Factors affecting menopause among Rajbanshi women of North Bengal

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ABSTRACT

*Aims: The present study aims to evaluate effects of different socio-economic, socio-demographic and lifestyle factors on natural age at menopause among Rajbanshi women of North Bengal. **Methods:** The study participants consisted of 510 Rajbanshi women aged between 45 years to 55 years who had experienced natural menopause. All the women were residents of Darjeeling district of West Bengal. The socio-economic, socio-demographic and lifestyle variables were recorded using a structured schedule. The data were statistically analysed using SPSS (version 17.0). The statistical tests included binary logistic regression and stepwise regression. **Results:** The mean age at natural menopause was 48.57 years (s.d.: 2.07; range: 44 years - 54 years). The binary logistic regression analysis showed that most of the factors except educational status (p>0.05) were significantly associated with natural menopause (p<0.05, p<0.01). The stepwise regression analysis showed that natural menopause was independently correlated with marital status, parity, last pregnancy and duration of breast feeding (p<0.01). **Conclusion:** Marital status, parity, age at last pregnancy and duration of breast feeding appear to have highly significant effects on natural age at menopause.*

Key words: Menopause, Rajbanshi, marital status, occupation, health, parity.

INTRODUCTION

Menopause is the permanent cessation of menstruation resulting from loss of follicular activity of the ovaries. Natural menopause is defined by the World Health Organization (WHO, 1996) as "the permanent cessation of menstruation, recognized as having occurred after 12 months of amenorrhea, not attributed to hormone use or surgery for the removal of the uterus or ovaries''. The menopause signals are a reduction of ovarian activity and a fall in fertility. The appearance of various symptoms and irregular menstrual periods are the characteristic features of this climacteric stage. The hormonal and biochemical changes that occur in this period can lead to various symptoms in a woman's body (Sharma et al., 2007). The onset of this physiological development not only marks the end of women's reproductive function but also introduces them to a new phase of life. It signifies the loss of reproductive capacity and the exact age of menopause is a marker for aging and health. Considering the physical, emotional and psychiatric complications of early and delayed menopause, numerous studies have been initiated to recognize associated factors of menopause so as to provide appropriate awareness and treatment before and after menopause.

Age at natural menopause varies widely between and within populations and is influenced by multitude of factors, both genetic and environmental. There are several factors which have significant influences on age at natural menopause. Factors such as smoking, nutrition, socio-economic status, fertility rate and nutritional factors can affect menopausal age (Torgerson et al., 1994). Other confounding factors include early age at menarche, menstrual bleeding length (>5 days), early marriage, low parity, ever use of oral contraceptive and early onset of mother's and sister's age at menopause, (Leidy, 1996; Gold et al., 2001; Matikainen et al., 2001; Reynolds and Obermeyer, 2001; Akahoshi et al., 2002; Parazzini, 2007). Several studies done among Indian women have reported ages at menopause ranging between 40 years to 50 years (Singh and Ahuja, 1980; Sharma et al., 2007; Dasgupta and Ray, 2013). Some regional level studies in the Indian subcontinent showed that around one fifth of Indian women reached menopause beyond 49 years of age (Adhi et al., 2007).

The importance of studying age of natural menopause along with its associated factors stems from the fact that it is strongly relevant to population health. Studies have shown its strong associations with an increased risk of the onset of certain chronic diseases (Sowers and

La Pietra, 1995; Jacobsen et al., 2004; Kaczmarek, 2007). Moreover, the decrease in estrogen levels at menopause is associated with rapid bone loss due to increased bone resorption, which may result in osteoporosis (Andreopoulou and Bockman, 2015). Another association is that of cancer with menopause (Grady et al., 1995).

The Indian subcontinent is a land of enormous cultural, geographical, and linguistic diversity, and has appreciably greater genetic diversity than any other comparable global region after Africa ((Majumder, 1998; Basu et al., 2003, 2016; Mehra, 2010). The country is composed of various tribal groups, ranked caste and other population groups that are largely endogamous. As age at menopause varies widely among populations, it is of further interest to investigate the age at menopause and its associated variables among an ethnic population of North Bengal. The data subsequently generated can be used for both national and international comparisons. Later studies can then primarily focus on associations of early/late menopause with disease.

Using 'Pubmed' (www.ncbi.nlm.nih.gov/pubmed/), there appears to be a dearth of studies on menopausal ages of women belonging to different ethnic populations of the region under study. However, some studies on menopausal awareness and attitudes towards the same have been reported among women from the state of West Bengal, India. Here the studies of Dasgupta and Ray (2009, 2013, 2017), Ray (2010), Som and Ray (2012) and Dasgupta et al. (2015) are mentionable.

MATERIALS AND METHODS

Area and subjects

The northern part of the state of West Bengal, India is popularly known as North Bengal and comprises of seven districts. The area is inhabited by a number of indigenous tribal (such as Rabha, Meche, Toto, Oraon, Santal and Munda) and non-tribal (Rajbanshi, Bengali caste and Bengali Muslim) populations. One of the largest populations among them is the Rajbanshi. This population is chiefly distributed in Assam and a few districts of West Bengal (Sanyal, 1965). In West Bengal they constitute the second largest percentage and number of the schedule caste population. It is generally agreed that ethnically the Rajbanshi show resemblances with the Koch population of neighbouring states of Assam and it is been conjectured that they belong to a mixed race Australasian/Dravidian and Mongolian (Risley, 1891). It has also been opined that they belong to a Dravidian stock and came in contact with heterogeneous Mongoloid population (Dalton, 1872). A study on genetic markers among the populations of north-

eastern India showed that the Rajbanshi was a semi Hinduized caste group located in between the clusters of Caucasoid caste and Mongoloid tribal populations (Kumar et al., 2004).

The sample size in the present study was determined after taking into account the sample sizes in various studies on menopause in India, especially those done in West Bengal. In their studies, Som and Ray (2012) and Som et al. (2014) had a sample size of 250 women. Singh and Pradhan (2014) in their study had a sample size of 252 women. A larger sample size of 480 women was observed in the study of Dasgupta and Ray (2013). Keeping these sample sizes in mind, it was decided that the sample size in the present study be around 500 women who had experienced natural menopause. Subsequently, the present population based cross-sectional study was carried out among 510 Rajbanshi women aged between 45 years to 55 years and who had experienced natural menopause. The women were the residents of seven villages in Kharibari block located in the district of Darjeeling, West Bengal. The data was collected by house hold visits during the period from November 2014 to June 2015.

The Rajbanshi women were selected using a multistage stratified random sampling method. Initially the Rajbanshi households in the seven villages were identified by the surnames and the information was verified from the governmental records. In the next stage, women comprising the age group of 45 years to 55 years and who had experienced menopause were identified and 530 of them were approached to voluntarily take part in the study. Twenty of them were subsequently excluded from taking further part in the study as because they had either experienced surgical menopause and/or undergoing hormone therapy. The final sample, thus, consisted of 510 women who had experienced natural menopause, The study was conducted in accordance with the ethical guidelines for human experiments as laid down in the Helsinki Declaration of 2000 (Touitou et al., 2004).

Age at natural menopause of the participants was determined following the method outlined by the WHO (WHO, 1996). The participants were asked to recall when they experienced their final menstrual period. It was also verified that the twelve consecutive months of amenorrhea was not due to any medical reason. Finally, the age at menopause was calculated by subtracting the year of birth of women from the year of their final menstrual period. The ages at menopause, and years elapsed between recalled age at menopause and present age were calculated in completed years. Age at menopause was ascertained by asking the participants to recall when they experienced menstrual bleeding for the last time in life.

Socio-economic, socio-demographic and lifestyle data

The participants were asked to confirm their age at marriage, first and last pregnancies, and number of pregnancies. The information was cross checked from husbands and/or mothers of the participants. Data on use of oral contraceptives were collected by asking the participants to report whether they had used oral contraceptives during their life exclusively or with other types of contraceptives. Data on history of different diseases were collected by interviewing the women and/or from the medical reports. All attempts were made to check recall bias, especially for data like age at menarche, age at first pregnancy, age at last pregnancy and duration of breast feeding of the last child. A structured schedule was used for this purpose and this decreased the recall interval between the actual timing of the incident and the time of data collection (Dasgupta and Ray, 2009; Ray et al., 2010).

Statistical analysis

Statistical analyses were performed using SPSS (Version 16.0, Chicago, IL, USA). Binary logistic regression (BLR) was used to determine the effects of different socio-economic, socio-demographic and lifestyles factors which have the potential to be significantly associated with natural menopause. The odds ratio (OR) were presented together with their 95% confidence intervals. The regression model allows for controlling the determinants variables by comparing with reference category. The BLR analyses were performed for all of the determinant variables that could be associated with natural menopause. The adjustments were made for independent variables including such as age, marital status, education, occupation, smoking, health status, parity, oral contraceptive use, age at first pregnancy, age at last pregnancy, and duration of breast feeding and these were entered into the regression model as a set of categorical variables. The results were obtained by comparing them with the reference categories. Stepwise regression analysis was done after getting significant effects of different factors on age at menopause. It is mainly used to identify a useful subset of predictors. The process systematically adds the most significant variable or removes the least significant variable during each step. The p-values of <0.05 and <0.01 were considered to be statistically significant.

RESULTS

The mean age at natural menopause in this present study was 48.57 years (s.d.: 2.07; range: 44 years - 54 years).

Binary logistic regression analysis and effects of different factors on natural menopause

A binary logistic regression (BLR) model was fitted to find out the odds for socio-economic, demographic and lifestyles related variables which had the potential to be significantly associated with age of natural menopause (Table 1). The results showed that most of the socio-economic factors except educational status ($p > 0.05$) were significantly associated with natural menopause ($p < 0.05$, $p < 0.01$). The results also showed that the married women exhibited a significant odds (0.004) for natural menopause ($p < 0.01$) rather than unmarried and widowed women. A woman who had 1-3 children showed significant odds (7.10) for natural menopause. The results of BLR analysis showed significant effects of natural menopause among women whose age at first pregnancy was 17-20 years (odds: 1.35, CI: 0.94-1.93) and age at last pregnancy was $25 \geq$ years (Odds: 8.27, CI: 3.51-19.48). The results also showed that the women who did not use oral contraceptives exhibited significant odds (5.41), ($p < 0.01$) as compared to other women who had used oral contraceptives. The regression analysis also showed that women belonging to no smoking category (Odds: 0.54, CI: 0.33-0.87), health status not normal including headache and other diseases (Odds: 0.023, CI: 0.01-0.39), time of breast feeding greater than 34 months (Odds: 0.26. CI: 0.34-19.27) and occupational level employee (Odds: 0.01, CI: 0.02-0.09) exhibited significantly greater odds for natural age at menopause ($p < 0.01$).

Stepwise linear regression analysis and effects of different factors on natural menopause

A stepwise linear regression analysis was done to assess the main independent parameters associated with natural menopause. The results showed that natural menopause was independently correlated with marital status, parity, last pregnancy and duration of breast feeding ($p < 0.01$) (Table-2).

Table 1. Effects of different variables on natural menopause using binary logistic regression

Variables	N	B	p-value	df	SE	Wald	Odds	95%CI
Marital status								
Married	325	-5.569	0.000	1	1.009	30.465	0.004**	(0.001-0.028)
Others (R)	185	-	-	-	-	-	-	
Parity								
1-3 children	293	1.561	0.001	1	0.204	92.04	7.10**	(4.760-10.06)
4≥ children (R)	217	-	-	-	-	-	-	
Education								
Illiterate (R)	105	-	-	-	-	-	-	-
Literate	405	0.131	0.568	1	0.228	0.327	1.139	(0.728-1.783)
Use of oral contraceptives								
Yes (R)	172	-	-	-	-	-	-	-
No	388	1.690	0.000	1	0.239	40.97	5.41**	(3.39-8.65)
Smoking								
Yes (R)	409	-	-	-	-	-	-	-
No	101	-0.617	0.012	1	0.264	6.271	0.540**	(0.33-0.87)
Health status								
Normal (R)	183	-	-	-	-	-	-	-
Headache and others	327	-3.7	0.000	1	0.270	19.56	0.023**	(0.01-0.39)
Age at 1st pregnancy								
17-20 years	271	0.303	0.009	1	0.183	2.72	1.35**	(0.94-1.93)
20≥ years (R)	239	-	-	-	-	-	-	-
Age at last pregnancy								
20-25 years (R)	73	-	-	-	-	-	-	-
25≥ years	437	2.11	0.000	1	0.437	23.38	8.27**	(3.51-19.48)
Time of breast feeding								

Below 23 months (R)	43	-	-	-	-	-	-	-	-
24-34 months	280	1.617	0.116	1	1.030	2.46	5.04		(0.66-37.90)
34≥ months	187	5.561	0.000	1	1.012	28.94	0.26**		(0.34-19.27)
Occupation									
Housewife (R)	417	-	-	-	-	-	-		-
Employee	93	-4.354	0.000	1	1.010	18.57	0.01**		(0.02-0.09)

Table 2: Stepwise linear regression analysis to understand influences of the main independent variables on natural menopause

Model	Unstandarized coefficients		Standardized coefficients	t	p	95% C.I	
	B	SE	B			Lower Bound	Upper Bound
Constant	-1.939	.043		-45.049	0.000	-2.023	-1.854
Parity	.214	.020	.218	10.93	0.000	.175	.252
Marital status	.706	.029	.701	24.033	0.000	.649	.764
Time of breast feeding	.080	.023	.101	3.436	0.001	.034	.126
Last pregnancy	-.047	.020	.034	-2.413	.016	-.085	-.009

DISCUSSION

A wide range in mean age at menopause among women both from India and the developed countries have been reported in the existing literature. In India, studies have indicated a range of 40.32 years to 48.84 years (Kar and Mahanta, 1975; Kulkarni and Joshi, 1959; Balgir, 1985; Sengupta and Gogoi, 1993; Kim et al., 2003; Bagga, 2004; Kaur et al., 2004; Singh and Arora, 2005). This range has been more or less corroborated in the present study.

The menopausal age among Brahmin women was reported to be 48.16 years (Sita Laxmi, 2001), while it was 45.33 years among Arya Vysya women (Lakshmi 1994). For Kalinga Vysya women, the same was reported to be 44.11 years (Lakshmi 1994). Trivarnika women showed the menopausal age to be 45.34 years (Lakshmi 1994). The mean age at menopause of Aao Nagas of Nagaland was reported to be 51.33 years (Purnungla and Sengupta, 2002). The median age at menopause was observed to be 48 years with the mean age being 46.7 years among women from north India (Kriplani and Banerjee, 2005). In a south Indian study, Bairy et al. (2009) documented the mean age at menopause to be 48.7 years. Kapur et al. (2009) observed the recalled mean age at menopause to be 45.02 years and age at menopause computed by probit analysis to be 46.82 years among women from Uttarkhand. Mean menopausal age in among women from Puducherry was 45 years (Poomalar and Arounassalame, 2013). In a pan-Indian study, Ahuja (2016) observed the average age of menopause of an Indian woman is 46.2 years, much less than their Western counter parts (51 years).

The results in the present study are almost similar with those of the above-mentioned studies. However, large scale epidemiological studies in other countries have observed an existence of a secular trend in age at menopause (e.g., Dratva et al., 2009; Pakarinen et al., 2010; Ramezani et al., 2014). In all these studies there has been an increase in age at menopause. In a very recent study, Mozumdar and Agrawal (2015) compared that data obtained in the Indian NFHS surveys from 1992 to 2005-2006, but could not establish any such secular trend regarding the menopausal age among Indian women.

Variations in the ages of menopause aroused interest in the minds of scientists to carry out studies in different populations. This is primarily keeping in view factors such as genetic, environmental and socio-economic status. Although results are not always consistent from one study to another, several factors have been shown to significantly influence age at

menopause. These include biological (e.g., genetic, nutritional, and reproductive history), sociocultural (e.g., educational, occupational, and rural-urban residence), reproductive (age at menarche, parity and kind of contraceptives used), and lifestyle (e.g., smoking and use of tobacco and dietary habits) factors. Early age at menarche, menstrual bleeding length (>5 days), body mass index, early marriage, low parity, ever use of oral contraceptive, early onset of mother's and sister's age at menopause, and smoking habits have been associated with the early onset of menopause (Leidy, 1996; Gold et al., 2001; Matikainen et al., 2001; Reynolds and Obermeyer, 2001; Akahoshi et al., 2002; Parazzini, 2007). Comprehensive reviews of the factors related to timing of menopause have been presented by many researchers (e.g. McKinlay, 1996; Ceylan and Özerdoğan, 2015). The results in the present study appear to in conformity with those reported in these studies.

In present study, married women had a significant effect on natural menopause. For parous women, age at natural menopause occurred significantly later than for nulliparous women, concurring with the results of previous studies (e.g. Bromberger et al., 1997). A trend of increasing age at menopause with increasing number of live births was observed in the present study, but the trend was not strongly monotonic, unlike that in some previous reports (e.g. Hardy and Kuh, 1999). A study of Chinese women found early menarche, younger age at first live birth, older age at last live birth and higher parity to be associated with late onset of menopause (Dorjgochoo et al., 2008). Literature shows that women who gave birth to at least one child have a larger reserve of oocytes and longer exposure to estrogen (Santoro et al., 2007).

Increasing parity may lead to slower depletion of ovarian follicle and results in a later age at menopause (Smith and Xu, 2008). Since onset of menopause is theorized to be related to the rate of loss of oocytes and thus to the occurrence of ovulatory cycles, the proposed mechanism by which parity and use of oral contraceptives may result in later age at natural menopause is by reducing ovulatory cycles earlier in life and thus preserving oocytes longer, resulting in later menopause. The present study observed that prior use of oral contraceptives was significantly associated with onset of natural menopause, although no relation with increasing duration of use was observed. The findings are consistent with those of some prior prospective studies (e.g., van Noord et al., 1997) but inconsistent with other results (e.g. Hardy and Kuh, 1999).

The results of the present study add to a growing body of literature showing that smoking is not highly associated with onset of menopause. Some studies have reported that

heavy smokers have an earlier menopause than light smokers (e.g. Torgerson et al., 1994). Previous studies have shown that former smokers have no or only a slightly earlier age at menopause than never smokers (e.g. Cooper et al., 1999). So the effect of smoking may not be permanent, a finding inconsistent with a toxic effect leading to atrophy of ovarian follicles. Polycyclic aromatic hydrocarbons in cigarette smoke are toxic to ovarian follicles and could result in their loss and thus in earlier menopause among smokers. Greater prevalence of hysterectomy among premenopausal smokers than non-smokers does not account for the earlier menopause in smokers. For example, a study in the United States showed that women who used oral contraceptive and had a smoking habit attained menopause at an early age whereas porous women attained it at later age (Gold et al., 2001). An appreciable number of studies (e.g., Elias et al., 2003; Sievert and Hautaniemi, 2003) observed smo3king as a consistent predictor for menopausal age. Matikainen et al. (2003) argued that cigarette smoke is toxic to ovarian follicles and leads to early ovarian failure and menopause.

The results of present study partially corroborate the finding from Indian national level data that show women who began and ended child bearing at an early stage of their reproductive life reached menopause early (Shyamala and Shivakami, 2005). Some non-Indian studies have also shown menarcheal age, duration of breastfeeding, and age at last pregnancies to be significantly associated with the onset of menopause (Lock, 1993; Gold et al., 2001; Chang et al., 2007; Parazzini, 2007; Dorjgochoo et al., 2008), suggesting a role for these variables in influencing the ovarian store of the body. For example, an increased duration of breastfeeding may prevent follicle depletion and preserve ovarian function and thereby delay the onset of menopause (Chang et al., 2007). The present study has observed that the duration of breast feeding, age at last pregnancy was highly significantly associated with onset of natural menopause.

In case of present study the employment women independently associated with earlier age at menopause. Several previous studies indicate that lower educational attainment and/or socio-economic status, often determined by occupational status of the woman or her husband, is associated with earlier age at menopause (e.g. Torgerson et al., 1994), although findings are not wholly consistent (e.g. Bromberger et al., 1997). Social and physical stress is also associated with amenorrhea and reproductive dysfunction, and low socio-economic status or low educational level may be markers for elevated stress.

A major limitation of the study is its cross-sectional nature. There may also be bias associated with the self-reported age of onset of menopause and previous history of

menopause. Other important variables such as anxiety and depression indexes and information on physical activity were also not considered. Another limitation is that only one ethnic group has been selected.

In conclusion the factors like marital status, parity, use of oral contraceptives, age at last pregnancy duration of breast feeding and occupational status of women appear to have highly significant effects on natural age at menopause among the Rajbanshi. As India is a multiethnic country, it would be interesting to perform similar research to identify how these factors discriminate the age of attainment of menopause for other ethnic groups.

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