

Menopause Characterization, Menarche and Fertility among Rural Females of Shimla (Himachal Pradesh)

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Abstract

Background: Menopause marks the cessation of reproduction. Menopause rating scales have been used to measure health-related quality of life among aging women. Menopause, menarche and number of live births play important roles in the life history of women.

Objectives: To study the prevalence and pattern of various menopausal characteristics and association of age of menopause with age of menarche and number of livebirths.

Methods: The study was based on cross-sectional data of 75 postmenopausal rural women and also secondary data from published sources to study trends.

Results: Mean age at menarche was 14.23 yrs. and mean age at menopause was 45.35 yrs. About 85% of women had reported some climacteric symptom. Joint/muscle pain was the most commonly reported symptom (66.7%). Women that had early menarche had lower number of live births than those who had later menarche. Women with the intermediate fertility category having 4-5 livebirths had later age of menopause than women having less than three livebirths.

Conclusion: Early and late ages at menarche were associated with early and late ages of menopause, respectively. Fertility performance of women also seemed to be associated with menarche and menopause ages. Indian women have lower mean age at menopause than European and South Asian women while so such difference was evident for age at menarche. Menopausal symptoms had little effect on sexual functioning than other concerns.

Introduction

Menopause marks the important universal developmental marker of the aging process among women. The natural menopause marks the end of woman's reproductive capacity as it results in permanent cessation of menstruation and ovulation. It is a physiological event and at the individual level is explained by depletion of the oocyte hypothesis [1,2]. The origin of menopause among women well before they die unlike non-human primates like chimpanzees and baboons has been explained on the basis of non-adaptive and adaptive theories [3,4,5]. Earlier fertility termination evolved in humans as a consequence of other evolutionary changes that made late births increasingly risky [6].

Age at menopause is confirmed by 12 months consecutive absence of menstrual period after the last final menstrual period. This is preceded by perimenopausal phase when menstrual cycles become irregular and interrupted by amenorrhoea. In the Western countries, the menopause transition occurs on an average at 46 years with a range from 34-54 years [7]. The mean/median age for menopause varies among- and within-human populations world over; occurring during the late/ mid 40s to 52 years of age [8,9]. The number of oocytes is fixed at the beginning of life and differences in the rate of depletion or deterioration would lead to individual differences. Several factors have been identified as independent sources of differences in age at menopause, which include genetics, Body Mass Index (BMI), reproductive and hormonal status [10]. There has been secular trend in age at menopause which has increased during the last 25 years due to changes in socioeconomic and lifestyle factors [11-16]. Factors like oral contraception and smoking are other reported correlates of the timing of natural menopause [17-19]. Indian women have been reported to have menopause two to three years earlier than the western populations [20] and these differences can be on account of environmental and genetic factors. Similarly age at menarche is also influenced by both genetic and environmental factors [21]. Heritability of age at natural menopause has been also studied [22]. Genome-Wide Association Studies (GWAS) have reported genetic determinants of age at menarche and age at natural menopause. He and Murabito [23] reviewed such studies and found more than 30 novel gene loci for age at menarche and 17 for age at natural menopause.

The various associated symptoms of menopause are due to decline of estrogen production, while continued production of gonadotrophin hormones by the hypothalamus [24]. The resulted menopausal distress due to miss-match signals in the brain is divided into somatic, urogenital and

psychological. The symptoms, the menopause status and the aging process are known to influence various aspects of women's health including bone loss, urogenital atrophy, urinary tract infections and incontinence, increased cardiovascular risk, sexual dysfunction, and loss of skin elasticity [25,26]. The biological and other changes associated with menopause are almost universal, but not all postmenopausal women are known to be affected. The cross-cultural research on menopause finds differences in the incidence/prevalence and severity of various climacteric symptoms and these are known to vary among-and within various segments of human populations [27-30]. It has also been suggested that differences in symptom sensitivity or a tendency to under-report are due to lack of education or else embarrassment among women [31]. Studies on prevalence of menopause symptoms are scarce from the state of Himachal Pradesh.

Menarche is a critical biological reproductive maturity marker that marks the time of onset of menstruation. Age at menarche varies among individuals and mean age at menarche varies among various cohorts of a population and also among human populations. The age at menarche among the Western countries was about 15.3 years around 1840 and in the early 1980s it averaged around 12.8yrs [32]. A review based on studies from 67 countries published between the 1960s and the 1990 reported the mean menarche age of 13.53 years [9]. Anderson and Must [33] reported that in the USA, age at menarche dropped from 12.75 yrs in the 1960s to 12.5 yrs in the 1990s and to 12.3 yrs in the 2000s. Menarche among German girls occurred at a median age of 12.8 years [34]. Secular trends in age at menarche are well known. However, in recent years the onset of menarche has not decreased further and ranges between 12.5 and 13.0 years in most other European countries and the USA [35-37]. In developed countries this downward trend has ceased [38] or reversed [39].

Among non-European populations, a three generational study in Taiwan [40] showed significant decreased in age at menarche over these generations. In India too, socioeconomic and population differences were observed for mean age at menarche [41]. During 1980s median age at menarche in Northwest India was 13.2 years [41]. Even studies conducted in Northwest India from 1990-2010 reported mean/median age at menarche between 12 to 13.6 years [42]. Most of the studies were done middle or lower middle socioeconomic samples. The interval between age at menarche and age at menopause (reproductive life span) has implications for population structure and fertility dynamics. The downward trend in age at menarche world may have implications for the reproductive health and wellbeing of women and little is known about their association among populations living in different ecological settings.

Understanding of the relationship between ages at menarche and menopause may help in the improvement in planning preventive strategies and quality of life. Comparison of fertility trends in human populations has revealed that women who have a later age at menarche also have an earlier age of menopause and there is negative correlation between age at menopause and age at menarche [43]. Forman et al [44] reviewed literature on association between age at menarche and age at menopause and found that 12 out of 36 studies reported significant association between them. Hardy and Kuh [45] and Rodstrom et al. [46] found direct correlation between early menarche and early menopause. Dorjgochoo et al. [47] found direct correlation with between late menarche (mean age 15.2yrs) and late menopause (mean age 49.2 years) in cohort of Chinese

women born 1930-1960. Both direct association [48-50] and inverse association [51] has been reported between age at menarche and age at menopause. The majority of studies have reported null relationship between age at menarche and age at menopause [44]. In view of contradictory reports, there is need to test this association in different populations of different nationalities living in different cultural settings.

Population studies have demonstrated an increased risk of earlier natural menopause among nulliparous versus parous or a trend towards a delay in menopause with increase in number of live births [50,52-55]. Reproductive span of women is an important indicator of fertility levels of a population and also to understand women's/family's reproductive planning and decision to end reproduction which is socially and culturally influenced. Over the years in India, a gradual increase in age at marriage among women and decrease in age at which they seek sterilization indicate that reproductive span is narrowing. Oral contraceptives and menstrual cycle characteristics appear to be associated with age at menopause [56,57]. So even if contraceptives are used by females, the number of livebirths may be associated with age at menopause and this aspect needs to be explored further. In view of these observations, number of livebirths may also be associated with age at menopause and this aspect requires exploration, which this study proposed to study.

The present study was undertaken with postmenopausal women of a rural population in Shimla to investigate menopausal characteristics, ages at menarche and menopause, and number of livebirths with the following specific aims and objectives: 1) To investigate the mean age at menopause; 2) To study incidence and pattern of various menopausal characteristics by using a standardized menopause rating scale; and 3) To study relationship of age of menarche with number of live births at their completion of their reproductive span. In view of the theoretical background given in the previous text, the present study also proposed to test the following hypotheses associated with menarche and menopause: 1) Women having an early age of menarche would have earlier menopause than those having late age of menarche; 2) women with earlier age at menarche would have fewer livebirths than women with later age at menarche; 3) since parity and age of menopause reported to be associated and assuming this to be true the study proposed to test that women having more number livebirths would have later age of menopause than women having fewer number of livebirths.

Materials and Methods

The materials for this study consisted of 75 postmenopausal women aged between 45-65 years with mean of 52.15 years and standard deviation of 4.68 years. They belonged to three villages around Shimla: Sangti, Neri and Chaeli, in the state of Himachal Pradesh. The ever-married women who had completed their fertility period were interviewed. Since the study was done in small villages and all the eligible females who agreed to participate were included in the study, so no sampling procedures were required. An interview schedule was designed and was used to get the detailed reproductive history of these women. The information was later checked with their husbands and elderly members of the family. The interview schedule included the following characteristics: Demographic information about fertility, mortality, morbidity, marriage and menopause was the key characteristics considered. Age at menarche and menopause

Table 1: Mean and Standard Deviation of frequency and percentage of various climacteric symptoms.

Sno	Climacteric / symptom	None 0	Mild 1	Moderate 2	Severe 3	Very severe 4	
Vasomotor symptoms							
1	Hot flush	Mean±SD			0.71±1.08		
		N	46	14	8	5	2
		(%)	61.3	18.7	10.7	6.7	2.7
2	Night Sweating	Mean±SD			0.91±1.33		
		N	43	14	8	2	8
		(%)	57.3	18.7	10.7	2.7	10.7
Vaginal symptoms							
3	Uterine prlayers (bleeding)	Mean±SD			0.47±0.84		
		N	55	7	11	2	0
		(%)	73.3	9.3	14.7	2.7	0
4	Vaginal atrophy	Mean±SD			0.63±1.11		
		N	51	11	7	2	4
		(%)	68.0	14.7	9.3	2.7	5.3
Psychosomatic symptoms							
5	Rapid heart beat	Mean±SD			1.16±1.16		
		N	31	15	15	14	0
		(%)	41.3	20.0	20.0	18.7	0
6	Numbness	Mean±SD			0.85±0.97		
		N	36	19	15	5	0
		(%)	48.0	25.3	20.3	6.7	0
7	Irritability	Mean±SD			0.93±1.07		
		N	35	19	13	7	1
		(%)	46.7	25.3	17.3	9.3	1.3
8	Fatigue/Tiredness	Mean±S.D			1.21±1.24		
		N	31	15	13	14	2
		(%)	41.3	20.0	17.3	18.7	2.7
9	Headache	Mean±SD			1.12 ± 1.14		
		N	29	21	14	9	2
		(%)	38.7	28.0	18.7	12.0	2.7
10	Sleep disturbance	Mean±SD			1.25±1.45		
		N	35	12	12	6	10
		(%)	46.7	16.0	16.0	8.0	13.3
11	Pressure or high stress	Mean±SD			1.25±1.33		
		N	32	13	14	11	5
		(%)	42.7	17.3	18.7	14.7	6.7
12	Muscle or joint pain	Mean±SD			1.60±1.48		
		N	25	15	10	11	12
		(%)	33.3	20.0	16.0	14.7	16.0
13	Faint	Mean±SD			0.92±1.30		
		N	43	12	8	8	4
		(%)	57.3	16.0	10.7	10.7	5.3
14	Breast pain	Mean±SD			0.87±1.19		
		N	43	11	12	6	3
		(%)	57.3	14.7	16.0	8.0	4.0
Psychological symptoms							
15	Depression	Mean±SD			0.97±1.17		
		N	37	16	11	9	2
		(%)	49.3	21.3	14.7	12.0	2.7
16	Tension	Mean±SD			1.12±1.26		
		N	32	19	12	8	4
		(%)	42.7	25.3	16.0	10.7	5.3
17	Forgetful	Mean±SD			1.01±1.26		
		N	39	12	11	10	3
		(%)	52.0	16.0	14.7	13.3	4.0
18	Poor concentration	Mean±SD			1.00±1.25		
		N	41	8	13	11	2
		(%)	54.7	10.7	17.3	14.7	2.7
Urinary symptoms							
19	Dysuria (difficult/painful urination)	Mean±SD			0.48±1.02		
		N	58	5	7	4	1
		(%)	77.3	6.7	9.3	5.3	1.3
20	Increased urinary frquency	Mean±SD			0.49±0.84		
		N	53	9	11	2	0
		(%)	70.7	12.0	14.7	2.7	0
21	Urine leak	Mean±SD			0.48±0.88		
		N	55	7	10	3	0
		(%)	73.3	9.3	13.3	4.0	0

Table 2: Age at menopause in relation to age at menarche: One way ANOVA.

Age at Menarche	N	Age at Menopause		F	P (two-tailed)
		Mean	SD		
Less than 13	25	44.84	1.49	2.032	.139
Between 13-15	36	45.25	3.33		
More than 15	13	46.69	2.69		

Table 3: Live Births in relation to age at menarche: One way ANOVA.

Age at menarche	N	Live Births		F	P (two-tailed)
		Mean	SD		
Less than 13	26	2.38	.98	4.442	.015
Between 13-15	36	2.47	1.28		
More than 15	13	3.62	1.85		

were determined by the retrospective recall method. The reported age at menarche did suffer from recall bias since there was huge recall interval. But this bias held good for all the women respondents of this study and so the biased reporting was random and not systemic. The inclusive criteria were that the family should have been the permanent resident of the village and postmenopausal women. The excluding criteria was that a household where there was a second premenopausal wife and no information on first wife was available was excluded.

Scales to measure menopausal or climacteric symptoms in a standardized way have been developed and are widely accepted. The Menopause Rating Scale (MRS) that measures health related quality of life [56] has been used for this study. This scale has been extensively used in epidemiological studies across cultures and validated to assess the severity of menopausal symptoms. The MRS asks: “Which of the following symptoms apply to you at this time?” and uses a Likert Scale of responses for each symptom: none, mild, moderate, severe very severe. The MRS is subdivided into different symptoms; each of which is scored on a scale from “0” (no complaints) to “4” (very severe symptoms). The questionnaire was first translated into Hindi language. A pilot study was done before proceeding for the field work to validate the translated MRS questionnaire schedule. During the pilot study, it was noted that women experienced difficulties in understanding the terms and rating the scale themselves. So as to minimize these problems, face-to-face interviews were done rather than using self-administered questionnaire. All questions were asked in Hindi language. The recall error may be higher among older women. The data so collected were analyzed statistically using SPSS18 and the various tools used for analysis are explained in the results section. No distinctions were made between prevalence and incidence terms and were used interchangeably in this study.

Table 4: Live Births in relation to age at Menarche: Multiple comparisons by Scheffes test.

Dependent variable	(I)	(J)	Mean difference (I-J)	Std. error	P (two-tailed)	95% Confidence Level	
						Lower bound	Upper bound
Live Births	<13	13-15	-.088	.335	.966	-.93	.75
		>15	-1.231*	.443	.025	-2.34	-.12
	13-15	<13	.088	.335	.966	-.75	.93
		>15	-1.143*	.422	.030	-2.20	-.09
	>15	<13	1.231*	.443	.025	.12	2.34
		13-15	1.143*	.422	.030	.09	2.20

Results

83% of the women had menarche between 10-15 years while 17% had at or later than 16 years. Mean age at menarche was 14.23 yrs. with standard deviation of 1.75 years. Mean age at natural menopause was 45.35 yrs and standard deviation of 2.75 years. The mean natural reproductive span among the present sample of women was 31.23 years.

Climacteric symptoms

The results of the descriptive statistics of various menopausal symptoms have been presented in Table 1. About 85% of the postmenopausal women suffered from some climacteric symptom. The most common menopausal symptoms were muscle or joint pain (67%), headache (61%), rapid heartbeat (59%) and fatigue (59%). Prevalence of vaginal atrophy, urinary symptoms, uterine bleeding was about 30% or less, while that of depression, headache, tension, tiredness and breast pain was about 50% or higher. Average total sum of scores of MRS in the present sample was 19.43 with standard deviation of 15.5. They were reluctant to talk about sexual behavior, but the most common narrative that emerged was that rather than menopausal symptoms, other concerns had greater effect on sexual functioning (Table 1).

Association between Age of Menarche, Menopause and Number of Live Births

Hypothesis 1: Women having an early age of menarche would have an early age of menopause than those having late menarche

The results are presented in Table 2. The table shows that women having lower age at menarche had early age at menopause and age at menopause increased with increase in age at menarche. The null hypothesis (H0: $\mu_1 = \mu_2 = \mu_3$) that mean ages at menopause among three groups with varying ages at menarche was equal was tested to find whether differences were significant or not. Table 2 showed that null hypothesis was not clearly rejected as F value was not significant by a two-tailed test. These results showed that the proposed hypothesis was not fully supported by the present data, despite there were some indications to that effect.

Age at Menarche with Number of Live births

Hypothesis 2: Women with earlier age at menarche would have lesser number livebirths than women with later age at menarche.

Results of analysis testing number of live births with reference to age at menarche are presented in Table 3. The table shows that women who had early menarche had less number of live births than those

Table 5: Live Births in relation to age at Menarche: Multiple comparisons by Tukey (HSD) test.

Dependent variable	(I)	(J)	Mean difference (I-J)	Std. error	P (two-tailed)	95% Confidence Level	
						Lower bound	Upper bound
Live Births	<13	13-15	-.088	.335	.963	-.89	.71
		>15	-1.231*	.443	.019	-2.29	-.17
	13-15	<13	.088	.335	.963	-.71	.89
		>15	-1.143*	.422	.023	-2.15	-.13
	>15	<13	1.231*	.443	.019	.17	2.29
		13-15	1.143*	.422	.023	.13	2.15

who had later menarche. The null hypothesis that mean numbers live births among three groups of mothers arranged according to their ages at menarche were same ($H_0: \mu_1 = \mu_2 = \mu_3$) was significantly rejected by the F-test. Since there were significant differences, the multiple comparisons were made by Scheffes' and Tukey's tests, and results are presented in Tables 4 and 5. The tables show that significant differences in number of livebirths with respect to age at menarche were observed when comparison was made among women who had age at menarche later than 15 years vis-à-vis with other two groups and not between <13 and 13-15. These results indicate that age at menarche might have some association with number of livebirths.

Relationship of Age at Menopause with Number of Livebirths

Hypothesis 3: Women having larger number livebirths would have late menopause than women having less number of livebirths.

Results of analysis testing number of livebirths with reference to age at menopause are presented in Tables 6. The table shows that women who had 0-3 number of live births had earlier age at menopause than those who had 4-5 live births; but such conclusion can be drawn from the third category of women having more than 6 live births. The null hypothesis $H_0: \mu_1 = \mu_2 = \mu_3$ was also not rejected by F-test (Table 6). The proposed hypothesis was not fully supported by the present data though there is some indication to that effect. So a new hypothesis may be proposed that women with intermediate fertility category having 4-5 livebirths had later age of menopause than women having less than three livebirths.

Discussion

Menopausal problems/symptoms

In the present study, prevalence of menopausal symptoms was 85% and similar prevalence rate has been reported from many other populations, for example among Nigerian population, reported prevalence is 84.5% [58]. According to WHO [57] hot flushes and night sweats are the most common symptoms associated with menopause, but hot flushes prevalence in the present sample was moderate 39%. Since difference between flushing and night sweating is the time of the day when these occur and both are caused by same factors, their

Table 6: Age at menopause in relation to live births: One way ANOVA.

Live births	N	Mean	S.D	F	P (two-tailed)
0-3	57	45.21	2.53	.732	.485
4-5	14	46.14	3.80		
>6	3	44.67	0.58		

prevalence rate is similar. It has been reported that women suffering from hot flushes range between 15.1% and 61% [59,60]. Menopausal symptom frequency and severity have been reported to vary among different racial and ethnic groups [13,61-63]. In Abadan (Nigeria), joint and muscular discomfort has been reported as the most common symptom (59%) followed by physical and mental exhaustion sexual problems (40%) and 39% prevalence of hot flushes [64]. Among the Japanese and Chinese women, the prevalence of hot flushes and night sweats has been reported to be lower than the women from the European ancestry [12,65]. Haines et al. reported lowest prevalence of hot flushes (5%), and very high prevalence of body and joint pains (93%) among Indonesians, Vietnamese (96%) and Koreans (76%) women [66]. However there are contradictory reports. For example, among the Thai women aged 45-65 years, Peeyananjarassri et al. reported the prevalence of the night sweats, hot flushes, and vaginal dryness as 20.8%, 36.8% and 55.3%, respectively [67]. In the present study, prevalence of body/ joint pains and vaginal dryness was lower than those in Southeast Asian populations.

According to Gold et al. African-American women reported more vasomotor symptoms and vaginal dryness and less urine leakage and sleeping difficulty than the Caucasians [12]. They further reported that the Hispanic women experienced higher frequency of urine leakage, vaginal dryness, heart pounding, and loss of memory than the Caucasians. Palacois et al. also found that the frequency of vasomotor symptoms varies widely depending on the geographical region, selection of criteria, and method of symptom identification [68]. They analyzed various databases reported in different, large, epidemiological studies, and found that the prevalence of such symptoms ranged from 74% of women in Europe, 36-50% in North

Table 7: Mean and Standard deviation (SD) of mean ages at menopause among populations of different nationalities.

Region	N	Mean yrs	SD	Range yrs	ANOVA	
					F	Sig.
India (South Asia)	48	46.35	1.66	42.56 - 49.36	23.408	.000
North & South East Asia	19	48.80	1.50	44.00 - 51.28		
Europe	19	50.58	.88	48.70 - 52.10		
USA	11	49.39	1.26	47.50 - 51.40		
Latin America	10	46.82	2.24	42.30 - 50.40		
Middle East	18	47.85	1.15	45.80 - 50.40		
Africa	9	48.33	1.01	46.16 - 49.60		
Total	134	47.91	2.09	42.30 - 52.10		

America, 45-69% in Latin America and 22-63% in Asia. There are many etiological theories, both biological and socio-cultural, regarding the occurrence of psychological symptoms in menopausal women. Obermeyer and Sievert invoked cultural specific symptoms to relate the reported nuances of the psychological symptoms. The various factors include differences in body size, hormone levels, socioeconomic status, smoking, diet, physical activity and psychological factors [69-71].

Concerns about the different methodologies used by investigators, language problems to understand medical terminology included translated terms and weakness of the research designs to assess the menopausal experiences have been expressed [72-74]. The use of uniform rating scale facilitates proper evaluation of the symptoms of menopause across various cultures. It has been observed that generally, women from developing countries, including those of the present study, tend to view menopause and its symptoms as a natural process that does not require medical care, so they are less aware about the health-related issues of menopause. Moreover culture of silence prevented them from seeking health care despite the fact that Shimla has a tertiary level hospital under medical college of Shimla.

Association between age at menarche and age at menopause

The results of the present study are consistent with the hypothesis of association between age at menarche and age at menopause. The women who had early menarche had early menopause and those with late menarche had late menopause. There are inconsistent reports on this association, varying from no association, positive association and inverse relationship and these are reviewed in the introduction part of this paper.

Thomas et al. [9] observed an increase in the average number of reproductive years (subtracting age at menarche from age at natural menopause), from 36.1 years among women born between 1915 and 1919 to 37.7 years among the 1935-1939 cohort ($p \leq 0.0001$). In present study, mean natural reproductive life span has been found to much lower than the women from the European ancestry. Other Indian studies also reports similar natural reproductive life span. It should be further explored whether it has something to do with early age at marriage. The present study also shows that women who had early menarche had lower number of live births than those who had later menarche.

Is Age at menopause among Indians lower than the western populations?

The databases published in various journals reporting mean ages at menopause of different populations across the globe were reanalyzed to study the significance of differences among them and the results are presented in Table 7. Since the number of studies is large (134 studies) and data as such has not been reported in this paper, so their references have not been given for brevity. Analysis of Variance (ANOVA) revealed significant differences in the mean ages of menopause across populations from different nationalities/geographical regions. These differences among populations in their mean ages of menopause may be attributed to the factors like geography and race, food habits, occupations, parity, marital status, age at menarche and socio-economic factors and genetics. Income,

education and the husband's occupational category have been found to be associated with menopause [75]. When compared with other population, the mean age of menopause in the present sample comes around the mid value. Indian populations have relatively lower mean age at menopause than the other populations from Southeast Asian and Europe by about 2 years. Median age at menopause among the European populations was around 51 years, being about 4 years higher than that in India. Palacois et al. [7] by searching electronic databases of MEDLINE (1966- October 2009) and EMBASE (1975-October 2009) reported median age at menopause in Europe ranges from 50.1 to 52.8 years, in North America from 50 to 51.4 years, in Latin America from 43.8 to 53 years and in Asia from 42.1 to 49.5 years. McKnight et al. [76] found no significant differences in age at menopause between the White and the Black women after making adjustments for covariates, but women from the south (Who had greater proportions of black than white women) had earlier menopause than from the North of the USA.

Studies in western populations suggest that the age at menopause increased in recent decades [13-15], and this shift may be related to changes of socioeconomic conditions and lifestyle, particularly among young women. Nichols et al. [77] in their study on 22,774 American women born between 1910 and 1969 found that the mean age at natural menopause increased from 49.1 years for those born in 1915-1919 to 50.5 years for those born in 1935-1939. However, these results were not supported by Pakarinen et al. [1] who studied a population based random sample of 7828 white women from Finland and found no evidence of a secular trend towards a later age at menopause in the last 25 years. McKinlay [78] in an overview of population based studies reported that there was no evidence of any secular trend in age at menopause.

In any population, there would be women having early, late or intermediate age of menopause. There are inter-population differences in frequency distribution of such women. For example, it has been reported [79] that 11.7% of the postmenopausal Saudi Arabia women had menopause after the age of 55 years (with mean of 58.9 yrs) compared with 5% in U.K. and USA [80] and 3.5% in Finland [81]. The Polish studies by Kaczmarek [50] showed that lower socio-economics of women might contribute to the earlier median age at menopause.

Association of age of menarche and menopause with Parity/number of livebirths

Results of the present study show that both age at menarche and menopause are associated with number of livebirths. The association between menarche and livebirths may be statistical due to association between age at menarche and age at menopause; lower the age of menarche would follow lower age at menopause and vice versa. Age of menopause was clearly delayed with increase in number of live births in the present study. These results are interesting and needs further examination. However, it has been known that estrogen hormone is an important factor in follicle survival. Higher levels of estrogen during pregnancy are known to inhibit follicular atresia [82]; the latter (i.e. atretic follicles) are known to decrease estrogen production [83]. During lactation, estrogen levels remain low, resulting in promoting apoptotic cell loss, and thus pregnancy delays onset of menopause [82]. The smoking and nulliparity have been reported to be associated with early menopause [55].

Conclusions

There are indications of association between early age at menarche and early age of menopause. Fertility performance of women was associated with mean menarche and menopause ages. Indian women have lower mean age at menopause than the European and South Asian women. Prevalence of body/joint pains was highest followed by accelerated heart beat and fatigue, while lowest prevalence was for urinary and vaginal problems.

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