Menarcheal age among Indian sportswomen

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The subjects of the study were 85 Indian sportswomen from Delhi and the states of Uttar Pradesh, Punjab and Gujarat, and included outstanding players of cricket, hockey, kho-kho and table-tennis, who were winners of university, state or national championships. A sample of 77 subjects selected at random was used as the control. The recall procedures suggested by Damon and Bajema (1974) were used. The combined mean age at menarche for sportswomen is 13.56 years and for the control sample is 12.7 years. Menarche was significantly delayed in those sportswomen who embarked on physical training activities before the onset of menstruation. There are also variations in the mean menarcheal age between participants in different sports specialities.

Keywords: Menarche, women athletes, India

The menarcheal age is the age at which menstruation first begins. It is an important landmark in the growth and development of women. There is a wide variation in the age of menarche depending upon various factors such as race, status, immigration, climatic conditions and also heredity. It varies between different populations and from one country to another, and is affected by certain diseases during childhood¹⁻¹¹. Family size also influences the age of menarche. Girls with fewer sibs attain menarche at an early age¹². The effect of nutrition on age at menarche has been studied in India by Satyanarayan and Naidu who reported that there was a late onset of menarche in undernourished girls compared with well-nourished girls from the same area¹³. Other studies support this result^{6,14}.

The age at menarche may differ between participants and non-participants in sports. Malina *et al.*¹⁵ found that menarche appears significantly later (13.58 years) in athletes than in non-athletes (12.23 years).

In the present study an attempt has been made to study: (1) whether menarcheal age of Indian athletes differs from that of girls who do not participate in sports; (2) the differences in the age of menarche of those girls who started participating in different activities before puberty, and the age of those who started playing after puberty; and (3) to detect variation in the age at menarche among sportswomen of different sports specialities as well as among those of different countries.

Materials and methods

The subjects of the study were 85 women athletes participating in four sports: hockey, cricket, kho-kho, and table-tennis during 1986–1987. Most of these girls were residents of Uttar Pradesh, Delhi, Punjab and Gujarat. They were winners at university, state or national championships. For the control group, a sample of 77 girls was selected at random from Banaras Hindu University (BHU) who never took part in sports. The procedures suggested by Damon and Bajema¹⁶ were taken into consideration when determining the subjects' recalled age at menarche. The *t* test was used to test for any significant differences between the means of various groups.

Results and discussion

The mean age at menarche of sportswomen (athletes) in different sports specialities was higher than that of non-athletes (control). It is noticeable that mean menarcheal age of the combined group is 13.56 years, while in the control the menarche occurs earlier at 12.7 years (Table 1). Menarche is delayed by more than 2 years in some of the sportswomen. The maximum delay (2.5 years) occurred in kho-kho (15.2 years) and the minimum (0.2 years) in table-tennis players. Comparing the values for the various categories of sportswomen and those of the control group indicates that menarcheal age is significantly delayed in all sportive categories except table-tennis players (Table 1). It seems most probable that menarche is delayed under the influence of regular sports activities. This confirms the findings of other workers that the menarcheal age is significantly late in athletes as compared with non-athletes^{3,7,9,10,15}.

Table 2 shows the results of carrying out *t* tests on various combinations of sports categories. It was found that no significant differences existed between

Table 1. Mean(s.d.) age of menarche in various sports categories and control group

Sports/games	n	Age range (years)	Mean(s.d.) age (years)	t test with control
Hockey	19	12.9–14.4	13.4(1.14)	3.493**
Cricket	33	12.0–14.3	13.0(0.23)	4.062**
Table-tennis	18	12.0–14.0	12.9(1.88)	0.756†
Control	77	11.9–13.4	12.7(0.67)	—

** *P* < 0.01, * *P* < 0.05, † not significant

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Table 2. *t* test among various combinations of sports categories

	Table-tennis	Kho-kho	Cricket	Hockey
Table-tennis	—	—	—	—
Kho-kho	0.499	—	—	—
Cricket	0.302	0.720	—	—
Hockey	0.969	0.400	1.934*	—

* $P < 0.05$

the various categories. The maximum value of *t* was found for the difference between cricket and hockey (1.934) while the minimum was for cricket and table tennis (0.302).

The data for menarcheal age in various sports categories were further divided into three groups to determine whether the delay is due to the strenuous activity related to sports or to some other factor such as late maturation of those girls who take up sport. Group A consists of those girls who took up sport before the onset of puberty. Group B comprises those girls in whom menarche had already occurred before they took up sport. Group C is a combined group (Table 3).

It is evident from Table 3 that in all the sports studied, the mean menarcheal age in group A is significantly higher than that in group B. The mean menarcheal age of sportswomen who started participating in sport earlier was further delayed (13.7 years). The mean menarcheal age of the combined sample of group C was higher (13.56 years) than that of the non-athletes (control). Both differences were significant at the $P = 0.05$ level. No significant difference between the mean age of menarche in group B and the control group could be noted. It is obvious from Table 4 that athletes from different

Table 3. Mean(s.d.) age at menarche of groups A, B and C and a control group

Category	n	Mean(s.d.)	t value
Athletes before puberty (group A)	56	13.7(1.49)	5.67*
Athletes after puberty (group B)	29	13.05(1.50)	1.53†
Combined sample of athletes (group C)	85	13.56(1.4)	4.84*
Control (group D)	77	12.7(0.67)	—

* $P < 0.05$, † not significant**Table 4.** Mean(s.d.) team age of menarche in different activity group

Category	Athletes started training before menarche			Athletes started training after menarche		
	n	Mean(s.d.)	t	n	Mean(s.d.)	t
Hockey	12	13.6(1.21)	2.81*	7	12.98(1.13)	0.21
Cricket	23	13.9(1.32)	2.72*	10	13.16(1.24)	0.38
Kho-kho	10	15.06(1.46)	3.25*	5	14.23(1.37)	0.85
Table-tennis	11	12.67(1.28)	1.98*	7	12.04(1.07)	0.23
Total	56			29		

* $P < 0.05$. Mean age of 77 control subjects was 12.7 years

activity groups in group A had a significantly delayed onset of menstruation, whereas group B does not show any significant differences. Thus it seems most probable that menarche is delayed under the influence of strenuous physical activity. The late maturation in women is advantageous for successful sports performance as suggested by Fox and Mathews¹⁷. It was noted that a majority of successful athletes in this study ($n = 56$ (65.9%)) commenced their sports activities before the onset of menstruation. This was further supported by Malina *et al.* who demonstrated that women who mature late are more successful performers¹⁸.

Table 5 indicates the age at menarche in descending order, in different sports specialties and in various populations of different countries. The differences in the age at menarche between the groups studied are quite striking. The high-school athletes from the USA had the earliest menarche while the women from high altitudes (India) and highland Sherpas (Nepal) had quite a late menarche (mean(s.e.) 16.5(0.17) and 18.2 years respectively). When the age at menarche of sportswomen from different sports specialties was compared, Indian basketball and volleyball players topped the list (15.39 and 15.05 years respectively) followed by Nigerian ballgame players, swimmers and racket game players.

The next highest position in the list is taken by national level runners (USA), followed by Olympic volleyball players, national level middle-distance runners and Olympic athletes (Montreal Games). The Indian sportswomen (present study) are at quite a low position in the list.

It is clear from Table 5 that the variation in age at menarche between different populations is considerable. However, there is also variation in age at menarche in different sports specialties. This study substantiates the view that there is a possibility of different maturity relationships for different sports

Table 5. Age at menarche in different sports and in various populations

Sport/country	Mean(s.e.)	Source
Highland Sherpas (Nepal)	18.2	Pawson ¹⁹
High altitude (India)	16.5(0.17)	Satwanti <i>et al.</i> ⁹
Basketball players	15.39(1.43)	Sidhu and Grewal ¹⁰
Volleyball players	15.05(1.59)	
Ballgame players (Nigeria)	14.74(1.51)	Mathur and Toriola ⁷
Swimmers (Nigeria)	14.28(1.13)	
Racket game players (Nigeria)	14.17(1.30)	
National level runners (USA)	14.20	Wakat and Sweeney ²⁰
Olympic volleyball players (USA)	14.18	
National level middle-distance runners (USA)	14.10	
All India pooled (India)	13.80(0.04)	ICMR ²¹
Olympic athletes	13.66	Carter ³
Sportswomen (India)	13.56(1.14)	Present study
Dutch girls (Holland)	13.2	Kemper ⁶
Germany (Berlin)	13.2	Grimm ²²
Hungary (West)	13.1(0.04)	Eiben ⁴
England (London)	13.0	Tanner ²³
College athletes (USA)	13.05	Feicht <i>et al.</i> ²⁴
High-school athletes (USA)	13.02	

and competitive levels among women athletes of different countries. This view is also supported by Malina *et al.*¹⁸.

References

- Amudsen DN, Diers CL. The age of menarche in classical Greece and Rome. *Hum Biol* 1969; **41**: 125–32.
- Bai KI, Vijayalakshmi B. Sexual maturation of Indian girls in Andhra Pradesh, South India. *Hum Biol* 1973; **45**: 695–707.
- Carter JEL, ed. *Physical Structure of Olympic Athletes*. Med Sports Sci. Basel: Karger, 1984; **18**.
- Eiben DG. Menarcheal age of girls in West Hungary. *Anthropol Anz* 1972; **33**: 205.
- Ellis WB. Age of puberty in tropics. *Br Med J* 1950; **ii**: 85–8.
- Kemper HCG, ed. Growth, health and fitness of teenagers. *Med Sport Sci* 1985; **20**: 81–7.
- Mathur DN, Toriola AL. Age at menarche in Nigerian Athletes. *Br J Sports Med* 1982; **16**: 250–2.
- Stager JM, Robertshaw D, Meischer E. Delayed menarche in swimmers in relation to age of onset of training and athletic performance. *Med Sci Sports Exerc* 1984; **16**: 550–5.
- Satwanti, BR, Kapoor AK, Singh IP. Variations in the age at menarche due to physical exercise and attitude. *Z Morphol Anthropol* 1983; **73**: 323–32.
- Sidhu LS, Grewal R. Age of menarche in various categories of Indian sportswomen. *Br J Sports Med* 1980; **14**: 199–203.
- Tanner JM. Age at menarche among Nigerian school girls with a note on their height and weight from 12–19 years. *Hum Biol* 1962; **34**: 187–97.
- Singh HD. Family size and age at menarche. *Am J Obstet Gynecol* 1972; **113**: 837–8.
- Satyanarayan K, Naidu AN. Nutrition and menarche in rural Hyderabad. *Ann Hum Biol* 1979; **6**: 163–5.
- Kralj-Cercek L. The influence of food body and social origin on the age at menarche. *Hum Biol* 1956; **28**: 393–406.
- Malina RM, Harper AB, Auent HH, Campbell EE. Age at menarche in athletes and non-athletes. *Med Sci Sports* 1973; **5**: 11–13.
- Damon A, Bajema CJ. Age at menarche: accuracy of recall after thirty-nine years. *Hum Biol* 1974; **46**: 381–4.
- Fox LE, Mathews DK. *The Physiological Basis of Physical Education and Athletics*. Philadelphia, USA: Saunders College, 1981.
- Malina RM, Spirduso WW, Tate C, Baylor AM. Age at menarche and selected menstrual characteristic in athletes at different competitive levels and different sports. *Med Sci Sports* 1978; **10**: 218–28.
- Pawson IG. The growth and development of high altitude children with special emphasis on population of Tibetan origin in Nepal. Pennsylvania State University, USA: PhD Thesis, 1974.
- Wakat DK, Sweeney KA. Etiology of athletic amenorrhea in cross country runners. *Med Sci Sports* 1979; **11**: 91.
- Indian Council of Medical Research (ICMR). Growth and development of Indian infants and children. *Technical Report Series*, 1972; **18**.
- Grimm H. Menarche statistics of Berlin public school graduates. *Zentralbl Gynakol* 1952; **74**: 1743–5.
- Tanner JM. Trend towards earlier menarche in London, Oslo, Copenhagen, The Netherlands and Hungary. *Nature* 1973; **243**: 95–6.
- Feicht CB, Johnson TS, Martin BJ, Sparks KE, Wagner WW. Secondary amenorrhea in athletes. *Lancet* 1978; **ii**: 1145–6.