 1518 (99.2) | 26 (1.7)      | 1                  |                  |
| Chronic morbidity                                |          |                 |                 |                  |
| Only one morbidity                                | 265 (17.3) | 6 (2.3)        | 0.58–3.74         |                  |
| More than one morbidity                          | 105 (6.9)  | 3 (2.9)        | 1.87 (0.54–6.44)  |                  |
| No morbidity                                     | 1160 (75.8) | 18 (1.6)      | 1                  |                  |
| BMI category                                      |          |                 |                 |                  |
| Underweight                                      | 210 (13.7) | 5 (2.4)        | 1.89 (0.59–6.03)  | 9.12 (1.49–55.95) |
| Overweight and obese                             | 770 (50.3) | 15 (1.9)       | 1.54 (0.63–4.07)  | 0.44 (0.15–1.30) |
| Normal                                           | 550 (36)   | 7 (1.3)        | 1                  |                  |
| Waist–hip ratio                                  |          |                 |                 |                  |
| Abnormal                                         | 891 (58.2) | 21 (2.4)       | 2.55 (1.02–6.35)* | 18.74 (3.07–114.61) |
| Normal                                           | 639 (41.8) | 6 (0.9)        | 1                  |                  |

*P<0.05. OR: Odds ratio, BMI: Body mass index, OCP: Oral contraceptive pill, CI: Confidence interval, PMB: Postmenopausal bleeding
**Discussion**

The prevalence of PMB was found to be 1.8 percentage. Nearly 60% of women with PMB did not seek medical help. Among 94% women, who did not undergo screening, 66% were not aware of the screening facility and 24% did not undergo screening as they had no symptoms to go for it. Factors, such as women working as daily wage laborers, had three or more abortions, used OCPs at least for 1 year, had ten or more episodes of RTI in lifetime, underweight, and abnormal waist–hip ratio were associated with the occurrence of PMB among study sample.

PMB is an important symptom of cervical and endometrial cancer. This study showed the prevalence of PMB to be 1.8% which is low when compared with the studies done by Puri et al. in Chandigarh (7.7%) and Dasgupta and Ray in West Bengal (rural women – 20% and urban women – 29.9%).[15,18] In the study area, two out of 100 postmenopausal women tend to experience PMB. It emphasizes the need to have a system in place to ensure their opportunistic screening during their visit to a health facility.

We found that the odds of PMB were high among women who were working as daily wage laborers indicating that it is common among women with low socioeconomic status. A study done in Kerala, found PMB to be more associated with the middle-income group.[19] Previous studies had shown that women belonging to low socioeconomic class has increased the risk of cervical cancer, which is one of the important causes for PMB. The increased risk was attributed mainly to the nonattendance of screening, lack of knowledge about prevention of infections, poor menstrual hygiene, and delayed treatment-seeking behavior.[20,21] Such understanding of social determinants helps in the development of targeted strategies for vulnerable sections of society, fair policies, and schemes based on social justice so as to reach the wider population of the community.

Previous studies have found that prolonged OCP users (>5 years) have a risk for developing cervical cancer, breast cancer, cardiovascular diseases, and stroke.[22] We also observed an association between OCP usage (>1 year) and PMB which is an important symptom of cervical cancer. Women who had experienced more than 10 episodes of reproductive tract infections in their lifetime had more odds of getting a PMB episode. RTI remains as a highly neglected gynecological problem among women in reproductive age group, which contribute to the risk of cervical cancer, pelvic inflammatory disease, spontaneous abortions, and ectopic pregnancy.[23,24] We found that women who had three or more abortions had higher odds of PMB. In the local area, women prefer abortions as they perceive that contraceptives are harmful to health.[25]

Previous studies have shown that obese (BMI >30) women have more risk of PMB.[19,26] We observed that women with abnormal waist–hip ratio had more risk of getting an episode of PMB. Since the waist–hip ratio is less influenced by muscle and bone mass, it is considered as a better indicator for obesity as compared to BMI.[27] In addition, it was found the odds of PMB were high among women who were underweight. However, the link between underweight and PMB could not be understood and needs to be explored further. Hence, adopting for healthy lifestyles such as regular exercise and nutritious and balanced diet might contribute in the prevention of PMB episodes.

Notably, only, 5.6% of the respondents have reported to have undergone cervical cancer screening after menopause. A community-based cross-sectional study conducted by Aswathy et al. in Rural Kerala and a hospital-based study conducted by Harsha Kumar and Tanya in Mangalore also reported similar low screening level of 6.9% and 7.2%, respectively.[10,11] The majority of women who did not undergo screening in our study were not aware of the screening test or felt that they had no symptom for screening and some of them feared of a negative result. These findings were similar to findings in the other studies done in India.[10,11,25,29] This emphasizes the need of creating awareness about cervical cancer screening among women in the community.

To the best of our knowledge, this is the first large-scale community-based sequential exploratory mixed methods research, where the qualitative phase supported the quantitative phase. We used context-specific questionnaire to suit the given context. However, being a cross-sectional study, the temporality of associations cannot be assured. Being a sequential mixed method design, the process was lengthy and time consuming as compared to survey research.

**Conclusion**

The present study reported 1.8% prevalence of PMB among women in the study area and most of the factors identified as determinants are preventable. Cervical cancer screening rate was poor among the respondents and lack of awareness was stated as the major reason for it. Hence, the promotion of healthy lifestyles and contraceptives in early reproductive life and creating awareness for the need of early screening is recommended.

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**Conflicts of interest**

There are no conflicts of interest.

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Sindhuri and Dongre: Postmenopausal bleeding among rural women in Tamil Nadu

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