Original Article

How the development of chronic morbidity and multimorbidity depends on natural age of menopause: Results from nationally representative cross-sectional Indian study

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Abstract

Background: Multimorbidity development is linked with the age at menopause. Fewer studies are available to support the findings. This study was conducted to find, how multimorbidity is associated with the natural age of menopause. **Methodology:** LASI-1, a longitudinal study, collected detailed information on the psychological, social, economic, and health aspects of aging in India. Wave-1 data collection was done in all 35 states and union territories in India. Baseline data was collected from year 2017–2019. As the current study was a secondary data analysis to find the association between multimorbidity and age of menopause, only eligible women's relevant data was analyzed. **Results:** A total of 25,256 women were analyzed, 67.8% of participants had at least one comorbidity. The mean age was 58.5 ± 10.17 years. 57.04% and 13.45% women had optimal or suboptimal menopause, while 7.4%, 17.5%, and 4.4% had premature, early, and delayed menopause. A significant association was found for the presence of multimorbidity and premature (AOR 1.19 (1.07–1.32)), early menopause (AOR 1.18 (1.10–1.27)), and optimal age of menopause (AOR 0.83 (0.78–0.88)). **Conclusion:** There is a high burden of multimorbidity and it is associated with the natural age of menopause. This study would be helpful for effective policymaking and a better primary healthcare approach to deal with the condition.

Keywords: Chronic morbidity, multimorbidity, natural age at menopause, premature menopause

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Introduction

Menopause is a natural biological process marking the end of menstrual cycles. It is marked by the completion of one year after a woman's last menstrual period. On an average, an Indian woman attains menopause at the age of 46.2 years much earlier

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than their Western counterparts (51 years).[1] This phase is often associated with the development of chronic comorbidities like atherosclerotic cardiovascular disease, diabetes, osteoporosis, and Alzheimer's dementia.[2] Studies indicate that premature menopause increases the likelihood of chronic conditions and multimorbidity, compared to menopause onset at 50–51 years.[3] Moreover, each additional year of age at menopause is linked to a 2% decrease in age-adjusted mortality, with specific reductions in ischemic heart disease mortality. Conversely, delayed menopause poses a 5% higher risk of uterine or ovarian cancer, suggesting a complex relationship between menopause timing and overall health.[4] Despite these insights, data from India, a country with a vast and varied population, remains scarce. Longitudinal Ageing Study in India, i.e., LASI, addresses the gap by examining health, economic, and social outcomes in over 73,000 adults having ≥45 years of age from all Indian states and union territories.[5] It has provided critical insights into the health aspects of the aging population in India, including the relationship between menopause and chronic diseases.[6] Utilizing LASI data, this study investigates the impact of natural menopause age on chronic morbidity and multimorbidity in Indian women over 45, contributing vital information to a field predominantly focused on high-income countries. The study aims to analyze the association between the age during menopause (natural) and the prevalence of a single chronic morbidity and multiple morbidity i.e., multimorbidity in Indian women. Understanding the dynamics of menopause and its subsequent health implications is crucial for crafting effective preventive strategies, particularly in low- and middle-income countries. It is expected that the results of this research would play a significant role in influencing public health practices and policy in India. Specifically, they could guide the development of targeted screening and prevention programs for women at a heightened risk of chronic conditions.

The aim of the current research was to show the association of single chronic morbidity and multimorbidity with the natural age of menopause among the Indian population aged ≥45 years.

Methodology

LASI-1st wave is a longitudinal survey with a national representation that intends to collect comprehensive data on the physiological, social, economic, and psychological effects of aging in India from all the states and union territories. It was developed to fill the information vacuum regarding thorough and internationally comparable survey data on India's aging population. The United Nations Population Fund, the Ministry of Health and Family Welfare of the Government of India, and the National Institute on Ageing were providing funds. Contributors included the Harvard T.H. Chan School of Public Health, the International Institute for Population Sciences, and the University of Southern California.[5] Over 73,000 adult Indians were surveyed. Out of them, 14241 participants were included in the present study. [Figure 1].
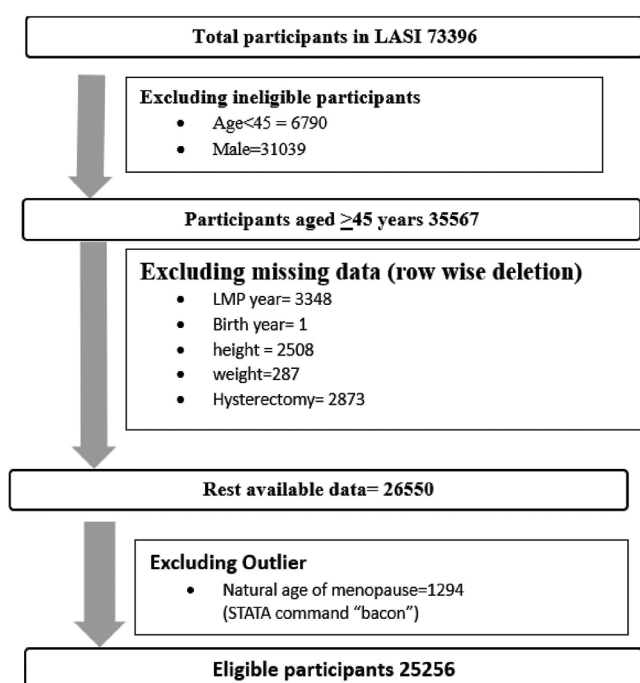
Figure 1: Flowchart showing participants selection process in this study

This is the largest study of its kind in the world and the first of its kind in India. It assesses the scientific evidence in relation to variables such as household economic status, employment, retirement, satisfaction, and life expectations; biomarkers; family and social networks; mental health (depression and cognitive impairments); functional health; and chronic and symptom-based health conditions. For the next 25 years, the survey aims to follow a representative sample of the older adult population every two years. A revised sample size will be used to account for attrition resulting from death, migration, nonreachability, and nonresponse.[7]

The Central Ethics Committee on Human Research (CECHR) of the Indian Council of Medical Research (ICMR) approved the LASI survey's implementation ethically. The Helsinki Declaration Principles guided the conduct of this study.

Outcome variable

Chronic morbidity and multimorbidity were the outcome variables. Following chronic morbidities were included—diabetes, hypertension, cancer, chronic heart disease (e.g., congestive heart failure, myocardial infarction, heart attack, other chronic heart diseases), chronic lung diseases (e.g., chronic bronchitis, asthma, chronic obstructive pulmonary disease, other chronic lung problems), stroke, dyslipidemia (high cholesterol), thyroid disorders, musculoskeletal disorder (MSD, e.g., rheumatism, arthritis, osteoporosis, other chronic joint or bone disorders), chronic renal failure, visual impairment, and hearing impairment. The interviewer asked related question about chronic health conditions/morbidities with dichotomous answers (no/yes)—"Has any health professional ever diagnosed you with the following chronic conditions or diseases?" Participants having

at least one; and two chronic health conditions were described as single chronic morbidity and multimorbidity, respectively.

Explanatory variables

The explanatory variable of choice was the natural age (years) of menopause. The following categories were made for further analysis from was natural age (years) of menopause—<40 (premature menopause), 40–44 (early menopause), 45–50 (optimal), 51–55 (suboptimal), and >55 (delayed).

Covariates

Age (years 45–59, ≥60), minimum education (illiterate, less than primary, primary completed, middle completed, secondary school, higher secondary, and Diploma/graduate), residence (rural, urban), marital status (unmarried, married/in live-in, Widow/separated/divorced), mpce (monthly per capita expenditure—poorest, poorer, middle, richer, richest) quintile, health insurance (no, yes), occupation (unemployed, professional and semiprofessional—"legislators and senior officials, professionals, technicians and associate professionals," clerical and skilled- "clerks, service workers and shopkeepers, skilled agriculture and fishery workers, craft and related trade worker, plant and machine operator," unskilled), physical activity (everyday, once per week, 1–3 times per week, once per month, never), self-rated health (excellent, very good, good, fair, poor,), tobacco abuse (no, yes), alcohol abuse (no, yes) and body mass index (BMI) categories were taken as other explanatory variables. BMI was calculated from documented weight and height. (BMI = weight (kg)/(height (meter))^2). Participants were categorized as per BMI—<18.5 (underweight), 18.5–22.9 (normal), 23.0–24.9 (overweight), 25.0–29.9 (preobese,) and obese (≥30.0).

Statistical analysis

Data was analyzed in Stata version 17 (StataCorp. 2017. Stata Statistical Software: Release 17. College Station, TX: StataCorp LP.). Characteristics of participants were described as mean (standard deviation) for continuous variables frequencies and percentages for categorical variables.

The age of menopause was calculated by subtracting the year of last menstruation (ht236_year) from the birth year (dm004_year). Outliers were removed by the Stata command "bacon."

Univariate logistic regression was conducted between the outcome variable and each explanatory variable. To avoid multicollinearity among explanatory variables, VIF (variance inflation factor) was applied. VIF >5 indicates a high correlation between a given explanatory variable and other explanatory variables in the model, which might create problems with the regression analysis. Self-related health and marital status had VIF >5. [Table S1] Hence, all the explanatory variables except these two were included for final association. *P* value < 0.05 was considered as statistically significant. *P* value < 0.2 was taken

for further multivariable logistic regression. Odds ratios (crude and adjusted) were plotted against categories of natural age of menopause. Thus, four graphs were generated in view of crude and adjusted odds ratio of single chronic morbidity and multimorbidity.

Results

The total eligible participants were 25,256 out of a total of 73,396 (6790 were having age less than 45, 31039 were males, 9017 had missing data, and 1294 were outliers) [Figure 1]. 67.8% participants had at least one comorbid condition. The mean age of the total eligible participants was 58.5 ± 10.17 years. Mean age at natural menopause was 46.8 ± 5.24 years.

Comorbid condition

34.3% of participants had a BMI in the normal range while 23.4% and 18% were preobese and underweight, respectively. There was a significant association between BMI categories and the presence of comorbidity. 60.49% of participants were having no level of education, while only 20% of participants had at least primary or less than primary education. A significant association was found between the level of education and the presence of comorbid condition. The majority of participants (65.2%) were living in rural areas, 65.1% were married, 67.2% were unemployed, 68.1% were never involved in any type of physical activity, and 20.5% and 4.1% were consuming any form of tobacco and alcohol, respectively. Forty percent of participants reported that they had good health. Only 189 participants were having any type of health insurance. A significant association was found between all the above variables (level of education, residence, marital status, health insurance, MPCE quintile, occupation, self-rated health, physical activity, alcohol consumption, and tobacco usage) and the presence of comorbid condition [Table 1].

Age at menopause

Mean (SD) age for premature, early, and delayed menopause was estimated as 35.9 (2.73), 42.3 (1.46), and 59.38 (3.74) years. 57.04% and 13.45% women had optimal or suboptimal menopause, while 7.4%, 17.5%, and 4.4% had premature, early, and delayed menopause. There was significant difference in prevalences among all categories of premature (menopause at less than 40 years), early (menopause between 45 and 50 years), optimal (at 45–50 years), suboptimal (at 51–55 years) and delayed menopause (after 55 years) for BMI categories, educational status, place of residence, marital status, MPCE quintile, occupational status, physical activity, self-related health, consumption of tobacco and alcohol [Table S2].

There was a significant association found between the presence of any single morbidity and age of menopause with adjusted odds ratio AOR 1.33 (1.19–1.48) for premature menopause, AOR 1.18 (1.10–1.27) for early menopause, and AOR 0.88 (0.78–0.88) for optimal age of menopause [Table 2]. A similar association was estimated for multimorbidity and menopause age with AOR 1.19 (1.07–1.32) for premature, AOR 1.18 (1.10–1.27) for early,

| Variable	Total (*n*=25256)	No comorbidity (*n*=8140)	Single comorbidity (*n*=17116)	Multimorbidity (≥2 comorbidities) (*n*=9404)	P
Table 1: Various characteristics of Indian female population aged ≥45 years					
Age (years)[a]	58.50 (10.17)	56.19 (9.45)	59.60 (10.32)	60.79 (10.39)	-
Age at natural menopause (years)[a]	46.82 (5.24)	46.80 (4.89)	46.82 (5.40)	46.90 (5.51)	-
BMI[a]	23.16 (4.92)	21.67 (4.30)	23.87 (5.04)	24.76 (5.13)	-
BMI category[b]					
Underweight (<18.5)	4,558 (18.05)	2,054 (45.06)	2,504 (54.94)	1,021 (22.40)	<0.001
Normal (18.5–22.9)	8,671 (34.33)	3,354 (38.68)	5,317 (61.32)	2,577 (29.72)	
Overweight (23–24.9)	3,711 (14.69)	1,059 (28.54)	2,652 (71.46)	1,493 (40.23)	
Preobese (25–29.9)	5,931 (23.48)	1,328 (22.39)	4,603 (77.61)	2,861 (48.24)	
Obese (≥30)	2,385 (9.44)	345 (14.47)	2,040 (85.53)	1,452 (60.88)	
Education[b] (minimum)					
Illiterate	15,278 (60.49)	5,817 (38.07)	9,461 (61.93)	4,738 (31.01)	<0.001
Less than primary	2,458 (9.73)	665 (27.05)	1,793 (72.95)	1,070 (43.53)	
Primary completed	2,820 (11.17)	701 (24.86)	2,119 (75.14)	1,274 (45.53)	
Middle completed	1,793 (7.10)	423 (23.59)	1,370 (76.41)	813 (45.34)	
Secondary school	1,468 (5.81)	276 (18.80)	1,192 (81.20)	758 (51.63)	
Higher secondary	654 (2.59)	118 (18.04)	536 (81.96)	327 (50.00)	
Diploma/graduate	785 (3.11)	140 (17.83)	645 (82.17)	424 (54.01)	
Residence[b]					
Rural	16476 (65.24)	6342 (38.49)	10134 (61.51)	4968 (30.15)	<0.001
Urban	8780 (34.76)	1798 (20.48)	6982 (79.52)	4436 (50.52)	
Marital Status[b]					
Unmarried	246 (0.97)	95 (38.62)	151 (61.38)	77 (31.30)	<0.001
Married/in live-in	16443 (65.11)	5796 (35.25)	10647 (64.75)	5663 (34.44)	
Widow/separated/divorced	8567 (33.92)	2249 (26.25)	6318 (73.75)	3664 (42.77)	
MPCE quintile[b]					
Poorest	5,145 (20.37)	2,132 (41.44)	3,013 (58.56)	1,444 (28.07)	<0.001
Poorer	5,234 (20.72)	1,898 (36.26)	3,336 (63.74)	1,721 (32.88)	
Middle	5,177 (20.72)	1,608 (31.06)	3,569 (68.94)	1,921 (37.11)	
Richer	4,954 (20.50)	1,357 (27.39)	3,597 (72.61)	2,082 (42.03)	
Richest	4,746 (18.79)	1,145 (24.13)	3,601 (75.87)	2,236 (47.11)	
Health insurance[b]					
No	25067 (99.25)	8103 (32.33)	16964 (67.67)	9305 (37.12)	<0.001
Yes	189 (0.75)	37 (19.58)	152 (80.42)	99 (52.38)	
Occupation[b]					
Unemployed	16,991 (67.28)	4,617 (27.17)	12,374 (72.83)	7,254 (42.69)	<0.001
Professional and semiprofessional	293 (1.16)	54 (18.43)	239 (81.57)	157 (53.58)	
Clerical and skilled	4,263 (16.88)	1,974 (46.31)	2,289 (53.69)	978 (22.94)	
Unskilled	3,709 (14.69)	1,495 (40.31)	2,214 (59.69)	1,015 (27.37)	
Physical activity[b]					
Everyday	4,498 (17.81)	1,967 (43.73)	2,531 (56.27)	1182 (26.28)	<0.001
More than once/week	1,462 (5.79)	677 (46.31)	785 (53.69)	362 (24.76)	
Once/week	826 (3.27)	318 (38.50)	508 (61.50)	260 (31.48)	
1–3 times/month	1,256 (4.97)	495 (39.41)	761 (60.59)	395 (31.45)	
Never	17,214 (68.16)	4,683 (27.20)	12,531 (72.80)	7205 (41.86)	
Self-rated health[b]					
Excellent	810 (3.21)	372 (45.93)	438 (54.07)	184 (22.72)	<0.001
Very good	4,416 (17.49)	1,883 (42.64)	2,533 (57.36)	1,102 (24.95)	
Good	10,164 (40.25)	3,844 (37.82)	6,320 (62.18)	3,135 (30.84)	
Fair	7,373 (29.20)	1,690 (22.92)	5,683 (77.08)	3,413 (46.29)	
Poor	2,489 (9.86)	351 (14.10)	2,138 (85.90)	1,567 (62.96)	
Tobacco usage[b]					
No	20074 (79.48)	6227 (31.02)	13847 (68.98)	7749 (38.60)	<0.001
Yes	5182 (20.52)	1913 (36.92)	3269 (63.08)	1655 (31.94)	
Alcohol consumption[b]					
No	24213 (95.87)	7643 (31.57)	16570 (68.43)	9159 (37.83)	<0.001
Yes	1043 (4.13)	497 (47.65)	546 (52.35)	245 (23.49)	

[a]Mean (SD), [b]*n* (%)

and AOR 0.83 (0.78–0.88) for optimal age of menopause. There was no significant association observed for suboptimal and delayed [Table 3] menopause with the presence of comorbidity. V-shaped graph was obtained for the association of single or multimorbidity with the age of menopause [Figure 2a and b].

Discussion

LASI study is one of the largest ongoing cohort studies in India on aging. With the advancement of age, the prevalence of morbidity also increases. In this study, we estimated that 67%
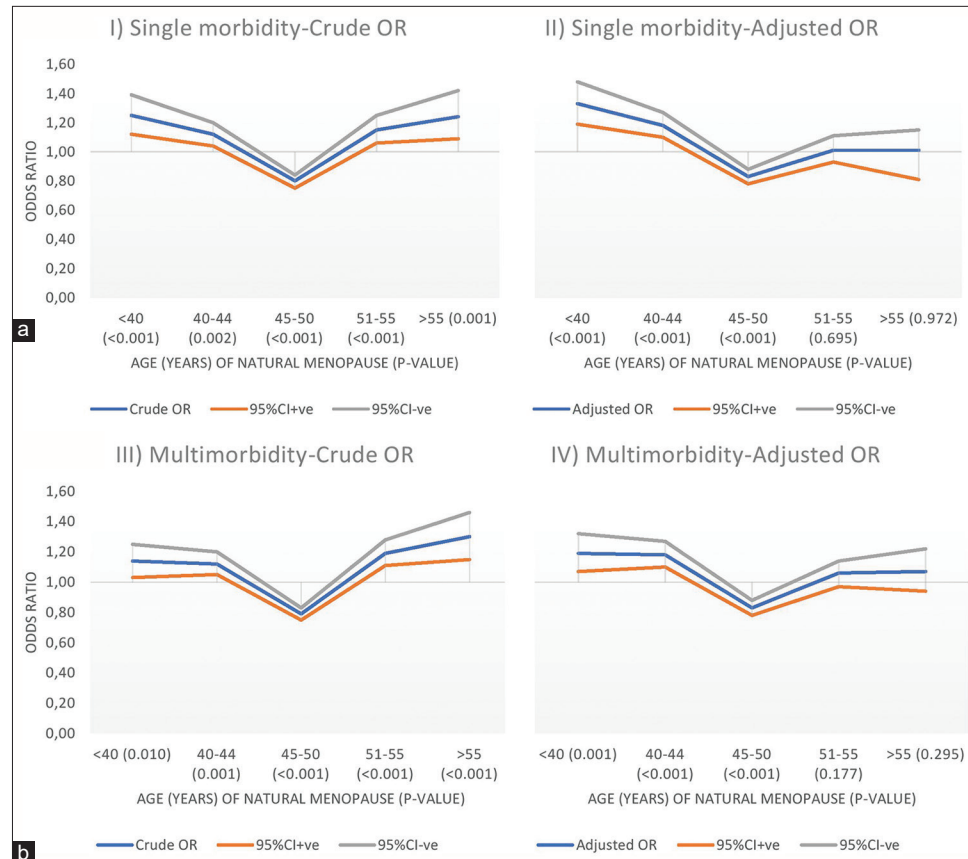
Figure 2: Graphical representation of relationship between (a) single chronic morbidity and natural age of menopause; (b) multimorbidity and natural age of menopause among Indian female population aged >45 years

Table 2: Association between single chronic morbidity and natural age of menopause among Indian female population aged ≥45 years

Odds ratio	Age of natural menopause (years)				
	<40 (*n*=1869 (7.40%))	40–44 (*n*=4423 (17.51%))	45–50 (*n*=14407 (57.04%))	51–55 (*n*=3397 (13.45%))	>55 (*n*=1160 (4.49%))
Crude (95% CI)	1.25 (1.12–1.39)	1.12 (1.04–1.20)	0.80 (0.75–0.84)	1.15 (1.06–1.25)	1.24 (1.09–1.42)
P	<0.001	0.002	<0.001	<0.001	0.001
Adjusted (95% CI)	1.33 (1.19–1.48)	1.18 (1.10–1.27)	0.83 (0.78–0.88)	1.01 (0.93–1.11)	1.01 (0.87–1.15)
P	<0.001	<0.001	<0.001	0.695	0.972

Adjusted for age, education, residence, mpce quintile, health insurance, occupation, alcohol abuse, tobacco abuse, BMI, physical activity. Classification accuracy=70.88%. Pseudo R^2=0.0982

Table 3: Association between multimorbidity (≥2) and natural age of menopause among Indian female population aged ≥45 years

Odds ratio	Age of natural menopause (years)				
	<40 (*n*=1869 (7.40%))	40–44 (*n*=4423 (17.51%))	45–50 (*n*=14407 (57.04%))	51–55 (*n*=3397 (13.45%))	>55 (*n*=1160 (4.49%))
Crude (95% CI)	1.14 (1.03–1.25)	1.12 (1.05–1.20)	0.79 (0.75–0.83)	1.19 (1.11–1.28)	1.30 (1.15–1.46)
P	0.010	0.001	<0.001	<0.001	<0.001
Adjusted (95% CI)	1.19 (1.07–1.32)	1.18 (1.10–1.27)	0.83 (0.78–0.88)	1.06 (0.97–1.14)	1.07 (0.94–1.22)
P	0.001	<0.001	<0.001	0.177	0.295

Adjusted for age, education, residence, mpce quintile, health insurance, occupation, alcohol abuse, tobacco abuse, BMI, physical activity. Classification accuracy=68.40%. Pseudo R^2=0.1075

of women suffered from at least any one type of comorbidity and 37% had more than one morbidity present. A study done by Puri *et al.*[8] reported that 17.4 per 100 women had single morbidity and 3.5 per 100 women had multimorbidity present. The reason for this difference might be due to younger age in a study done by Puri *et al.*[7] In the LASI study, the older population is studied and the prevalence of morbidity increase with the advancement of age. One cohort study done by Blümel JE *et al.*[9] in the United Kingdom reported that 48% of women had multimorbidity present. The mean age in that study was 27.8 years compared to 58 years in our research. Another observation by Xu *et al.*[10] (Australia) reported a 55.1% prevalence of multimorbidity among women aged 45–59 years. Study by Valadares *et al.*[11] done in Brazil reported that 53% of the women had multimorbidity. There is varied prevalence, but most of the studies reported a higher burden. This needs special attention from a policy point of view.

In this study, we found a significant association of comorbid conditions with body mass index, educational status, tobacco use, and alcohol consumption. Similar findings were reported by Puri *et al.*[8] for—body mass index, consumption of alcohol and tobacco. A cohort study done in the United Kingdom also reported similar findings for body mass index and educational status.[9] A review done by Ojo *et al.*[12] reported that there is a role of dietary factors and intervention in the management of chronic morbidities. In this study, we also found significant association with other covariates like rural–urban residence, marital status, health insurance, occupational status, and physical activity. No other studies found an association with these variables. The reason for this variation could be due to sociocultural and age differences. In this study, we also found a significant association of single or multimorbidity with premature, early, or optimal age of menopause but not with suboptimal of delayed menopause. Other studies even done at different age groups and different settings reported similar findings.

A large sample size of this study increases its representativeness. As this is an ongoing cohort study, the progression of morbidity status could be assessed in the next wave. This study had some limitations. The presence of morbidity by study participants is self-reported that can lead to over- or under-estimation of results. As this is secondary data analysis, differentiation between natural and medical causes was not possible. Being a cross-sectional study, design temporality could not be established.

Conclusion

The present study suggests that there is a high burden of one or multiple morbidity among women with increase in age. It is associated with premature menopause. Other factors contributing are lifestyle factor, educational status, and occupational status. This study would be helpful for effective policymaking and a better primary healthcare approach to deal with the condition.

However, association with dietary pattern needs to be further studied.

LASI survey obtained its ethical clearance from ICMR. So, our study does not require separate ethical clearance.

Consent for publication

Proper consent was taken for publication from the authority.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Table S1: Distribution of participants as per Variance inflation factor		
Variable	VIF	1/VIF
Premature menopause	1.01	0.99
Age category	1.25	0.80
Education		
Less than primary	1.08	0.93
Primary completed	1.14	0.87
Middle completed	1.14	0.88
Secondary school	1.16	0.86
Higher secondary	1.11	0.90
Diploma/Graduate	1.24	0.80
Residence	1.30	0.77
MPCE quintile		
Poorer	1.61	0.62
Middle	1.63	0.61
Richer	1.64	0.61
Richest	1.72	0.58
Marital status		
Married/in live -in	23.99	0.04
Widow/separated/divorced	24.18	0.04
BMI_CAT		
1	1.29	0.78
2	1.24	0.80
3	1.4	0.72
4	1.28	0.78
Health insurance	1.04	0.96
Occupation		
Professional and semi-professional	1.13	0.89
Clerical and skilled	1.27	0.79
Unskilled	1.16	0.86
Physical activity		
More than once/week	1.25	0.80
Once/week	1.15	0.87
1-3 times/month	1.23	0.82
Never	1.81	0.55
Tobacco abuse	1.08	0.93
Alcohol abuse	1.05	0.95
Self-rated health		
Very good	5.34	0.19
Good	8.15	0.12
Fair	7.26	0.14
Poor	3.75	0.27
Mean VIF	3.24	

Table S2: Various characteristics of Indian female population aged >45 years as per natural age of menopause

Variable	Age of natural menopause (years)					P
	<40 (*n*=1869 (7.40%))	40-44 (*n*=4423 (17.51%))	45-50 (*n*=14407 (57.04%))	51-55 (*n*=3397 (13.45%))	>55 (*n*=1160 (4.49%))	
Age (years)[a]	58.84 (9.63)	58.03 (9.74)	56.80 (10.01)	62.50 (8.75)	69.11 (8.85)	-
Age at natural menopause (years)[a]	35.99 (2.73)	42.31 (1.46)	47.24 (2.94)	52.52 (1.38)	59.38 (3.74)	-
BMI[a]	22.97 (5.17)	22.98 (4.90)	23.29 (4.90)	23.23 (4.85)	22.39 (4.98)	-
BMI category[b]						
Underweight (<18.5)	389 (8.53)	851 (18.67)	2,454 (53.84)	593 (13.01)	271 (5.95)	<0.001
Normal (18.5-22.9)	664 (7.66)	1,509 (17.40)	4,941 (56.98)	1,150 (13.26)	407 (4.69)	
Overweight (23-24.9)	230 (6.20)	650 (17.52)	2,157 (58.12)	523 (14.09)	151 (4.07)	
Preobese (25-29.9)	385 (6.49)	1,011 (17.05)	3,470 (58.51)	813 (13.71)	252 (4.25)	
Obese (>30)	201 (8.43)	402 (16.86)	1,385 (58.07)	318 (13.33)	79 (3.31)	
Education[b] (minimum)						
Illiterate	1,240 (8.12)	2,743 (17.95)	8,336 (54.56)	2,077 (13.59)	882 (5.77)	<0.001
Less than primary	186 (7.57)	471 (19.16)	1,343 (54.64)	359 (14.61)	99 (4.03)	
Primary completed	181 (6.42)	508 (18.01)	1,698 (60.21)	360 (12.77)	73 (2.59)	
Middle completed	116 (6.42)	284 (15.84)	1,156 (64.47)	203 (11.32)	34 (1.90)	
Secondary school	86 (5.86)	219 (14.92)	943 (64.24)	186 (12.67)	34 (2.32)	
Higher secondary	26 (3.98)	91 (13.91)	443 (67.74)	75 (11.47)	19 (2.91)	
Diploma/Graduate	34 (4.33)	107 (13.63)	488 (62.17)	137 (17.45)	19 (2.42)	
Residence[b]						
Rural	1,203 (7.30)	2,853 (17.32)	9,361 (56.82)	2,212 (13.43)	847 (5.14)	<0.001
Urban	666 (7.59)	1,570 (17.88)	5,046 (57.47)	1,185 (13.50)	313 (3.56)	
Marital Status[b]						
Unmarried	17 (6.91)	45 (18.29)	144 (58.54)	35 (14.23)	5 (2.03)	<0.001
Married/in live -in	1,100 (6.69)	2,730 (16.60)	9,829 (59.78)	2,156 (13.11)	628 (3.82)	
Widow/separated/divorced	752 (8,78)	1,648 (19.24)	4,434 (51.76)	1,206 (14.08)	527 (6.15)	
MPCE quintile[b]						
Poorest	392 (7.62)	930 (18.08)	2,949 (57.32)	617 (11.99)	257 (5.00)	0.024
Poorer	365 (6.97)	948 (18.11)	3,007 (57.45)	689 (13.16)	225 (4.30)	
Middle	396 (7.65)	909 (17.56)	2,945 (56.89)	694 (13.41)	233 (4.50)	
Richer	360 (7.27)	874 (17.64)	2,789 (56.30)	703 (14.19)	228 (4.60)	
Richest	356 (7.50)	762 (16.06)	2,717 (57.25)	694 (14.62)	217 (4.57)	
Health insurance[b]						
No	1,856 (7.40)	4,392 (17.52)	14,299 (57.04)	3,364 (13.42)	1,156 (4.61)	0.285
Yes	13 (6.88)	31 (16.40)	108 (57.14)	33 (17.46)	4 (2.12)	
Occupation[b]						
Unemployed	1,300 (7.65)	2,990 (17.60)	9,533 (56.11)	2,303 (13.55)	865 (5.09)	<0.001
Professional and semi-professional	14 (4.78)	33 (11.26)	197 (67.24)	45 (15.36)	4 (1.37)	
Clerical and skilled	288 (6.76)	753 (17.66)	2,473 (58.01)	575 (13.49)	174 (4.08)	
Unskilled	267 (7.20)	647 (17.44)	2,204 (59.42)	474 (12.78)	117 (3.15)	
Physical activity[b]						
Everyday	336 (7.47)	793 (17.63)	2,637 (58.63)	559 (12.43)	173 (3.85)	0.002
More than once/week	91 (6.22)	246 (16.83)	882 (60.33)	182 (12.45)	61 (4.17)	
Once/week	45 (5.45)	133 (16.10)	496 (60.05)	116 (14.04)	36 (4.36)	
1-3 times/month	95 (7.56)	210 (16.72)	745 (59.32)	153 (12.18)	53 (4.22)	
Never	1,302 (7.56)	3,041 (17.67)	9,647 (56.04)	2,387 (13.87)	837 (4.86)	
Self-rated health[b]						
Excellent	60 (7.41)	130 (16.05)	485 (59.88)	105 (12.96)	30 (3.70)	<0.001
Very good	281 (6.36)	715 (16.19)	2,675 (60.58)	582 (13.18)	163 (3.69)	
Good	721 (7.09)	1,757 (17.29)	5,882 (57.87)	1,342 (13.20)	462 (4.55)	
Fair	583 (7.91)	1,370 (18.58)	4,062 (55.09)	1,019 (13.82)	339 (4.60)	
Poor	224 (9.00)	451 (18.12)	1,302 (52.31)	346 (13.90)	166 (6.67)	
Tobacco usage[b]						
No	1,463 (7.29)	3,483 (17.35)	11,582 (57.70)	2,658 (13.24)	888 (4.42)	0.001
Yes	406 (7.83)	940 (18.14)	2,825 (54.52)	739 (14.26)	272 (5.25)	

Contd...

Variable	Age of natural menopause (years)					P
	<40 (*n*=1869 (7.40%))	40-44 (*n*=4423 (17.51%))	45-50 (*n*=14407 (57.04%))	51-55 (*n*=3397 (13.45%))	>55 (*n*=1160 (4.49%))	
Alcohol consumption[b]						
No	1,797 (7.42)	4,259 (17.59)	13,832 (57.13)	3,228 (13.33)	1097 (4.53)	0.007
Yes	72 (6.90)	164 (15.72)	575 (55.13)	169 (16.20)	63 (6.04)	

Table S2: Contd...

[a]Mean (SD). [b]*n* (%)