

# Study of Factors Associated with the Age of Natural Menopause in Menopausal Women Aged 30 to 80 Years from the Keur Massar Health District in 2015 (Senegal)

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## Abstract

**Introduction:** Menopause is a biological phenomenon that occurs at a more or less early or late age in the life of every woman. The general objective is to study the factors associated with the age of natural menopause in menopausal women aged between 30 and 80 years who have gone through down Keur Massar health district in 2015. **Methodology:** This was an observational, cross-sectional, descriptive and analytical study conducted in Keur Massar health district from December 1<sup>st</sup> to 10<sup>th</sup>, 2015. Two-stage cluster sampling was conducted. Data were collected during an individual interview at home after consent. They covered socio-economic conditions, health and nutrition status, gynecological-obstetrical history, and lifestyle. A multivariate analysis was performed using the Cox model with a 5% risk of alpha error. **Results:** A total of 627 postmenopausal women were surveyed. Mean age of these women was 54.5 years ( $\pm 8.6$  years). A proportion of 72.1% of the women was married and 46.7% was in school. Mean age of natural menopause was 47.1 years ( $\pm 5.03$  years). The median age of natural menopause was 47 years. Factors associated with the age of natural menopause were high parity of more than 4 children (Hra = 0.35 [0.13 - 0.92]), the existence of frequent childhood illnesses (Hra = 1.72 [1.13 - 2.64]), use of the intra-uterine device—IUD—as a modern contraceptive method (Hra = 0.39 [0.24 - 0.63]), sibling size (Hra = 0.85 [0.78 - 0.93]), family size (Hra = 1.03 [1.01 - 1.06]), and polygamy regime (Hra = 0.56 [0.37 - 0.85]). **Conclusion:** Many factors in childhood as well as during the period of female genital activity can impact the age of natural menopause. It is then important to improve the health status of women, children and the standard of living of the population.

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## Keywords

Age Menopause, Associated Factors, Survival, Senegal

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### 1. Introduction

According to the World Health Organization (WHO), menopause is defined as a permanent cessation of menstruation resulting from a loss of ovarian follicular activity [1]. This definition is primarily retrospective, since it is based on a 12-month period of consecutive amenorrhea with no obvious physiological or pathological cause [2]. It is a natural phenomenon [1]. Natural menopause usually occurs between the ages of 45 and 55 years. It can be early or late. The steroid hormone deficiency that marks menopause can influence morbidity and mortality by cause during the rest of life. The categories of diseases that are most affected are cardiovascular diseases and malignant tumors [3]. The risk of endometrial cancer increases with age at menopause [4]. Early menopause contributes independently to the risk of post-menopausal fracture [5] and the development of multi-morbidity [6].

The age of menopause depends on the number of follicles in the ovaries. This number begins to decrease at the end of fetal life, and the follicular capital is practically exhausted after menopause [3]. This age of natural menopause varies considerably from one country to another country. In the United States of America, out of a sample of 25,499 women, approximately 65% are menopausal at age 50 or older [5]. In 2009, Velez *et al.* [7] reported a median age of 50 years in Latin America and the Caribbean. In Japan the median age of menopause was 52.1 years in 2012 [8], in Europe 54 years [9], in Poland 51.2 years [10]. In Korea a study conducted over the period 2001 to 2014 showed a median and average age of 49.3 years [11]. In Burkina Faso in 2014, an average age of 47.1 years was found [12] and in Senegal 47.8 years in 2006 [13].

Several factors can influence the age of menopause. Socioeconomic difficulties in childhood and adulthood are associated with the age of natural menopause [12]. Vélez *et al.* [7] in Latin America found that the proportion of women with early menopause was higher among housewives, the nulliparous. Current smoking, low education level, single and unemployed status, and low or moderate physical activity are significantly independently associated with early menopause, while oral contraceptive use, multiparity and good nutrition during childhood are associated with late menopause [9] [10] [11] [14].

Few studies on the age of onset of natural menopause and its determinants are conducted at the population level in Africa and Senegal. This explains the lack of knowledge of the period of occurrence of natural menopause and associated factors, hence the need for a baseline study on natural menopause in Senegal. The general objective is to study the factors associated with the age of natural menopause among menopausal women aged 30 to 80 years who have lived in the

Keur Massar health district in 2015.

## 2. Method

A quantitative estimate is chosen for this study. The study was observational, cross-sectional, descriptive and analytical over the period from December 1<sup>st</sup> to 10<sup>th</sup>, 2015. The study population was made up of women aged between 30 and 80 years who had undergone menopause and were living in Keur Massar health district in 2015. This age group is explained by the fact that menopause is documented in Senegal to occur between 28 to 65 age group [13]. The threshold of 80 years was set in order to reduce memory bias. The study took place in the region of Dakar, the capital of Senegal, and more precisely in the suburb of Keur Massar in its health district located 17 km far from Dakar.

Women with amenorrhea for more than 12 months in the absence of contraception, breastfeeding, hormonal treatment or any other artificial method of non-procreation are included. All women absent at home during the survey after two visits by the interviewer as well as those refusing to sign the informed consent and those residing in the District's area of responsibility for less than 6 months are not included.

The sample represents approximately 600 women. This value is calculated from the Schwartz [15] formula ( $N = (\varepsilon\alpha^2 \cdot p \cdot q) / i^2$ ) with a precision of 5%, a cluster effect of 1.5 and a non-response effect of 2%. This sample was divided into 30 clusters of 20 women. A two-stage cluster survey was conducted. At the first stage, the neighbourhoods in the areas of responsibility are identified. In the second stage, eligible households are selected and all women meeting the criteria are selected. The choice of the first household is made by random selection using the Pen method (stand in the middle of the neighbourhood and choose a given direction randomly) [16]. Then the following households are determined using a sampling step equal to 2.

The collection is done by direct interview of the women, in their own homes. The information is collected using a questionnaire. The questionnaire is based on a review of validated questionnaires already established for this type of study. It concerns sociodemographic characteristics, behavioural factors, biological factors and environmental factors (previous living conditions, woman's income). Nutritional status was estimated by assessing the satisfaction of food requirements. Questions were asked whether or not there were difficulties in meeting food needs. The socio-economic level was assessed on the basis of household goods. A rating of type 1 and type 2 goods resulted in an accumulation of goods score. The score made it possible to create three classes corresponding to the levels (high, medium, low) of economic well-being. In fact, households were assigned scores based on the number and type of durable goods owned, which goods were air conditioner, television, telephone, refrigerator, radio and also include dwelling characteristics as the source of supply of drinking water, energy for lighting, cooking, flooring material and means of transport.

The collected data are entered using the EPI INFO version 2000 software and the analysis carried out with the R software. The univariate analysis made it possible to determine the position or dispersion parameters of the quantitative (mean, standard deviation, median, extremes) and qualitative (absolute and relative frequencies) variables. Overall survival was determined by the Kaplan Meier method [17]. The Logrank test was used to assess the relationship between two variables and to plot survival curves according to the variables.

The multivariate analysis is done by modelling with the Cox model. A risk of alpha error ( $\alpha$ ) of 5% is taken. All variables that had a  $p$ -value of less than 0.25 were included in the model. Then following the step-by-step top-down strategy, the variables whose  $p$ -values are not significant are excluded from the model. The final model was validated by the Schoenfeld test [18]. This multivariate analysis made it possible to determine the adjusted Hazard Ratio (HR).

### 3. Results

#### 3.1. Characteristics of Women

The study involved a total of 627 postmenopausal women. The average age of the women was 54.5 years with a standard deviation of 8.6 years. All women knew their age at the onset of menopause. The mean age of natural menopause was 47.1 years with a standard deviation of 5.03 years. The median age was 47 years. Married women accounted for 72.1%, 56% of whom were on a monogamous status. They were enrolled in school in 46.7% (Table 1).

#### 3.2. Characteristics of Women in Childhood

A proportion of 44.7% of the women's parents lived in the city and 46.1% in the village. The average family size was 18.03 ( $\pm 9.7$ ). It ranged from 2 to 52 persons with a median size of 15 members.

A proportion of 98.4% of women's fathers were gainfully employed, and the parents of women with high socio-economic status were 59.2% and those with low socio-economic status were 18.6%.

#### 3.3. Characteristics of Women in the Period of Genital Activity

During the period of genital activity, 44% of the women had a paid activity. A proportion of 22.5% of women had difficulty meeting their food needs. A proportion of 84.5% of women had means to consult in a public hospital and 71.9% owned their living quarters (Table 1).

#### 3.4. Lifestyle Characteristics

Women in regular physical activity of at least 30 minutes a day accounted for 27.3%; 8% consumed alcoholic beverages and 2.4% smoked. Women whose spouses smoked accounted for 20.6%. Thus, the proportion of women who smoked actively was 2.4% and that of women who smoked passively was 19.6% (Table 2).

**Table 1.** Distribution of postmenopausal women by socio-demographic and economic characteristics in childhood and period of genital activity (n = 627).

	Absolute frequencies (n)	Relative Frequencies (%)
<b>Socio-demographic characteristics</b>		
<b>Marital status</b>		
Married	452	72.1
Widow	104	16.6
Divorced	31	4.9
Single	29	4.6
Separated	11	1.8
<b>Schooling</b>		
Yes	293	46.7
No	334	53.3
<b>Religion</b>		
Muslims	554	88.3
Christians	70	11.2
Traditional beliefs	3	0.5
<b>Ethnic group</b>		
Ouolof	246	39.2
Pular	105	16.8
Serere	102	16.3
Diola	64	10.2
Others	110	17.5
<b>Economic characteristics during childhood</b>		
<b>Habitat area</b>		
City	280	44.7
Village	289	46.1
Village then town	47	7.5
City then village	10	1.6
Unspecified	1	0.2
<b>Type of family environment experienced</b>		
Siring parents	407	64.9
Paternal parents	123	19.6
Maternal parents	64	10.2
Family friend	5	0.8
Others	3	0.5
Unspecified	25	4.0
<b>Paid activity of the father</b>		
Yes	617	98.4
No	10	1.6
<b>Difficulty in meeting food needs</b>		
Yes	158	25.2
No	469	74.8
<b>Difficult childhood</b>		
Yes	65	10.4
No	562	89.6
<b>Socio-economic level</b>		
High	371	59.2
Medium	139	22.2
Low	117	18.6

## Continued

Economic characteristics during the period of genital activity		
<b>Women with a paid activity</b>		
Yes	276	44.0
No	351	56.0
<b>Meeting basic needs</b>		
Yes	567	90.4
No	60	9.6
<b>Difficulty in ensuing food needs</b>		
Yes	141	22.5
No	486	77.5
<b>Judgement of one's own economic situation</b>		
Good	203	32.4
Medium	362	57.7
Poor	53	8.5
Unspecified	9	1.4
<b>Means of consultation in public hospitals</b>		
Yes	530	84.5
No	94	15.0
Unspecified	3	0.5
<b>Housing owned or rented</b>		
Owner	451	71.9
For rent	172	27.4
Unspecified	4	0.6
<b>Socio-economic level</b>		
High	373	59.5
Medium	188	29.9
Low	66	10.6

### 3.5. Characteristics Related to Women's Medical History and Genital Activity

A proportion of 29.5% of the women had common childhood illnesses. Women with regular cycles before the age of 40 represented 72.2%. The average age of menarche was 14.2 years ( $\pm 1.7$  years). The average length of women's menstrual cycles was 28.3 days ( $\pm 2.1$ ) and 54% of women had a regular cycle of 28 days. The average length of women's menstruation was 5.1 days ( $\pm 2.2$  days). The average number of children was 5.5 ( $\pm 2.6$ ) ranging from 0 to 14 children. A total of 21 women (3.3%) had no children and 62% had 5 or more children (**Table 2**).

### 3.6. Characteristics Related to the Use of Modern Contraceptives

A proportion of 22% or 138 of the women were on oral contraceptives. Women who used other contraceptive methods accounted for 22.5%. A proportion of 7.5% used the intra-uterine device (IUD); 10.8% used injectables; 4.6% used implants and 2.3% used the natural method (**Table 2**).

### 3.7. Overall Survival and Factors Associated with Natural Menopause Age

The overall survival from natural menopause, as determined by the Kaplan-Meier

**Table 2.** Distribution of women by lifestyle habits, medical history and genital activity (n = 627).

	Absolute Frequencies (n)	Relative Frequencies (%)
<b>Characteristics related to women's lifestyles</b>		
<b>Regular physical activity of at least 30 min/day</b>		
Yes	171	27.3
No	456	72.7
<b>Consumption of alcoholic beverages</b>		
Yes	52	8.0
No	550	88.0
Unspecified	25	4.0
<b>Tobacco consumption</b>		
Yes	15	2.4
No	567	90.4
Unspecified	45	7.2
<b>Type of smoking</b>		
Old smoking	04	26.7
Current smoking	07	46.6
Unspecified	04	26.7
<b>Partner's tobacco consumption</b>		
Yes	129	20.6
No	479	76.4
Unspecified	19	3.0
<b>Smoking mode</b>		
Active smoking	15	2.4
Passive smoking	123	19.6
No smoking	448	71.5
Unspecified	41	6.5
<b>Breastfeeding method used</b>		
Exclusive breastfeeding (AME)	352	58.1
Artificial feeding	31	5.1
Mixed feeding	214	35.3
Unspecified	9	1.5
<b>Characteristics related to women's medical records and genital activity</b>		
<b>Common childhood illnesses</b>		
Yes	185	29.5
No	379	60.4
Unspecified	63	10.0
<b>Existence of a history of prior serious disease</b>		
Yes	156	24.9
No	468	74.6
Unspecified	3	0.3
<b>Malnutrition</b>		
Yes	33	5.3
No	594	94.7
<b>Hospitalization during childhood</b>		
Yes	96	15.3
No	522	83.3
Unspecified	9	1.4

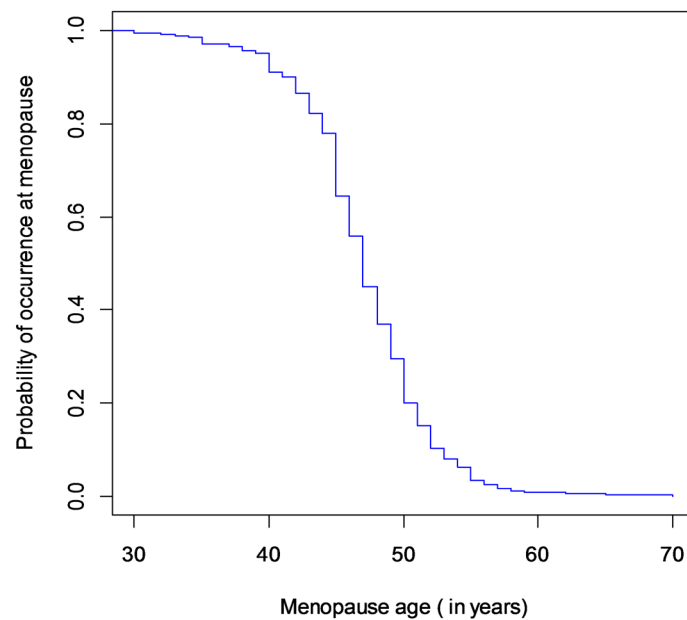
**Continued**

<b>Regularity of menstrual cycles before 40</b>		
Yes	453	72.2
No	168	26.8
Unspecified	6	1.0
<b>Amount of blood during menstruation</b>		
Little	87	13.9
Average	334	53.3
Abundant	200	31.9
Unspecified	6	1.0
<b>Parity</b>		
Nulliparous	21	3.3
One to four children	209	33.3
Five children and more	392	62.0
Unspecified	5	1.4
<b>Abortions</b>		
Yes	226	36.0
No	395	63.0
Unspecified	6	1.0
<b>Characteristics related to the use of modern family planning methods</b>		
<b>Use of oral contraceptives</b>		
Yes	138	22.0
No	473	75.4
Unspecified	16	2.6
<b>Use of other contraceptive methods</b>		
Yes	141	22.5
No	461	73.5
Unspecified	25	4.0
<b>IUD (Intra-Uterine Device) use</b>		
Yes	47	7.5
No	113	18.0
Unspecified	467	74.5
<b>Use of injectables</b>		
Yes	68	10.8
No	105	16.8
Unspecified	454	72.4
<b>Use of the natural method</b>		
Yes	14	2.3
No	147	23.4
Unspecified	466	74.3
<b>Use of implants</b>		
Yes	29	4.6
No	132	21.1
Unspecified	466	74.3

method, is shown in **Figure 1**. The median age of menopause was 47 years, corresponding to 50% of women who had already gone through menopause.

Multivariate analysis with the Cox model gave the explanatory factors for the age of menopause. Thus high parity of more than 4 children in women reduces





**Figure 1.** Graphic representation of overall survival for natural menopause age.

the risk of early menopause (HRa = 0.35 [0.13 - 0.92]). In the same way, women with older siblings (HRa = 0.85 [0.78 - 0.93]) and those on a polygamous status (HRa = 0.56 [0.37 - 0.85]) have a lower risk of early menopause. The use of the IUD as a modern contraceptive method is therefore associated with a later age of menopause (HRa = 0.39 [0.24 - 0.63]). In addition, women who have lived in large families and those with frequent childhood illnesses have a high risk of earlier menopause with respectively (HRa = 1.03 [1.01 - 1.06]) and (HRa = 1.72 [1.13 - 2.64]) (**Table 3**).

#### 4. Discussion

Limits of study: our study has a number of limitations that should be noted. Menopause is most often a taboo subject in Senegal societies, and raising such a subject with women can lead to information bias. We carried out a descriptive cross-sectional survey for analytical purposes to be able to identify the factors associated with the age of natural menopause by a multivariate analysis. These associations can be better demonstrated by a cohort study. Our survey came at a time when women had their last period for at least 12 months and menarche for several years. This can be a source of information bias, particularly recall bias. Also, it is possible that women with menopause rather have died at a young age which can underestimate the real links that exist.

This study shows a median age of natural menopause of 47 years. These results are comparable to those found by JC Moreau *et al.* [13], Faye *et al.* in Burkina Faso [12], Garrido-Latorre *et al.* in Mexico [19], Velez *et al.* [7] in Santiago de Chile, and Kwawukume in Ghana [20]. However, in the USA Gold *et al.* [14], in Europe Dratva *et al.* [9], in Japan Toshiyuki *et al.* [8], in Bridgetown and Sao

**Table 3.** Factors associated with age at menopause in multivariate analysis with the Cox model.

Characteristics of women	Adjusted HR (CI to 95%)
<b>Marital status</b>	
Married	1
Unmarried	3.46 [0.80 - 14.91]
Widower	2.26 [0.87 - 5.88]
<b>Matrimonial regime of women married</b>	
Monogamy	1
Polygamous	0.56 [0.37 - 0.85]
Size of the siblings	0.85 [0.78 - 0.93]
Size of the family	1.03 [1.01 - 1.06]
<b>Existence of frequent diseases during childhood</b>	
No	1
Yes	1.72 [1.13 - 2.64]
<b>Use of the intra-uterine device (IUD)</b>	
No	1
Yes	0.39 [0.24 - 0.63]
<b>Parity (Number of children per woman)</b>	
Zero to one	1
Two to four	0.43 [0.16 - 1.16]
Five and more	0.35 [0.13 - 0.92]

Paulo (Brazil) in Latin America Velez *et al.* [7], in Korea Park *et al.* [11] found median menopausal ages of 51.4, 54, 52.1, 50, and 49.3 years, respectively. This variation reflects the differences between countries with high and low living standards.

Factors associated with age at menopause found in this study represent marital status, siblings, common childhood illnesses, use of the intra-uterine device (IUD) as a modern contraceptive method, and high parity.

In our fitted model, high parity is associated with late menopause. Indeed, women with five or more children have an advanced age of menopause compared to those who are nulliparous or have one child. However, such an effect was not found in women with two to four children. Faye *et al.* found similar results in Burkina Faso [12], as did Garrido-Latorre in Mexico [19] and Kaczmarek in Poland [10]. Christine *et al.* in her multivariate model also found higher parity associated with a lower risk of early menopause [21]. The number of children per woman can influence the age of menopause. Park *et al.* [11] in Korea found that women who gave birth were less likely to experience early menopause.

In our study, the age of menopause appears to be higher in women on a polygamous status than in those on a monogamous status. This can be explained by the fact that in our Senegalese context, women in polygamy tend to have many children because of rivalry between co-wives contributing to the reduction of follicular loss. Thus the extinction of follicular activity will occur at an advanced age, hence the menopause at a late age. Park *et al.* [11] in Korea found that the

absence of a partner made the earlier onset of natural menopause more likely.

Our study also found a relationship between sibling size and family size with age at menopause. Larger siblings would decrease the risk of early menopause while larger family size would increase this risk.

Another factor that has been found to influence the age of menopause is the frequent illnesses in childhood. Women with episodes of childhood illness are at higher risk of menopause at an earlier age than others. Kaczmarek found the same results in Poland [10]: women with a good and fairly good childhood health status are less likely to go through menopause before women with a poor health status. Gold [14] in her study judged health status using a history of heart disease and found that women with a history of heart disease were more likely to go through menopause before those without a history of heart disease.

Our study showed a reduced risk of early menopause among IUD users compared to non-IUD users. However, Anna and Nick [22] found an association between contraceptive pill use and later menopausal age.

## 5. Conclusion

Factors that can influence the age of menopause arise in both childhood and adulthood. Our study found that these factors are related to the environment, lifestyle habits, and particularly female genital activity. Thus it is important to improve the health status of women, children and the standard of living of the population.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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