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Age at Menarche and Its Relation to Ages at Marriage, First-Birth and Menopause among Rural Nepalese Females

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Abstract

The aim of this paper is to study age at menarche and its relation to ages at marriage, first birth and menopause among resident of rural Nepalese females. Data are taken from a sample survey of Palpa and Rupandehi districts. Median ages at marriage, first birth and menopause were found to be 17, 19 and 46 years respectively. It was found that ages related events (menarche, marriage, first birth and menopause) were found to be largely inter-related. The waiting time at menarche for getting married was found to be about two years, and the correlation between age at menarche and age at marriage is statistically significant. Transition probability matrix also revealed that ages at menarche, marriage, first birth and menopause were found to be statistically associated. Finally, the onset of menarche among females signals that they will be ready for marriage and thereby giving birth of child. These findings may help planners and policy-makers for designing proper policy in improving reproductive health and reproductive rights of females along with controlling the level of fertility in a country.

Key words: Transition probability, correlation matrix, reproductive period, fertility, statistically significant

Introduction

The first menstrual period among girls is known as menarche. It is an important maturity indicator of adulthood for the assessment of the developmental status of pubertal girls (Aryal 2010a, Cameron & Nadgdee 1996). Menarche, no doubt, is a biological event; however, its timing is influenced by a number of socio-economic and biological factors (Aryal 2010b). It is supposed to be the sensitive indicator of development of adolescent girls (Aryal 2002a, Dann & Roberts 1993, Laska-Mierjewska *et al*. 1982, Vienna & Capucci 1994). Urbanization and modernization can have direct effects on the onset of age at menarche (Aryal 2006, Graham *et al*. 1999, Hulacnika & Waliszko 1991, Pasquet *et al*. 1999).

The girls with having faster physical growth and girls with having relatively over weight had faster onset of menarche (Aryal & Yadava 2005, Samsudin 1990). Previous studies showed that the menarcheal timing among poorly nourished girls was highly related to the amount of protein, and particularly meat consumed by them (Aryal 2008, Kralji-Cerek 1956). Non-vegetarian girls would menstruate about 6 months earlier than vegetarian girls and there exists a positive correlation of age at menarche and non-vegetarian diet (Aryal 2007, Bagga & Kulkarni 2000, Kralji-Cercek 1956, Shastree *et al*. 1974). Girls who have to do more physical work, or have a long and tiresome way to go school have a greater expenditure of calories which

may delay the onset of puberty (Aryal 2005a, Valsik *et al*. 1973). In developing countries, like India, Bangladesh and Nepal, the school girls normally have some or the girls coming from nearby areas walked or cycled down to schools (Aryal 2011). It is stated that a delay in secretion of specific hormones responsible for sexual maturity and to have achieving late menarche might be one of the possible reasons among girls involved in sports activities (Aryal 2005b, Satwanti *et al.* 1982). Body size and puberty are inter-related and the earlier the menarche, the greater was the peak velocity of the height spurt (Aryal 2005c, Simmons & Greulich 1943, Tanner 1962).

After menarche, there is also wide variation among societies in the intermediate fertility variables, particularly in the age at entry into sexual union and the use of contraception and abortion (Aryal 2002b, Davis & Blake 1956). The onset of age at menarche is a signal of the maturity and readiness for marriage. Age at menarche affects fertility through the length of the reproductive life span, adolescent sub-fecundity, and foetal wastage. Women with early menarche have had shorter birth intervals and higher lifetime fertility (Aryal 2004, Riley *et al.* 1993). Age at menarche plays an important role in deciding the level of fertility in a society of less developed region.

Adequate work has not been carried out yet on age at menarche despite its direct relationship with fertility as well as woman health particularly in Nepal. It is therefore this paper investigates the relationships of age at menarche with ages at marriage, first birth and menopause.

Methodology

Data are taken from a sample survey entitled of Palpa and Rupandehi districts of western rural Nepal. The data were collected from eight clusters; four clusters from each district and each cluster consisted of wards of the Village Development Committee (VDC), a lowest administrative unit. A VDC consists of nine wards. The clusters were randomly selected and completely enumerated. The survey schedule included questions on the household composition, facilities and belongings. A total of 811 households were surveyed. Besides, information on socio-economic, demographic and cultural variables, the data on age at menarche, marriage, menopause, and first birth, and related on fertility were also collected from all eligible females. In the survey, a total of 1258 females had attained menarche on or before the survey point. A sample of 1019 married females of marriageable ages and 547 unmarried girls were obtained. Eight hundred fifty one females gave first birth at survey point and 144 females provided their age menopause at the survey point. The bi-variate cross tabulation of ages at menarche, marriage, first birth and menopause are computed. Transition probability matrices and correlation matrix were also computed.

Results and Discussion

Table 1 presents median age at menarche, marriage, first-birth and menopause with respect to age at menarche. It is indicated that median ages at marriage, first birth and menopause increased with increases age at menarche. Delay the onset of menarche leads further delay of subsequent reproductive process; however, it did not show systematic trends. For instance, median age at marriage was 16.5 years for females who had attained menarche on or before 13th birthday while they became mother after 2.5 years, and finally they had terminated menstruations by 44 years of age. Since total crude fertile period was estimated around 30 years. Median age at marriage was 17.1 years for females who had attained menarche by 15th birthday while they became mother at the age of 19.3 years and they had terminated menstruations by 45th birthday. Likewise, median age at marriage was 17.6 years for females who had attained menarche by 17 years and older age while they became mother at the age of 21 years, and they had terminated menstruations by 46 years of age. These figures imply that females' reproductive events are inter-related to some extent; however, the degrees of relationships are unclear. A similar pattern has also been observed for females both residing in Tarai and Hill; however, females belong to Hill are likely to show late reproductive performance than their Tarai counter-parts.

Table 1. Linkage of ages at menarche, marriage, first birth and menopause

Age at menarche	Median								
	Age at marriage			Age at first-birth			Age at menopause		
	Hill	Tarai	Total	Hill	Tarai	Total	Hill	Tarai	Total
13 & less	16.63 (140)	16.40(180)	16.49(320)	19.10(130)	18.87(145)	18.99(275)	43.94(20)	43.57(15)	43.78(35)
14	16.58 (118)	16.86(164)	16.74(282)	19.01(111)	19.25(123)	19.03(234)	45.12(21)	22.67(17)	44.92(38)
15	17.60 (100)	16.76(108)	17.13(208)	19.59(81)	19.56(89)	19.28(170)	45.83(8)	45.45(10)	45.62(18)
16	17.42 (62)	16.50(65)	16.97(127)	19.0(49)	19.01(54)	19.01(103)	46.01(7)	45.72(5)	45.89(12)
17 & later	17.67 (50)	17.44(32)	17.58(82)	20.57(33)	21.00(36)	20.96(69)	46.81(5)	46.63(6)	46.71(11)
Total	17.04 (470)	16.68(549)	16.83(1019)	19.06(404)	19.03 (447)	19.04(851)	45.62(61)	45.36(53)	45.48(114)

Parentheses indicate the number of females

Table 2. Correlation matrix of ages at menarche, marriage, first birth and menopause

Age at	Menarche	Marriage	First birth	Menopause
Menarche	1.000	0.154**	0.216**	0.170*
Marriage		1.000	0.691**	0.084
First birth			1.000	0.127
Menopause				1.000

** Significant at 5%level and **significant at 1%level*

The correlation matrix presented in Table 2 shows statistically significant relationships among ages at menarche, marriage, first birth and menopause; however, insignificant associations of age at menopause with marriage and first birth are observed.

Transition probability matrices presented in Table 3 showing the association of ages at menarche and marriage. Elements of transition probability matrix are interpreted in percentage hereafter. Around 25 per cent females who had attained menarche on or before their 13th birthday, among them, over 15 per cent got married immediately on or before 13th birthday while 10, 16 and 35 per cent females got married respectively by 14, 16 and 18 years and older age. Over 29 per cent females had attained menarche by 14 years of age, among them, 13 per cent got married before menarche. Similarly, about 21 per cent had attained menarche by 15 years of age, of them, over 18 per cent got married before menarche. Like-wise 15 per cent females attained menarche by 16 years of age, of them, 26 per cent got married before reaching 16 years of age while 62 per cent females got married after menarche (by 17 years and older age), and the remaining 12 per cent got married within and well after at menarche. However, around 11 per cent females who had attained menarche by 17 years and older age, of them, 10 per cent got married immediately by age of 17 years and 56 per cent got married by 18 years and older age, and the remaining about 33 per cent got married before menarche. Diagonal elements of transition probability matrix show the events of marriage and menarche occur simultaneously with a very short interval of time, and elements below diagonal refer to the marriages occur before menarche and elements above diagonal denote the proportion of marriages occur after menarche.

Table 3. Probability matrix of ages at menarche and marriage

Age at menarche	Age at marriage(N=1019)						Total
	13 & less	14	15	16	17	18 & later	
13 & less	0.1542	0.1028	0.0988	0.1621	0.1344	0.3478	0.2483
14	0.1313	0.0808	0.1212	0.1448	0.1549	0.3670	0.2915
15	0.1048	0.0810	0.1000	0.1619	0.1810	0.3714	0.2061
16	0.1216	0.0676	0.0743	0.1081	0.1351	0.4932	0.1452
17 & later	0.0901	0.0180	0.0991	0.1351	0.0991	0.5586	0.1089
Total	0.1256	0.0775	0.1021	0.1462	0.1462	0.4024	1.0000

Around 29 per cent females who had attained menarche on or before their 13th birthday, among them, 32 per cent became mother on or before their 17th birthday indicating a waiting time for motherhood at onset of menarche of about four years while 15 and 10 per cent females became mother respectively by 19th and 20th birthdays indicating that the waiting time for motherhood at onset of menarche was 7 and 8 years respectively (Table 4). Over 29 per cent females who had attained menarche by 14 years, of them, 26 per cent females became mother by 17 years and younger age while 15, 13 and 19 per cent females became mother respectively by 18, 20 and 22 and older age, which indicates that the waiting time for motherhood at onset of menarche ranges from around 3 to 8 years. Only 10 per cent females who had attained menarche very late of age 17 years and older age, of them, 50 per cent became mother by 22 years and older age with having more than 5 years waiting time for motherhood at onset of menarche while 11 and 17 per cent females became mother before they were reaching 18 and 21 years of age, which indicates that the waiting time for motherhood at onset of menarche was a year and 4 years respectively.

Table 4. Probability matrix of ages at menarche and first birth

Age at menarche	Age at first birth(N=851)						Total
	17 & less	18	19	20	21	22&later	
13 & less	0.3232	0.1341	0.1524	0.0976	0.0671	0.2256	0.2887
14	0.2635	0.1497	0.1677	0.1257	0.1018	0.1916	0.2940
15	0.2170	0.1415	0.2264	0.1509	0.0566	0.2075	0.1866
16	0.1948	0.1818	0.1429	0.1429	0.1039	0.2338	0.1356
17& later	0.0000	0.1056	0.1341	0.1667	0.0926	0.5000	0.0951
Total	0.2482	0.1391	0.1620	0.1285	0.0827	0.2394	1.0000

Around 31 per cent females who had attained menarche by 13 years and younger age, and among them, 23 per cent had menopause by 44 years and younger age while 17 per cent had menopause by 49 years and older age, which indicates of reproductive fertile period ranges from about 30 to 36 years (Table 5). Over 15 per cent females attained menarche by 15 years of age, of them, 11, 6 and 61 per cent females had experienced menopause respectively by 44, 46 and 49 years and older age. Only 10 per cent females had attained menarche by 17 years and older age, of them, 9 per cent females had menopause by 44 years and younger age, 27 per cent had menopause by 47 years and 18 per cent had menopause by 49 years and older age, which indicates of total reproductive fertile period ranges from 27 to 32 years.

Table 5. Probability matrix of ages at menarche and menopause

Age at menarche	Age at menopause(N=144)						Total
	44 & less	45	46	47	48	49&later	
13 & less	0.2286	0.3429	0.2000	0.0286	0.0286	0.1714	0.3070
14	0.2368	0.0526	0.2368	0.0789	0.1316	0.2632	0.3333
15	0.1111	0.0556	0.0556	0.1111	0.0556	0.6111	0.1579
16	0.2500	0.0833	0.0000	0.2500	0.0833	0.3333	0.1053
17& later	0.0909	0.0909	0.2727	0.2727	0.0909	0.1818	0.0965
Total	0.2018	0.1491	0.1754	0.1053	0.0789	0.2895	1.0000

Around 13 per cent females got married by 13 years and younger age, among them, over 58 per cent females became mother by 17 years and younger age indicating 4 years waiting time for motherhood at marriage, 6 per cent became mother by 20 years indicates that the waiting time for motherhood at marriage was 7 years, and 10 per cent became mother by 22 years and older age indicating that the waiting time for motherhood at marriage was little more than 8 years (Table 6). Over 10 per cent females got married by 15 years of age, of them, 19 per cent became mother by 18 years of age and 7 per cent became mother by 21 years of age. Similarly, around 39 per cent females got married by 18 years and older age, of them, 44 per cent became mother by 22 years and older age, 20 per cent became mother by 20 years of age and only 2 per cent became mother by 18 years and younger age.

Table 6. Probability matrix of age at marriage and age at first birth

	Age at first birth(N=851)						
Age at marriage	**17&less**	**18**	**19**	**20**	**21**	**22&later**	**Total**
13 & less	0.5775	0.1268	0.0986	0.0563	0.0423	0.0986	0.1250
14	0.6222	0.1556	0.0889	0.0667	0.0000	0.0667	0.0792
15	0.4483	0.1897	0.1724	0.0172	0.0690	0.1034	0.1021
16	0.2857	0.2198	0.2308	0.0989	0.0220	0.1429	0.1602
17	0.1899	0.2532	0.2405	0.1392	0.0759	0.1013	0.1391
18&later	0.0000	0.0536	0.1584	0.2039	0.1429	0.4420	0.3944
Total	0.2482	0.1391	0.1620	0.1285	0.0827	0.2394	1.0000

About 17 per cent females who got married on or before 13th birthday, among them, over 26 per cent had attained their menopause by 44 years and younger age while 31 and 21 per cent females had attained their menopause respectively by 46 and 49 years and older age Table 7. Similarly, around 35 per cent females got married by 18 years and older age, of them, 18 per cent had attained menopause by 44 years and younger age while 10 and 43 per cent had attained menopause respectively by 46 and 49 years and older age.

Table 7. Probability matrix of ages at marriage and menopause

	Age at menopause(N=144)						
Age at marriage	**44&less**	**45**	**46**	**47**	**48**	**47&later**	**Total**
13 & less	0.2632	0.1053	0.3158	0.1053	0.0000	0.2105	0.1667
14	0.1667	0.0000	0.1667	0.1667	0.1667	0.3333	0.0526
15	0.2500	0.1250	0.2500	0.1250	0.1250	0.1250	0.0702
16	0.1905	0.1905	0.2857	0.0476	0.1429	0.1429	0.1842
17	0.2000	0.1500	0.0500	0.2000	0.1000	0.3000	0.1754
18&later	0.1750	0.1750	0.1000	0.0750	0.0500	0.4250	0.3509
Total	0.2018	0.1491	0.1754	0.1053	0.0789	0.2895	1.0000

Over 32 per cent females who have first child before they reached by 18 years of age, among them, over 22 per cent had attained menopause by 44 years and younger age while 28 and 19 per cent had attained menopause by 46 and 49 years and older age respectively (Table 8). Like-wise 15 per cent became mother by 20 years of age, among them, 12 per cent had attained menopause by 44 years and younger age while 6 and 35 per cent had attained menopause by 46 and 49 years and older age respectively. For instance, around 17 per cent became mother by 22 years and older age, of them, 21 per cent had attained menopause by 44 years and younger age while 11 and 37 per cent had attained menopause by 47 and 49 years and older age respectively.

Table 8. Probability matrix of ages at first birth and menopause

	Age at menopause(N=144)						
Age at first birth	**44&less**	**45**	**46**	**47**	**48**	**49&later**	**Total**
17&less	0.2222	0.2500	0.2778	0.0556	0.0000	0.1944	0.3158
18	0.0833	0.0833	0.0833	0.1667	0.1667	0.4167	0.1053
19	0.1875	0.0625	0.1250	0.1250	0.1875	0.3125	0.1404
20	0.2941	0.1176	0.0588	0.1176	0.0588	0.3529	0.1491
21	0.1429	0.2143	0.1429	0.1429	0.1429	0.2143	0.1228
22&later	0.2105	0.0526	0.2105	0.1053	0.0526	0.3684	0.1667
Total	0.2018	0.1491	0.1754	0.1053	0.0789	0.2895	1.0000

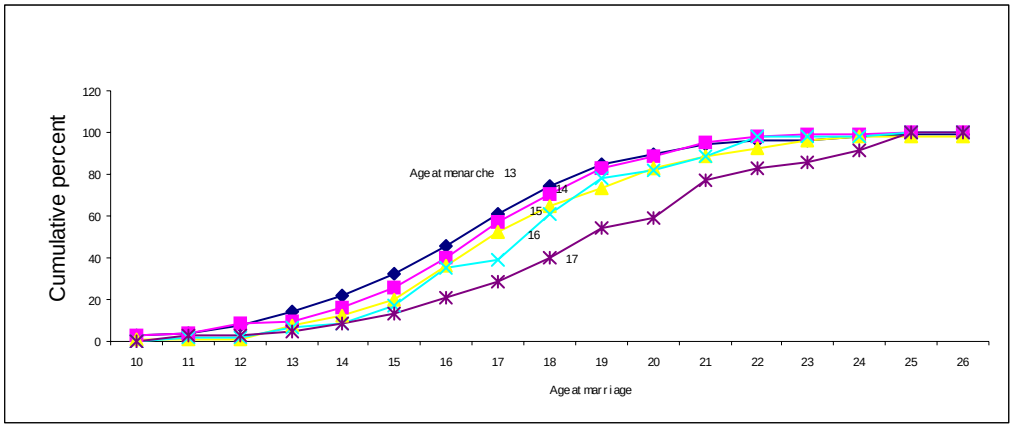

Fig. 1. Percentage distributions of age at marriage and age at menarche

Figure 1 clearly shows that the proportion of marriages was higher among early maturing females whereas the lower proportion of marriages was found among late maturing females. The figure also shows a strongly positive association between the onset of menarche and timing of marriage where late matures females married later ages and early matures females got married at an early ages. For instance, around 9 per cent of late maturing females (age at menarche 17 years and older age), and 22 per cent of earliest maturing females (age at menarche 13 years or younger age), got married before 14th birthday. Similarly, over 35 per cent late matures females got married by 18 years of age while 75 per cent early matures females got married by 18 years of age. The graph clearly indicates that over 90 per cent of earliest and latest maturing females got married before they are reaching 20 and 24 years of age respectively.

The higher proportion of females became mother at early ages among females of early matures whereas the proportion is very low among late menarche and indicating a strong association between menarche and motherhood (Figure 2). For instance, more than 72 per cent females became mother among late maturing females while 49 per cent became mother among early maturing females before they reached 20th birthday. Result also indicates that early maturing females got married early and consequently they became mother at an early age. In Nepal, unless female proves her fertility, her socio-cultural status is not improved in the household and society (Aryal 2011). However, childlessness is regarded as a curse on woman (Aryal 2010c, Niraula 1991). In fact it is natural for a bride to improve her status as well as her autonomy by producing children as soon as possible. Similarly, 22 per cent became mother at age of 19 years among late matures females while 54 per cent became mother at 19 years among early matures females.

Results indicate that ages at menarche and first birth are significantly associated. The graph also shows that age at menarche is closely tied with subsequent reproductive events. Females who had attained menarche an early age, obviously they can capable to give births at an early age only if they got married. Because birth outside marriage is not practiced in Nepal; however, one may get married early often result to have motherhood at an early age. Indeed, the degree of relationship between age at menarche and age at first birth varied largely both between and within populations. This also further corroborates the fact that marriage is the most powerful event to be a mother at an early age.

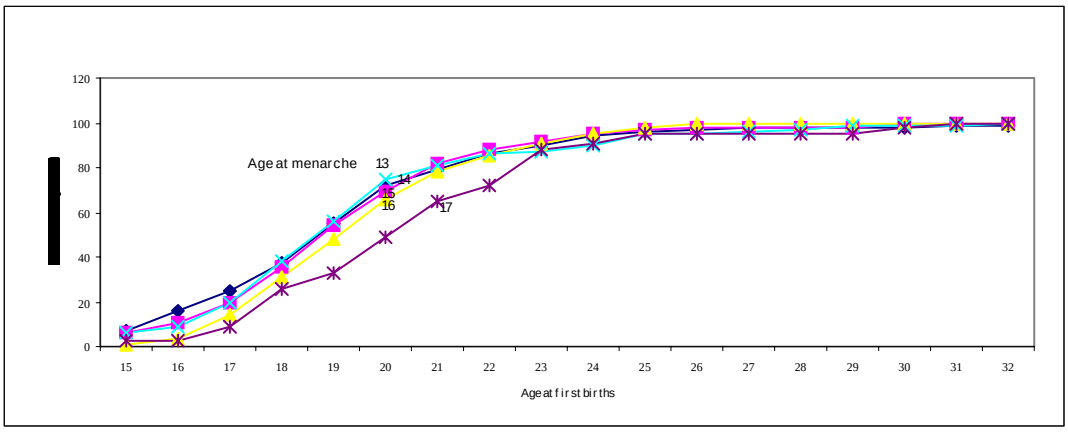

Fig. 2. Percentage distributions of first birth and age at menarche

Post-menarcheal phase of girls is characterized by some of the restriction on their movements and by the imposition of special safeguard in most of the society. For instance, in most of the Nepalese traditional society, the initiation of first menses has been observed as ceremonially or socially in a great extent. However, in some community, girls are kept in a closed room to home at the time of first menses for about thirteen days where they kept without any exposures to light and without any contact to the persons. Girls are staying without any task in a dark room without taking care of their health conditions and they are not allowed to touch anything as well as not allowed to speak even to their family members. This evidence is so surprising even if it is performed socially and traditionally in most of the higher castes group of people yet. Although among urban and educated society, such tradition has gone deteriorating over time and gradually broken such social norms regarding first menstruations. Likewise, the successive menses among females in such society are also observed ceremonially until the fourth days of their menses; however, there is less restriction in successive menses cycles than the first menstruation. Though in the successive menses cycles, females are also not allowed to touch anything and also not allowed to enter into their house as well.

This tradition has been strictly followed by some of the section of society; however, the tradition has gone deteriorating over time due to advancement of modern technologies and access to the education and awareness, which break the long back tradition gradually. Indeed this tradition may have both positive and negative importance, and often results the society believed to perform this event traditionally. In positive sense, at the time of menstruation until their fourth days, females are more acute in risk to their own health if they are involving to hard physical labor work along with the likelihood of the initiation of sexual intercourse within the bleeding period. This practice of restriction may be considered as an abstinence of high risk health by not allowing them to do usual work and intercourse. Further it is believed that they should need special health care at the time of menses period. In the negative sense, this event can be taken as the curse for females among more traditional society, often result, to escape from so-called curse on them, they should observe and perform this event ceremonially and socially until the fourth days of the menstruation in case of successive menses and thirteenth days in case of first menses. It is also believed that after fourth days of their menses, they are supposed to be mentally and physically prepared for sexual intercourse as well as they are ready to do for hard physical labor. Indeed there is no formal sex education to the girls often result they are rarely aware of the connection between sexual intercourse and conception. It is in this periphery that the first menstruation among girls is often horrifying, appalling, frightening and fear-provoking experience to them, because it most likely to occur without any prior knowledge.

Median age at marriage was found to be 16.83 years while age at first-birth was 19.04 years and age at menopause was 45.48 years among the resident of rural females. Paper investigates inter-relationships of ages at menarche, marriage, motherhood and menopause using correlation well as transition probability matrices. Evidence leads to vary reproductive outcomes where age at menarche is most likely to correlate with marriage, and this further corroborates the consistent findings with other several studies elsewhere. The tradition of getting married before menarche has been well practiced in Nepal since long back. This would be the better illustrations of the linkages of two events, marriage and menarche, clearly suggested a strong association between ages at menarche and marriage.

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