Age at menarche of subpopulation of Nepalese girls

L Sunuwar,[1] CG Saha,[2] Anupa KC[3] and K Upadhyay Dhungel[4]

[1]Department of Physiology, Patan Academy of Health Sciences, Lalitpur, Nepal, [2]Department of Physiology, Manipal College of Medical Sciences, Pokhara, Nepal, [3]Department of Pharmacology, Patan Academy of Health Sciences, Lalitpur, Nepal, [4]Department of Physiology, KIST Medical College, Lalitpur, Nepal

Corresponding author: Laxmi Sunuwar, Assistant Professor, Department of Physiology, Patan Academy of Health Sciences, Lalitpur, Nepal; e-mail: snrlasi@hotmail.com

ABSTRACT

The present study was carried out to explore the mean age at menarche of school going girls of Western Nepal, Pokhara and to determine the factors influencing age at menarche. The data was collected from five schools located within the Pokhara Valley of Western Nepal. Only the students who had experienced menarche were included in the study. Verbal consent was obtained after explaining the objectives of the study; the students were interviewed for personal and family details and information obtained was recorded. The age at menarche was found to be 12.69 ±0.95 years. The mean age at menarche of those attending community schools was significantly higher than that of those attending private schools (12.85 ±0.87 vs 12.41 ±0.99 years). The mean age at menarche was found to be delayed with increase in number of family members and more siblings. The mean age at menarche of the vegetarians was higher than that of non-vegetarians (12.82. ± 0.81 vs 12.68 ±0.95 years).

Keywords: Age at menarche, adolescent, western Nepal.

INTRODUCTION

Menarche indicates the specific stage of first periodical regular flow of blood from uterus in all healthy females.[1] It is the most striking event in the process of female puberty, which in turn is a part of adolescence. Sequence of events takes place throughout puberty - thelarche, the development of breasts, followed by pubarche, the development of axillary and pubic hair, and then by menarche, the first menstrual period.[2]

Menarcheal age serves as an easily identifiable marker for developmental status relative to same-age peers. Several reports are found stating that the females having early menarche have elevated risk for breast cancer.[3,4] The age at menarche is not fixed, but varies from population to population.[5] It may also vary with races, size of the family and environmental factors.[3,5-9] Few reports have shown that age at menarche varies with passage of time, occurring earlier than it did.[9] However, literature about the age of menarche in Nepalese population is scanty and hence, it is worth studying. Present study attempted to explore the age at menarche and factors influencing it amongst the girls of Western Nepal, Pokhara.

SUBJECTS AND METHODS

The study sites were five schools located in the Pokhara Valley, Western Nepal. It was a cross-sectional study following non-probability sampling method. Data collection was done for duration of four months (March 2006 to June 2006). The female students (n=450) of the selected schools who had already experienced menarche as well as those who were facing secondary amenorrhea at the time of study were included. The girls were personally interviewed for the required information (monthly income, earner's occupation, menarche age of mother and eldest sister etc).

The data thus collected was analyzed using statistical package for the social sciences (SPSS Version 10.0) and MS-Excel. Independent-samples t-test was used to determine the significance level of the difference in mean age at menarche. Non-parametric two-independent-samples test (Mann-Whitney U) was applied to determine the significance level of the differences in age at menarche on the basis of type of school attended.

RESULTS

The age range of the participants was found to be 9-20 years and the mean age at menarche was found to be 12.69 ±0.95 years. The earliest occurrence of menarche was found in a girl at the age of 9 years.

Fig. 1. shows the mean age at menarche of the participants (12.69 years), their mothers (14.80 years) and their eldest sisters (13.40 years). The difference between mean age at menarche among them was found statistically significant ($p<0.001$).

Table-1 shows the mean age at menarche according to dietary habit. It was seen that the mean age at menarche

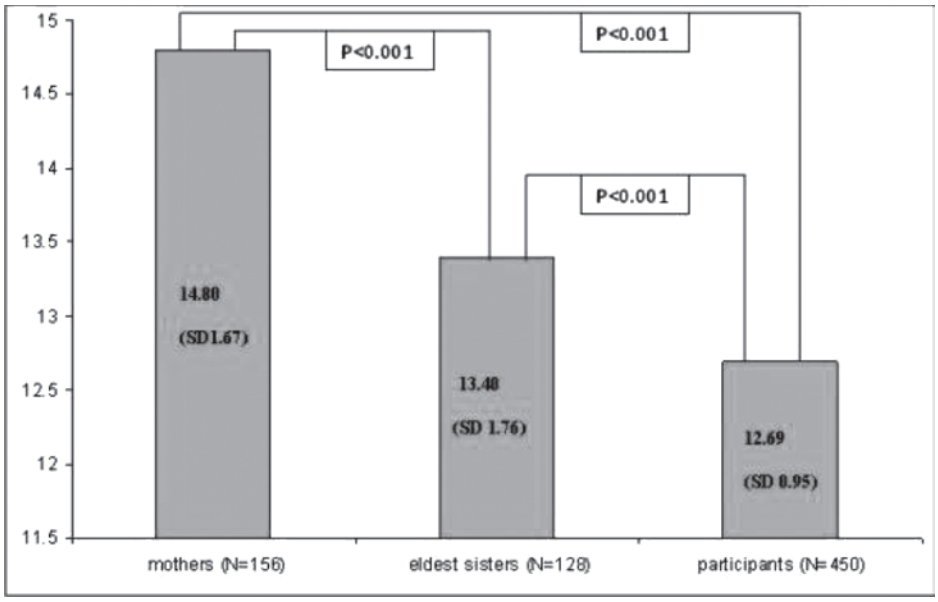

Fig. 1. Mean age at menarche of the participants, their mothers and their eldest sisters

Table-1: Mean age at menarche according to dietary habit

Parameter		N=450(%)	Mean age at menarche(SD)	p value
Dietary habit	Vegetarian	17 (3.77)	12.82 (0.81)	0.544
	non-vegetarian	433 (96.22)	12.68 (0.95)	

of the vegetarian participants (n=17) was little higher than that of non-vegetarians (n=433) [12.82 ±0.81 vs 12.68 ±0.95 years].

Table-2 gives the comparison of the family size and number of siblings of the participants with their age at menarche. It was seen that participants from a family of four or fewer members had a lesser age at menarche (at 12.46 ±0.93 years) while that for participants from families with more than four members was found to be 12.76 (±0.94) years. This result was significant statistically at p<0.005. Also, an increase in age at menarche was seen with more number of siblings. The mean age at menarche of the participants with only one or no siblings was significantly lower than that of those with more than one siblings (12.36 ±0.86 vs 12.79 ±0.94 years).

Table-3 shows the difference between ages at menarche of the participants according to type of school they were attending. The mean age at menarche of the participants attending private school was significantly higher (12.41 ±0.99 years) than that of the participants attending community school (12.85 ±0.87 years).

Table-2: Mean age at menarche in relation to family size and number of siblings

Parameter		N=450 (%)	Mean age at menarche(SD)	p value
Number of family members	4	108 (24.00)	12.46 (0.93)	<0.005
	≤>4	342 (76.00)	12.76 (0.94)	
Number of siblings	1	108 (24.00)	12.36 (0.86)	<0.001
	≤>1	342 (76.00)	12.79 (0.94)	

DISCUSSION

In the present study, the mean age at menarche of young girls from Western Nepal, Pokhara was found to be 12.69 ± 0.95 years. A study by Sharma *et al* showed median age at menarche of schoolgirls of Dharan to be 12 years with age range 11-17 years which was slightly less than that of present study.[10] In another study the mean age at menarche of 239 girls from Palpa and Rupandehi Districts was found to be 14.3 years.[11] This difference in mean age at menarche may be due to increased urbanization of Dharan and Pokhara relative to Palpa and Rupandehi. Increased urbanization can lead to better socio-economic status, more sedentary lifestyle, exposure to media and changes in dietary habits as well as better psychological preparation all of which can have an effect in the age at menarche.[5,8,9]

The mean age at menarche of the students in the present study was found to be lesser than that of their elder sisters (13.4 ±1.76 years) which was in turn lesser than that of their mothers, (14.8 ±1.67 years). This shows a descending pattern of age at menarche with successive generations. In a study carried out in Spain, mean age at menarche in mothers, (13.45 ±1.51 years) was significantly (p<0.01) greater than in daughters (13.03 ±1.28 years).[12] Similarly, the study by Ersoy *et al* showed the mean menarcheal age of the mothers (13.6 ±1.39 years) was higher than the mean menarcheal age of the daughters 12.82 ±1.07 years, (P<0.001).[13] Studies have explained such decrease in age at menarche with successive generations as a result of increase in urbanization and environmental changes like better dwelling conditions, smaller family size compared to previous generations, food habits and sedentary life styles of successive generation.[3-5,8,9] Children today are exposed to television advertisements for high-fat and simple-carbohydrate food and drinks. Also, activities like watching television with snacks can be associated with sedentary lifestyle.[14] This in turn is associated with

Table-3: Relation of mean age at menarche and school type

Type of school	N=450 (%)	Mean age at (SD) menarche	p value
Private	166 (36.88)	12.41 (±0.99)	<0.001
Community	284 (63.11)	12.85 (±0.87)	

increasing body mass and body fat. The fat cells secrete leptin. Leptin can influence the synthesis and/or secretion of other hypothalamic peptides which in turn modulate gonadotropin- releasing hormone (GnRH) release.[15,16] Rise in GnRH leads to increased production of gonadotropins (luteinizing hormone; LH and follicular stimulating hormone; FSH). Higher levels of FSH and LH causes resultant increase in estrogen level. Rising levels of estrogens and pulsatile GnRH secretion leads to initiation of menses and eventuallly create cyclic menstrual patterns causing early menstruation.[17]

In the present study, mean age at menarche of the vegetarian participants 12.82 (±0.81) years, was higher than that of non-vegetarians which was 12.68 (±0.95) years. This result, however, was found to be statistically insignificant (p=0.544). Similarly, many studies have reported the accelerating influence of good nutrition on puberty from many parts of the world. These studies had a common belief that the protein rich high calorie diet causes better physical maturation and early menarche.[5,18,19] On the contrary a study carried out by Padmavati *et al* reported the delayed onset of menarche of non-vegetarian girls.[18] Also, in our study; comparison was limited by small sample size of vegetarians compared to non-vegetarians.

The mean age at menarche in the current study was found to be delayed with increase in number of family members ($p<0.005$) and siblings ($p<0.001$) and both results were statistically significant. A study by Padez *et al* has also shown girls born in small families with one child matured earlier than those born in large families with four or more children.[7] Another study by Roberts *et al* found that menarcheal age is strongly influenced by family size and also partly by position in family i.e., menarche occurs later in large sibships.[20,21] However, Salces *et al* found no such significant contribution of birth order on the age at menarche.[12,22]

The mean age at menarche of girls from private schools was lower than that of the girls from community school. Attending private school indicates better family income, which is also a component of socioeconomic status. However, the age at menarche of the participants in our study could not be correlated with monthly family income as all the participants were not able to give information regarding the monthly income of the family. There are other components associated with socioeconomic status (family size, living conditions, nutrition supplement) which are usually associated positively with early menarche.[5,18,19] A study carried out in Nigeria showed that school girls from higher socio-economic class reached menarche earlier than the lower socio-economic counterparts.[23] In a similar cross-section study carried out on menarcheal age in 2087 Ghanaian school girls, the menarcheal age (13.98 ±1.42 years) was found to be significantly influenced by social class, parents ethnic origin, educational institution and home living area.[24] Nepalese evidence is consistent with the argument that menarcheal timing is associated with nutritional status where early maturing females come from richer family who enjoy a greater availability of good food than others.[11] Another explanation according a report made by Danker Hopfe is that the degree of urbanization, occupation and educational status of parents, family income, dwelling conditions, as well as family size do not exert a direct influence on the occurrence of the first menstruation. These are essentially 'secondary' factors, which are more or less associated with those factors that presumably have a more direct influence, such as nutritional condition and health status.[9]

Menarche is the most striking event in the process of female puberty. Menarcheal age serves as a marker for developmental status relative to same-age peers. Several reports have also associated early menarche with increased risk for morbid conditions like breast cancer. The mean age at menarche in our study was found to be 12.69 ± 0.95 years. Higher age at menarche was associated with attending community school, larger family size and larger number of siblings. However, this data does not represent the whole Nepalese population. Larger studies regarding age at menarche need to be carried out in larger representative population.

ACKNOWLEDGEMENTS

We thank Mr. Shital Bhandary, assistant professor, department of Community Health Sciences, Patan Academy of Health Sciences for his invaluable help in statistical analysis.

REFERENCES

1. Biswas RK, Kapoor AK. Age at Menarche and Menopause Among Saharia Women –A Primitive Tribe of Madhya Pradesh. *Anthropologist* 2004; 6: 247-52.
2. Ayatollahi SMT, Dowlatabadi E, Ayatollahi SAR. Age at menarche and its correlates. Southern Iran. *Iran J Med Sci* 1999; 24: 20-5.
3. Trentham-Dietz A, Nichols HB, Remington PL *et al*. Correlates of Age at Menarche among Sixth Grade Students in Wisconsin. *Winconsin Med J* 2005; 104: 65-9.
4. Petriduo E, Syrigou E, Toupadaki N, Zavitsanosw X, Willett W, Trichopoulos D. Determinants of age at menarche as early life predictors of breast cancer risk. *Int'l J Cancer* 1996; 68, 193-8.

5. Zacharias L, Wurtman RJ. Age at menarche. Genetic and environmental influences. *New England J Med* 1969; 280: 868-75.
6. Thórdur Eydal Magnússon. Age at menarche in Iceland. *Amer J Physical Anthropol* 2005; 48: 511-4.
7. Padez C, Rocha MA. Age at menarche in Coimbra (Portugal) school girls: a note on the secular changes. *Annals Human Biol* 2003; 30: 622-32.
8. Pasquet P, Manguelle Dicoum Biyong A, Rikong Adie H, Befidi Mengu H, Garba MT, Froment A. Age at menarche and urbanization in Cameroon: current status and secular trends. *Annals Human Biol* 1999; 26: 89-97.
9. Deb R. Variation in the Age at Menarche of the Assamese and Bengali Girls of Guwahati, Assam. *Anthropol* 2009; 11: 259-64.
10. Sharma M, Gupta S. Menstrual Pattern and Abnormalities in the High School Girls of Dharan: A Cross Sectional Study in Two Boarding Schools. *Nepal Med Coll J* 2003; 5: 34-6
11. Aryal TR. Age at menarche. Differentials and Determinants. *J Nepal Med Assoc* 2004; 43: 71-5.
12. Sanchez-Andres. Genetic and environmental factors affecting menarcheal age in Spanish women. *Anthropol-Anz* 1997; 55: 69-78.
13. Ersoy B, Balkan C, Gunay T, Egemen A. The factors affecting the relation between the menarcheal age of mother and daughter. *Child Care Health Dev* 2005; 31: 303-8.
14. Graham EA. Economic, Racial, and Cultural Influences on the Growth and Maturation of Children. *Pediaty Rev* 2005; 26: 290-4.
15. Cunningham Matthew J, Clifton Donald K, Steiner Robert A. Leptin's Actions on the Reproductive Axis: Perspectives and Mechanisms. *Biol Reprod* 1999; 60: 216-22.
16. Chan Jean L, Mantzoros Christos S. Leptin and the hypothalamic-pituitary regulation of the gonadotropin-gonadal axis. *Pituitary* 2001; 4: 87-92.
17. Gutyon AV, Hall JE. Textbook of Medical Physiology. 11th edition. Philadelphia: Elsevier Saunders 2006; 1011-2.
18. Rokade S, Mane A. A study of age at menarche, the secular trend and factors associated with it. *Internet J Biol Anthropol* 2009; 3: 1939-4594.
19. Asgharnia M, Faraji R, Sharami H, Yadak M, Oudi M. **A** study of menarcheal age in Northern Iran (Rasht). *Oman Med J* 2009; 24: 95-8.
20. Roberts DF, Wood W, Chinn S. Menarcheal age in Cumbria. *Ann-Hum-Biol* 1986; 13: 161-70.
21. Robert M. Berne, Matthew N. Levy, Bruce M. Koeppen, Bruce A. Stanton. General Principles of Endocrine Physiology; The Reproductive Glands. *Physiology.* 8th edition: St. Louis, Missouri: Elsevier; 2004.p. 726: 963.
22. Salces I, Rebato EM, Susanne C, San Martin L, Rosique J. Familial resemblance for the age at menarche in Basque population. *Ann Hum Biol* 2001; 28: 143-56.
23. Abioye Kuteyi EA, Ojofeitimi EO, Aina OI, Kio F, Aluko Y, Mosuro O. The influence of socioeconomic and nutritional status on menarche in Nigerian school girls. *Nutr-Health* 1997; 11: 185-95.
24. Adadevoh SW, Agble TK, Hobbs C, Elkins TE. Menarcheal age in Ghanaian school girls. *Int'l J Gynaecol Obstet* 1989; 30: 63-8.