



Association of Lifestyle and Reproductive Factors with Age at Natural Menopause among Postmenopausal Women in Gampaha District

Premasinghe KGDS¹, Punchihewa PHDN¹, Rajamanthri RDT¹, Rajapaksha RWVNA¹, Atapattu PM¹

¹Faculty of Medicine, University of Colombo, Colombo, Sri Lanka where the work was carried out

Corresponding Author: Premasinghe KGDS

Email: medmbbs202140@stu.cmb.ac.lk

Abstract

Background: Menopause is a natural transition marking the end of a woman's reproductive capacity, defined by the cessation of menstruation for 12 consecutive months without pathological cause or intervention. International studies have shown that lifestyle and reproductive factors may influence its onset. However, research on Sri Lankan women under this topic is limited.

Objectives: To describe the age at natural menopause and lifestyle and reproductive factors of a group of postmenopausal women in Gampaha district and to determine any association between lifestyle and reproductive factors with the age at natural menopause.

Method: A descriptive cross-sectional study with an analytical component was done, with 126 postmenopausal women in a selected Public Health Midwife (PHM) area in Gampaha. Study participants were selected via a multistage cluster sampling method. Data was collected via an

interviewer-administered questionnaire which was prepared based on 24-hour dietary recall, International Physical Activity Questionnaire, National Health Interview Survey Tobacco Use Questionnaire, The Alcohol Use Disorders Identification Test and Reproductive History Questionnaire of Women's Health Initiative. Lifestyle factors were studied under four components; dietary factors, physical activities, smoking and alcohol consumption. Age at menarche, parity, total breastfeeding duration and contraceptive usage were assessed under reproductive factors.

Results: The mean age $\pm$ standard deviation (SD) at natural menopause was 48.37 ($\pm$ 5.40) years. Premature menopause was experienced by 4.8%. The mean ($\pm$ SD) daily calorie intake was 961.02 ($\pm$ 233.70) calories. Participants had a mean ($\pm$ SD) total MET (Metabolic Equivalent of Task) score of 6864.15 ($\pm$ 7574.11) minutes, with 72.2% categorized as having high levels of physical activity. None of the participants were active smokers while 7.9% were exposed to passive smoking. The mean ($\pm$ SD) age at menarche was 13.73 ($\pm$ 1.32) years, while the mean ($\pm$ SD) parity was 2.39 ($\pm$ 1.12). A majority (67.5%) had breastfed for over four years in total. Only 35.71% had used contraceptives during their lifetime. No statistically significant associations were observed between the age at natural menopause and lifestyle or reproductive factors.

Conclusion and Recommendations: The mean age at natural menopause of the study



population was 48.37 which aligns with previous studies done among Sri Lankan post-menopausal women under natural conditions. High level of physical activity and a low-calorie intake was observed in the majority emphasizing the need for exploring and improving the nutritional status of postmenopausal women. Lifetime contraceptive use was observed in only about 1/3rd of the participants, highlighting the need for promoting contraceptive practices among women. There was no association between lifestyle or reproductive factors with the natural age of menopause. Future studies with larger and more diverse populations, as well as detailed data collection, are recommended to enable a more comprehensive analysis of associations.

Keywords: Age at menopause, lifestyle, reproductive, diet, physical activity

Background

Menopause is a natural transition marking the end of a woman's reproductive capacity. It can occur as a natural physiological change or as a result of clinical procedures, pathological causes etc. Natural menopause is considered after 12 consecutive months without menstruation and without any other obvious physiological or pathological cause and any clinical intervention. Reduced levels of circulating blood estrogen and loss of ovarian follicular activity are the two main causes of natural menopause. Most women experience natural menopause between the ages of 45 and 55 years as a natural part of biological ageing.⁽¹⁾ The mean age of natural menopause in Sri Lanka is around 51 years.⁽²⁾ Numerous physiological, hormonal, and psychological changes accompany the menopausal transition and

these changes are impacted by sociocultural, psychological and ethnic variables.⁽³⁾ Postmenopausal women were found to have a high prevalence of menopausal symptoms, which have been demonstrated to lower general health status, increase irritability, depression and bone loss, as well as lower quality of life.

Women experiencing menopause before 40 years of age is termed as premature menopause.⁽¹⁾ Premature menopause results in a longer period of exposure to above mentioned changes. Thus, it is important to identify factors associated with age at natural menopause.

There are several studies revealing association of lifestyle and reproductive factors with age at natural menopause. An Italian cross-sectional study showed a relationship between age at natural menopause and higher parity.⁽⁴⁾ However, no correlation was discovered between parity and the age at menopause in a study done in the People's Republic of China.⁽⁵⁾ This suggests changes of associated factors in different countries. But available published literature regarding the factors associated with the age at natural menopause in Sri Lankan women is limited.

This study aimed to describe the lifestyle and reproductive factors of postmenopausal women in a semi urban population of Sri Lanka, and explore their association with the age at natural menopause.

Methods

This descriptive cross-sectional study with an analytical component aimed to assess postmenopausal women of ages 40-65, focusing on socio-demographic, lifestyle



and reproductive factors. The study population comprised women residing in Gampaha MOH area using a multi-staged cluster sampling method. Houses of selected streets in the area were visited consecutively and only one eligible participant per household was chosen. Women who met the inclusion criteria (postmenopausal for at least one year, aged 40-65 years and residents of the area for over three months) were recruited after obtaining written informed consent.

Data collection was done via a structured interviewer-based questionnaire, covering three sections: socio-demographic factors, lifestyle factors including diet, physical activity, smoking, alcohol consumption and reproductive history (including age at menopause, menarche, parity, and contraceptive use). The questionnaire was developed referring validated instruments; 24-hour dietary recall, the International Physical Activity Questionnaire ⁽⁶⁾, the National Health Interview Survey Tobacco

Use Questionnaire ⁽⁷⁾, the Alcohol Use Disorders Identification Test ⁽⁸⁾ and the Reproductive History Questionnaire of Women's Health Initiative. ⁽⁹⁾ It was translated into Sinhala and Tamil as well. Statistical analysis was conducted using SPSS, with descriptive and analytical tests at a 0.05 significance level.

Ethics approval was obtained from the Ethics review committee, Faculty of Medicine, University of Colombo (MFC/AL/2020/2140).

Results

The study included 135 participants with a response rate of 93.3%. (n=126)

Sociodemographic characteristics

The age of participants ranged from 47 to 65 years with a mean age of 58.96 years (SD= ±4.85). The age distribution of the participants is stated in Table 1.

Table 1: Distribution of the sample by age groups

Age groups	Number (n=126)	Percentage (%)
Current age (in complete years)		
45-49	6	4.80
50-54	23	18.30
55-59	28	22.20
60-65	69	54.80

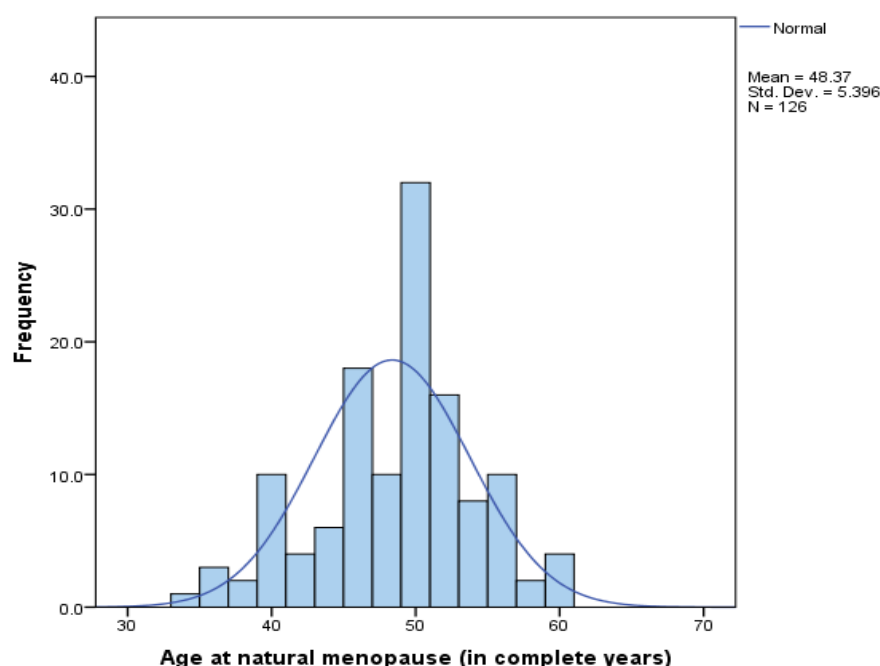
Majority of the participants (54.80%, n=69) were in the 60-65 years' age range. All the participants were Sinhalese and the majority of them (77.8%, n=98) were housewives. The majority (62.70%, n=79) had a monthly household income of less than 50,000 LKR.

The age at natural menopause

The age at natural menopause in the participants ranged from 34 to 60 years with the mean age being 48.37(SD= ±5.40) years while both the median and the mode being 50 years. Most participants (38.1%, n=48) had attained natural menopause between the ages of 50-54 years. Figure 1 shows the distribution of age at natural menopause of the participants.



Figure 1: The distribution of age at natural menopause.



The lifestyle factors

In this study dietary factors, physical activities, smoking and alcohol consumption were assessed under the lifestyle factors.

1) Dietary factors

The daily dietary intake of postmenopausal women was assessed in this study. The mean total daily calorie intake of the

participants was 961.02 calories. (SD= ± 233.70) The median was 962.83 calories while the values ranged between 238.00 and 1681.00 calories. The majority (64.30%, n=81) consumed at least one fruit per day.

Table 2 summarizes the daily consumption of key dietary factors, including total carbohydrate, animal protein, plant protein, total protein, and fat intake.

Table 2; Daily nutrient consumption (in grams)

Dietary categories	Mean (grams)	Minimum (grams)	Maximum (grams)	Standard deviation
Carbohydrate	237.26	109.00	945.13	± 174.97
Animal protein	11.13	0.00	27.00	± 6.698
Plant protein	15.04	6.0	29.00	± 3.477
Protein	26.23	6.0	48.26	± 8.59
Fat	17.40	3.83	48.00	± 9.62



2) Physical activities

Physical activities per week were studied under engagement in vigorous activities,

moderate activities, walking and resting. They are described in MET (Metabolic Equivalent of Task) minutes in Table 3.

Table 3: Engagement in vigorous activities, moderate activities, walking and resting per week

Variable	Number (n=126)	Mean MET	Standard deviation
Vigorous activities	21	2034.29	±6257.09
Moderate activities	126	3371.43	±2124.42
Walking	116	1458.44	±1665.38
Resting	126	1543.33	±1044.89
Total activities	126	6864.15	±7574.11

All the participants had engaged in moderate and resting activities. Majority of the participants (92.1%, n=116) had engaged in walking activities and only twenty-one participants (16.67%) had engaged in vigorous physical activities.

The total MET minutes per week were categorized into three groups: low, moderate and high. Majority of the participants (72.2%, n=91) had engaged in high physical activities according to MET minutes' categorization.

3) Smoking and alcohol consumption

There were no active smokers among the participants of the study. However, there were 10 (7.9%) passive smokers out of them 4 (40%) had been exposed to the smoke for one to two hours per day and six (60%) had been exposed for 2-5 hours per day.

Of the participants, only one (0.8%) had consumed alcohol. And that was 1-2

glasses per time with a frequency less than once a month.

The reproductive factors

The mean age at menarche was 13.73 years (SD= ±1.32). It ranged from 11 to 17 years and the mode 13 years. Twelve participants (9.5%) had experienced irregularities in menstruation in their lifetime, with 10 having irregularities throughout their reproductive ages.

All participants had been pregnant at least once. The mean age at first pregnancy and last pregnancy are 26.79 years (SD= ±5.70) and 32.89 years (SD= ±5.16) respectively. Most had 3 pregnancies (n=42, 33%), and had delivered 2 live births (n=50, 38.1%). Every participant has at least one live birth while 38 participants (31.20%) have had at least one miscarriage. Only two (1.59%) had attempted to conceive without success for more than a year, but neither of them has consulted a doctor and is therefore unaware of the reason.



All participants have breastfed their children. The mean ages at first and last breastfeeding was 26.98 years ($SD = \pm 6.31$) and 34.60 years ($SD = \pm 5.28$) respectively. The majority of participants (67.50%, $n=85$) had breastfed for more than four years.

Only 44 out of 126 participants (34.90%) reported using one contraceptive method

during their lifetime, while three participants (2.38%) reported using two methods. The most commonly used contraceptive method among participants was oral contraceptive pills (34.04%, $n=16$). Additionally, the mean duration of oral contraceptive pill usage among those who used it was 38.25 months ($SD = \pm 23.17$ months). Table 4 describes the reproductive factors of the participants.

Table 4 : Distribution of reproductive factors among the participants.

Category	Number (n=126)	Percentage (%)
1) Age at menarche		
Early menarche (<12 years)	2	1.60
Normal menarche (12-15 years)	108	85.70
Late menarche (>15 years)	16	12.70
2) Gravidity		
1	16	12.70
2	37	29.40
3	42	33.33
4	21	16.70
5	10	7.90
3) Live births		
1	25	19.80
2	50	39.70
3	34	27.00
4	15	11.90
5	2	1.60
4) Miscarriages		
0	88	69.80
1	32	25.40
2	4	3.20
3	2	1.60
5) Total breastfeeding duration		
4-6 months	2	1.60
7-12 months	8	6.30
13-23 months	16	12.70
2-4 years	15	11.90
> 4years	85	67.50



Association of lifestyle factors with the age at natural menopause

1) Dietary factors

The study aimed to explore the relationship between various dietary intakes per day and the age at natural menopause among this group of participants. The results presents Pearson correlation coefficients (r values) and their significance (p values) levels for each dietary component were analyzed. These correlations were not statistically significant, indicating no statistically significant relationship.

Fruit consumption and its association with the age at natural menopause was done among the 126 participants. The data were categorized based on daily fruit intake: those not consuming fruits and those consuming at least one fruit per day. A t -test was conducted to compare the mean age at natural menopause between the two groups. The t -test results indicate no significant difference in the age at natural menopause between the two groups ($p=0.907$).

Table 5: Association of daily dietary intake with age at natural menopause

Dietary component	Pearson correlation	Significance (2-tailed)
Total carbohydrate intake per day	-0.046	0.613
Total animal protein intake per day	0.095	0.291
Total plant protein intake per day	0.019	0.835
Total protein intake per day	0.062	0.493
Total fat intake per day	-0.087	0.333
Total calorie intake per day	0.090	0.319

2) Physical activities

The participants were divided into two groups: “moderate to low physical activity” (less than 3000 MET minutes per week, combining low and moderate) and “high physical activity” (more than 3000 MET minutes per week). There was no significant difference ($p= 0.378$) between the natural age at menopause in “moderate to low physical activity” physical activity group and “high” physical activity group using an independent sample t -test.

alcohol consumption with the age at natural menopausal because there were no active smokers, only ten passive smokers and only one-woman consuming alcohol among the participants.

Association of reproductive history with the age at natural menopause

Any associations with the age at natural menopause with variables in the reproductive history of women were calculated using the independent sample t test and the Pearson’s correlation coefficient. Age at natural menopause did not show any significant association with age at menarche ($p=0.115$), total breastfeeding duration ($p=0.182$) and the

3) Smoking and alcohol consumption

There were not enough numbers to analyze any association between smoking and



use of oral contraceptives ($p=0.850$) using independent sample t-tests. There was also no significant correlation between parity and age at natural menopause using the Pearson correlation coefficient ($r=-0.078$, $p=0.383$).

Discussion

The mean age at natural menopause among participants in this study was 48.37 years ($SD = \pm 5.40$), which aligns with previous findings from a Sri Lankan study reporting a mean age of 48.35 years.⁽¹⁰⁾ Compared to international studies, Indian women had a slightly lower mean menopause age of 46.60 years,⁽¹¹⁾ while women in the United Kingdom had a mean age of 47.80 years,⁽¹²⁾ also on the lower side. In contrast, Korean women had a slightly higher mean menopause age of 49.30 years,⁽¹³⁾ potentially influenced by genetic, lifestyle, or socioeconomic factors. Notably, 4.8% of participants experienced premature menopause (before 40 years), a condition associated with increased risks of cardiovascular disease and osteoporosis. This finding highlights the importance of targeted healthcare interventions to address the unique health challenges faced by this group.

Dietary analysis revealed significant nutritional deficiencies among postmenopausal participants. The mean daily caloric intake was below the recommended levels for women in this age group, reflecting inadequate energy intake.⁽¹⁴⁾ Carbohydrates were the primary macronutrient consumed, reflecting typical dietary patterns, but variability in intake was high. Excessive carbohydrate consumption among some participants could increase the risk of insulin resistance,

especially in this high-risk group. Protein and fat intake were consistently below recommended levels, raising concerns about insufficient essential fatty acids crucial for cardiovascular health and hormonal balance. Moreover, inadequate fruit consumption was evident, with 35.7% of participants reporting no daily fruit intake. This poses a risk of nutrient deficiencies, weakened immune function, and chronic diseases. Overall, poor nutrient and caloric intake among postmenopausal women could adversely impact health outcomes, emphasizing the need for nutritional interventions.

Physical activity levels among participants were generally high, primarily due to moderate activities like walking and household or agricultural tasks. Vigorous activities were infrequent, consistent with earlier findings that household and occupational tasks significantly contribute to physical activity levels.⁽¹⁵⁾ The use of the International Physical Activity Questionnaire (IPAQ) provided useful insights; however, its MET minute categorization may not fully capture Sri Lankan activity patterns. Reporting biases related to age, occupation, and social class may have influenced the results.⁽¹⁵⁾

Reproductive health findings were consistent with prior research. The mean age at menarche was 13.73 years, with 85.7% of participants reporting normal menarche. This age aligns closely with international pooled data reporting a mean age of 13.2 years.⁽¹⁶⁾ The mean parity was 2.39, reflecting cultural norms favoring smaller families in Sri Lanka.⁽¹⁷⁾ Miscarriages were reported by 31.2% of participants, highlighting the need for awareness and support related to pregnancy



loss. Breastfeeding practices were prevalent, with 67.5% of participants breastfeeding for over four years, in accordance with WHO recommendations. However, only 35.71% reported contraceptive use, primarily oral contraceptive pills, while 65.1% had never used contraception. These findings reflect cultural barriers and limited awareness regarding family planning, consistent with prior studies.⁽¹⁷⁾

Contrary to expectations, no significant associations were observed between dietary intake carbohydrates, proteins, fats, and calories and the age at natural menopause. These findings differ from studies like the Nurses' Health Study, which identified links between dietary patterns and menopause timing. Differences may stem from variations in dietary quality and long-term patterns. The use of a 24-hour dietary recall, while providing detailed data, limited the ability to assess habitual dietary patterns. The absence of a food frequency questionnaire (FFQ) was due to concerns about recall bias and participant fatigue, which may have restricted the depth of dietary assessments.

Similarly, no significant associations were identified between physical activity levels and the age at natural menopause. This contrasts with studies conducted in China and Japan, which reported differing relationships between physical activity and menopause timing.^(18,19) These differences may be attributed to genetic predispositions or variations in activity types, such as manual labor versus structured or leisure-time exercise.

Reproductive factors, including age at menarche, parity, breastfeeding duration,

and contraceptive use, also showed no significant association with the age at natural menopause. For example, early menarche (≤ 15 years) was not significantly correlated with menopause timing ($p = 0.115$), contrasting with findings from international pooled data.⁽¹⁶⁾ Similarly, parity and breastfeeding duration showed no significant relationships.

The study has several strengths, including the use of validated international questionnaires and a comprehensive assessment of lifestyle and reproductive factors. However, there are notable limitations. The small sample size (126 participants) and cross-sectional design limit the generalizability and ability to infer causality. The exclusive focus on Sinhalese women restricts ethnic diversity, while the reliance on 24-hour dietary recall may not reflect long-term dietary habits. Additionally, recall bias may have influenced data on physical activity and contraceptive use.

Future research should employ larger, prospective cohort studies with diverse populations to explore long-term dietary and lifestyle patterns. Public health initiatives should focus on addressing nutritional deficiencies, improving family planning awareness, and supporting self-employment opportunities to enhance the health and well-being of postmenopausal women.

Acknowledgements: The authors acknowledge the support of the Provincial Director of Health Services Western Province, the Regional Director of Health Services Gampaha, the Medical Officer of Health Gampaha and the Gampaha MOH



staff for their support and the participants who consented to engage in this study.

Conflict of Interests: All authors wish to confirm that there are no known conflicts of interest associated with this publication and there has been no financial support for this work that could have influenced its outcome.

Sources of funding: None

References

1. Menopause [Internet]. [cited 2024 Oct 11]. Available from: <https://www.who.int/news-room/fact-sheets/detail/menopause>
2. Ministry Of Health Sri Lanka | Annual Health Bulletin [Internet]. [cited 2025 Jan 20]. Available from: <https://www.health.gov.lk>
3. Talaulikar V. Menopause transition: Physiology and symptoms. *Best Pract Res Clin Obstet Gynaecol*. 2022; 81:3–7.
4. Parazzini F, Progetto Menopausa Italia Study Group. Determinants of age at menopause in women attending menopause clinics in Italy. *Maturitas*. 2007;56(3):280–287.
5. Sun X, Zhang R, Wang L, Shen X, Lu Y, An J, et al. Association Between Parity and the Age at Menopause and Menopausal Syndrome in Northwest China. *Asia Pac J Public Health*. 2021; 33(1):60–66.
6. IPAQ [Internet]. [cited 2025 Jan 20]. Available from: <https://sites.google.com/view/ipaq/home>
7. NHIS - Adult Tobacco Use - Guide for Data Users [Internet]. 2021 [cited 2024 Oct 12]. Available from: https://www.cdc.gov/nchs/nhis/tobacco/tobacco_guide.htm
8. Alcohol Use Disorders Identification Test (AUDIT) [Internet]. [cited 2025 Jan 20]. Available from: <https://auditscreen.org/>
9. Form 31 - Reproductive History [Internet]. [cited 2025 Jan 20]. Available from: <https://www.whi.org/dataset/1049>
10. Siriwardana KDVF. STATISTICAL ANALYSIS ON AGE AT NATURAL MENOPAUSE OF WOMEN IN SRI LANKA [Internet] [Thesis]. 2016 [cited 2024 Apr 24]. Available from: <http://dr.lib.sjp.ac.lk/handle/123456789/9592>
11. Prasad JB, Tyagi NK, Verma P. Age at menopause in India: A systematic review. *Diabetes Metab Syndr*. 2021; 15(1):373–377.
12. Tschiderer L, Peters SAE, van der Schouw YT, van Westing AC, Tong TYN, Willeit P, et al. Age at Menopause and the Risk of Stroke: Observational and Mendelian Randomization Analysis in 204 244 Postmenopausal Women. *J Am Heart Assoc*. 2023; 12(18):e030280.
13. Park CY, Lim JY, Park HY. Age at natural menopause in Koreans: secular trends and influences thereon. *Menopause N Y N*. 2018; 25(4):423–429.
14. Food Based Dietary Guidelines for Sri Lankans – Practitioners' Handbook – Nutrition Division [Internet]. [cited 2024 Oct 13].



- Available from:
<https://nutrition.health.gov.lk/english/food-based-dietary-guidelines-for-sri-lankans-practitioners-handbook/>
15. Gudmundsdottir SL, Flanders WD, Augestad LB. Physical activity and age at menopause: the Nord-Trøndelag population-based health study. *Climacteric J Int Menopause Soc.* 2013; 16(1):78–87.
 16. Mishra GD, Pandeya N, Dobson AJ, Chung HF, Anderson D, Kuh D, et al. Early menarche, nulliparity and the risk for premature and early natural menopause. *Hum Reprod Oxf Engl.* 2017; 32(3):679–686.
 17. Weeratunga MK, Dissanayake L. Factors Influencing the Contraceptive Usage among Older Women in Sri Lanka.
 18. Dorjgochoo T, Kallianpur A, Gao YT, Cai H, Yang G, Li H, et al. Dietary and lifestyle predictors of age at natural menopause and reproductive span in the Shanghai Women's Health Study. *Menopause N Y N.* 2008; 15(5):924–933.
 19. Nagata C, Wada K, Nakamura K, Tamai Y, Tsuji M, Shimizu H. Associations of physical activity and diet with the onset of menopause in Japanese women. *Menopause N Y N.* 2012; 19(1):75–81