

AGE AT MENARCHE AND MENSTRUAL CHARACTERISTICS OF ADOLESCENT GIRLS OF AMBALA, HARYANA

Rashmi Choudhary and Indu Talwar

ABSTRACT

The present study aims to evaluate age at menarche and examine menstrual characteristics of semi-rural adolescent girls of Ambala, Haryana. The cross-sectional sample consisted of 300 adolescent girls of age ranging from 11 to 17 years. On the basis of *status quo* method and using probit analysis, the median age at menarche was calculated as 13.65 ± 1.05 years. The menstrual flow period was on an average of 4.6 ± 1.36 days and mean interval between cycles was 28.04 ± 2.63 days. Mothers (60.3%) were the main source of knowledge regarding menstruation. Majority of girls (73.81%) used sanitary pads. Most common menstrual complaint was pain in abdomen (44.08%) and the most prevalent restriction (80.3%) was prohibition to visit a religious place during menstruation. The present study suggests a need to spread greater awareness among adolescent girls regarding the physiological phenomenon of menarche; ensure hygienic practices during menstruation and to educate them regarding taboos associated with this event.

Keywords: menarche, adolescence, puberty, menstrual characteristics.

INTRODUCTION

Adolescence is the most significant phase of human development which is associated with numerous bodily changes starting from puberty to adulthood. The meaning of the word 'adolescence' can be traced back to the latin word 'adolescere', which means to grow up. The age-group of 10-19 years has been identified as the phase of adolescence by WHO (1999). As per the UNICEF, The State of the World's children, 2011 report, the total population of adolescents is 1.2 billion in the entire world, while India has the largest population of adolescents constituting of 21.4% of its population. The period of adolescence is marked by physical growth and maturation along with mental and psychological development. This period needs special attention as in this crucial phase, a dependent child develops into an independent adult with additional roles and responsibilities (Gluckman & Hanson, 2006).

Rashmi Choudhary, Research Scholar, Department of Anthropology, Panjab University, Chandigarh, E-mail: rashmikapoor5feb@gmail.com; **Indu Talwar**, Professor, Department of Anthropology, Panjab University, Chandigarh, E-mail: talwarindu@yahoo.co.in

Adolescence in girls, being a transition period from childhood to womanhood can be very demanding and comes with its own challenges (Kirk & Sommer, 2005). It starts with puberty which is associated with a gambit of changes like growth spurt, breast development (thelarche), pubic hair (pubarche) and first menstruation or menarche; triggered by neural and hormonal influences.

Menarche is a significant milestone in a girl's life, a part of the complex process of growing up. Unlike other pubertal changes, it is a distinct event which comes suddenly, without any forewarning. This physiological phenomenon is the beginning of a cyclic or periodic event which involves loss of blood along with the shedding of endometrium. The age of menarche in most females occurs between the age of 10 and 16 years, though there may be variations (Rees 1995). Age at menarche has been extensively studied in diverse populations as well as many ethnic groups as it is an important indicator of sexual maturity in females (Eveleth & Tanner 1976). The variation in the age at menarche in different populations often reflects the quality of life of that population (Prado *et al.*, 1995). Many studies suggest that both genetic and environmental factors play an important role in influencing the age at menarche (Eveleth & Tanner, 1990; Salces *et al.*, 2001; Ayatollahi *et al.*, 2002).

Menarche has been studied extensively in relation to environment (Artaria & Henneberg 2000; and Bilquis & Madhavalatha 2003), nutrition (Bojlen & Bentzon 1971; Chowdhury *et al.*, 2000) and high altitude (Malik & Hauspie 1986; Sharma 1990). Menarche is also related with ecological and socio-economic factors (Mierzejewska, 1970), urban and rural conditions (Malina *et al.* 1977; Shukla *et al.* 1994) and seasonal variation (Bojlen & Bentzon 1971; Valenzula *et al.* 1996).

A number of studies have been conducted to investigate the affect of different factors on the age at menarche. It is well documented that these factors are multifold starting from ethnicity, social class differences, number of siblings, birth order, geographical location, education, occupation to body mass index, body size and physique, skeletal maturity, physiological variables and secular trends (Marshall and Tanner, 1986; Danker-Hopfe, 1986; Sharma *et al.*, 1988; Gustavo & Gonzales, 1994; Bagga & Kulkarni, 2000; Berkey *et al.*, 2000; Kaplowitz *et al.*, 2001; Okasha *et al.*, 2001; Chumlea *et al.*, 2003; Talwar & Bajwa, 2005; Kaplowitz, 2006; Zegeye *et al.*, 2009). Thus the interplay of various factors such as genetic variability, nutritional status, health/hygiene and other environmental influences affect the age at menarche in a given population over a period of time (Liestol 1982).

Studies on age at menarche in developed countries indicate a declining trend (Anderson *et al.*, 2003; Anderson & Must, 2005; Biro *et al.*, 2006). Similar results are found in developing countries (Singh & Malhotra, 1988; Bagga & Kulkarni, 2000; Hwang *et al.*, 2003; Hosny *et al.*, 2005; Goon *et al.*, 2010). The possible explanation for this decline could be improvement in nutritional status and general health along with other environmental factors which display a significant association (Wyshak 1982; Chowdhury *et al.*, 2000).

Studies in India have shown that young girls are often unaware about menstruation until menarche i.e. their first period (Narayan *et al.*, 2001). The way a girl responds to menarche depends a great deal on the manner in which she learns about it and her preparation for the event (Rao *et al.*, 1998). The culture of shame and silence around this topic impacts on their menstrual preparedness and management, making the situation even worse for the adolescent girls. Many taboos and social and cultural restrictions related to menstruation are still practiced according to the studies conducted in various parts of India (Singh, 2006; Paul, 2007; Dhingra *et al.*, 2009).

A periodic assessment of populations is necessary to study the age at menarche and characteristics associated with it to witness the silent trends. Keeping this in mind, the present study aims at ascertaining the age at menarche and the menstrual characteristics (i.e. menstrual pattern, practices, problems and restrictions) among semi-rural adolescent girls of Ambala district in Haryana.

MATERIAL AND METHODS

The present cross-sectional study was conducted among 300 semi-rural adolescent girls in the age-group of 11 to 17 years, randomly selected from two schools, namely Govt. Senior Sec. School, Jalbera and Lord Mahavir Jain Public School, Ambala Cantt of Ambala district in Haryana. Age at menarche was recorded using *Status quo* method. In this method, data regarding menarcheal age can be obtained by asking a girl of her "current status" on the presence and absence of menarche and recording the dichotomous yes-no data for each girl. *Status quo* method was chosen because such information is subject to less error or bias than alternative more complex recall methods (Macmohan, 1973; McDowell *et al.* 1981). Demographic profile of the girls including date of birth, type of family, family income, educational, occupational and nutritional status was taken using an interview schedule. Information about their menstrual characteristics such as duration of menstrual flow, interval between the cycles, source of knowledge, problems and taboos associated with menstruation was also obtained.

The educational and occupational details of parents of the subjects are given in Table 1. In the present study, 5.6% of fathers and 19.5% of mothers were found to be illiterate. Among the literate parents, (13% fathers and 15.8% mothers) had education up to primary level. The percentage of other literate parents was; up to middle school (19.6% fathers and 10.1% mothers), high school (18.6% fathers and 16.8% mothers) and higher secondary (22.1% fathers and 16.8% mothers). Though 20.9% mothers were graduates, a figure higher than fathers (19.3%), majority of them (89.3%) were housewives. 34.7% of fathers worked as unskilled labourers and 38.6% were in service (clerical jobs). Only 10.2 % fathers had their own business. According to Kuppaswamy scale (Maheshwaran, 2014), it was found that the 20.7% parents belonged to lower-middle, 45% upper-lower and 34.3% to upper-middle socio-economic status.

Statistical Analysis

For the statistical analysis, data was entered in Microsoft Office Excel (2007) and was analyzed with SPSS version 16. The median age of menarche was calculated by probit analysis.

RESULT

In the present study, out of 300 adolescent girls, 233 were found to be menstruating. Table 2 shows the number and percentage of girls from 11 to 17 years, in whom menarche had occurred. Only 25% of girls experienced menarche at 11 years, while menarche had occurred in 100% girls by 15 years. Converting the percentage of girls, in whom menarche had occurred, into probit values and using graphical method, the median age at menarche for adolescent girls of present sample is found to be 13.65 ± 1.05 years.

Table 3 shows mean and standard deviation of duration of menstrual flow per cycle and interval of menstrual cycle among the adolescent girls in the age group ranging from 11-17 years. The mean duration of menstrual flow was 4.60 ± 1.36 days and mean interval between menstrual cycles was 28.04 ± 2.63 days. P-value shows that there is no significant age difference for the duration of menstrual flow and menstrual interval among the sample girls.

The present study revealed that majority of girls (60.3%) had mother as a primary source of information regarding menstruation followed by friends (17.6%) and then TV or internet (7.6%). Other sources were Sister (5%), Teacher (4.2%), Aunt (1.9%), Grandmother (0.8%), books (1.9%) and Doctor (0.8%), as is evident from Table 4.

Regarding the type of sanitary protection used during menstruation, majority of girls (73.81%) reported that they used sanitary pads, only 20.6% used cloth while the rest (5.57%) used both i.e. cloth and sanitary pad (Table 5).

Results in the Table 6 show that most common problem reported by the sample girls in the present study was abdominal pain (44.08%) followed by tiredness (40%), irritability (35.1%), low appetite (13.8%) and dysmenorrhoea (13.06%). Other problems reported were headache (10.6%), body ache (7.7%), heaviness (7.3%), vomiting (6.5%), acne (5.7%) and depression (4.89%), whereas 16.3% girls had no complaints.

Table 7 shows various kinds of restrictions faced by girls during menstruation. 3.4% of the girls in the present study did not follow any restriction. 80.3% of the remaining girls were restricted to visit temples or participate in religious ceremonies, 47.8% girls were not allowed to touch pickles, 32.9% avoided head bath, 29.9% of girls were restricted from physical activities, 26.06% of girls avoided carrying heavy weight, 22.6% girls were prohibited to water the plants, 18.8% girls avoided looking into the mirror and 12.4% girls were not allowed entry in the kitchen.

There were many restrictions regarding food, out of which, most common was eating food considered hot, like almonds, coconut and other nuts. The restrictions

were also against having “cold” food such as curd and milk, sour and spicy food, egg, and non-vegetarian food.

DISCUSSION

A secular declining trend has been observed in the age at menarche all over the world since last two centuries (Tanner 1955). The developing countries still show the declining trend though it has flattened in many developed countries of Europe and North America (Thomas *et al.*, 2001). In India, large variation in mean menarcheal age has been reported among girls across different states or geographical areas (Pathak *et al.*, 2014). In this context, it is imperative to compare the results of the present study with other such studies conducted in Northern states of India. Table 8 presents the comparison between the results of studies done till recently.

The median age at menarche (in years) of the sample girls in the present study on comparison with other studies in Northern states of India showed higher value than Punjabi girls of Chandigarh & Ludhiana (13.03) studied by Sharma *et al.*, (1988), Punjabi HSES girls (12.65) of Chandigarh studied by Talwar *et al.* (1987). It is also higher than the Punjabi girls of lower and upper socio-economic groups of Chandigarh studied by Kaul *et al.* (1997), Bania girls of Mandi Gobindgarh (12.88 ±0.72) studied by Talwar & Kaur (1999), Punjabi arora girls of Delhi (12.8±1.04) studied by Khanna & Kapoor (2004), Rajput girls of Solan (13.00±0.06) Talwar & Bajwa (2005), Lucknow girls (12.43±1.49) Khatoon *et al.* (2011), rural girls of Lucknow (12.84) Sachan *et al.* (2012), rural Punjabi girls of Nalagarh (12.88±1.23) Talwar *et al.* (2012), Aligarh, U.P girls (12.36) Bano (2012), Ghaziabad, U.P. girls (12.24±1.15) Saxena (2014), Uttarakhand girls (12.74±0.98) Sharma *et al.* (2015), Punjabi baniya girls (12.3) Goyal *et al.* (2016) and Haryana rural girls (12.76±0.936) studied by Sharma *et al.* (2016). However, it is more close to mean age at menarche of rural girls of Ludhiana (13.62) studied by Mokha *et al.* (2006) and Uttarakhand girls (13.6±1.1) found by Prakash *et al.* (2010).

The median age at menarche found in the present study shows lower value than girls of NCR region (14.7) studied by Dahiya & Rathi (2010), Haryanavi girls (14.3±1.2) studied by Ahamed *et al.* (2015) and Himachali girls of Nahan area of Sirmaur district (13.90±0.85) found by Kaur & Pathak (2014). Besides genetic variations, the geographic differences as well as socioeconomic status, environment and food habits of the population may be responsible for the variation in the age at menarche of girls in different places of North India. The limitation of such comparison is that such studies are conducted in small geographical areas and different methodology (mean/median age) may have been employed in each of these studies.

In the present study, it was observed that mean duration of menstrual flow (4.60 days) and interval between menstrual cycles (28.04 days) was in the normal range i.e. between (3-5) days and (21-35) days respectively. No significant age difference was found for these two parameters among the sample girls. These results are

comparable with the findings of another study (mean duration 4.43 ± 1.4 days and inter-menstrual interval 27.88 ± 1.21 days) by Chopra & Sharma (2014) among semi-rural girls of Yamunanagar, Haryana. Similar studies conducted by Patil and Angadi (2013) and Kanotra *et al.*, (2013) in Maharashtra reported inter-menstrual interval of 28-35 days in more than 90% girls. Duration of menstrual flow was 3-5 days in majority of Lucknow girls studied by Sachan *et al.*, (2012).

The major source of knowledge regarding menstruation was mothers (60.3%) in the present sample, which signifies their role in dissemination of correct information regarding menarche and menstruation to their daughters. Similar findings have been reported by other studies done by Khanna *et al.*, (2005); Singh *et al.*, (2006); Dasgupta and Sarkar (2008); Mudey *et al.*, (2010); Jogdand and Yerpude (2011), Thakre *et al.*, (2011); Kamaljit *et al.*, (2012); Sudeshna and Aparajita (2012); Kanotra *et al.*, (2013); Katiyar *et al.*, (2013); Sharma and Manhas (2013); Sharma *et al.*, (2013); Sharma *et al.*, (2015) and Sharma *et al.*, (2016). However, in a study by El-Gilany *et al.*, (2005) in Mansoura, Egypt; mass media was found to be the main source of information followed by mothers, while in another study in rural Ambala, Haryana, Arora *et al.*, (2013) found that majority of adolescent girls gained information from their friends. Friends were also the main source of information in various other studies (Dhingra *et al.*, 2009; Juyal, 2012; Bhattacharjee *et al.*, 2013). This could be because these matters are perceived as "secret and personal" by the girls and there is a lack of open communication between mothers and daughters (Dhingra *et al.*, 2009), in these populations. On the other hand, mothers could be the main source of information due to increasing awareness and decreasing inhibition with rising literacy levels among them (Raina & Balodi, 2014).

Other sources of information in the present study were sisters (5%), friends (17.6%), older family members (2.7%) and teachers (4.2%). These results are consistent with those of other studies (Khanna *et al.*, 2005; Dasgupta and Sarkar, 2008; Mudey *et al.*, 2010). Internet (7.6%) is fast becoming an important source of gaining information on this issue.

Present study revealed that more number of girls (74.2%) used sanitary pads than cloth, which is concordant with the findings of other studies (Adhikari *et al.*, 2007; Juyal *et al.*, 2012; Kamaljit *et al.*, 2012; Shanbhag *et al.*, 2012; Kanotra *et al.*, 2013; Sharma *et al.*, 2016). However, many studies indicate that use of sanitary pads is more in urban areas (Omidvar and Begum, 2010; Thakre *et al.*, 2011; Kamath *et al.*, 2013). Socio-economic status is the most important factor that influences the choice of absorbent material used by girls (El-Gilany *et al.* 2005). It was observed in the present study that girls (4.8%) sometimes use both cloth and readymade sanitary pads depending upon the circumstances, similarly documented by Sommer (2010) and Crofts & Fisher (2012). Due to easy availability, low cost and shyness in buying of sanitary pads; clothes are still preferred by many girls, also indicated in studies done by Khanna *et al.*, 2005; Singh *et al.*, 2006; Dasgupta and Sarkar, 2008; Udgiri *et al.*, 2010; Sahu *et al.*, 2011; Jogdand and Yerpude, 2011; Subhash *et al.*, 2011; Raina and Balodi, 2014; Sharma *et al.*, 2015 and Patil and Udgiri, 2016.

Majority of girls (44.08%) in the present study reported abdominal pain during menstruation as the most common complaint followed by tiredness (40%), irritability (35.1%), low appetite (13.8%) and dysmenorrhoea (13.06%). Studies conducted by Hanagi (2001); Poureslami and Ashtiani (2002); Joshi *et al.* (2006); Swarnalatha and Vasantha (2007); Avasarala and Panchangam (2008); Sharma *et al.* (2008); Dhingra *et al.* (2009) and Nair *et al.* (2012). Also reported similar findings about menstrual problems such as stomach pain, fatigue, muscle stiffness, restlessness and irritability. These problems could be attributed to a number of factors such as nutritional status, psychological, hormonal or higher levels of prostaglandins associated with pain (Sahoo *et al.*, 2011).

The study found many restrictions; religious, food-related, or domestic prohibitions during menstruation, followed by most of the sample girls without raising any questions. These are passed down from mothers to daughters thus perpetuating the cycle of ignorance and false perceptions regarding menstruation. Thus the myths, misconceptions, superstitions and taboos persist. A woman's menstruating status is perceived to be dangerous to others, hence there are restrictions associated with it. It is believed that it is also hazardous to plants, biological and social processes and has the potential to spoil food (Narayan *et al.*, 2001). The most common restriction of not touching pickle during menstruation has the basis in the belief that some specific ray or smell comes out of the body during this time, which spoils the preserved food (Kumar & Srivastava 2011). Blood is considered to be a "hot" agent and during menstruation when a woman is losing blood, she can become "cold". That is why they are advised against having "cold" food such as curd and milk. Sour food is to be avoided as it is believed to disturb or stop the menstrual flow and disturb ovarian function whereas eating hot food like dry fruits and coconut will result in more bleeding. Similar dietary restrictions were reported by other studies in different parts of India (Kumari and Dubey, 1990; Talwar, 1997; Audinarayana *et al.*, 2005; Puri & Kapoor 2006; Singh 2006; Paul 2007).

In the present study, majority of girls (80.3%) reported restrictions from visiting temples and taking part in religious functions. Similar result was reported by studies by Ferro-Luzzi (1980); Phipps (1980); Chawla (1992); Drakshayani *et al.*, (1994); Ahuja and Tiwari (1995); Sharma *et al.*, (2006); Nair *et al.*, (2007); Dhingra *et al.*, (2009); Nemade *et al.*, (2009); Udgiri *et al.*, (2010); Arora *et al.*, (2013); Bhattacharjee *et al.*, (2013) and Sharma *et al.*, (2016).

18.8% of the sample girls reported that they were not allowed to look into the mirror during menstruation. They believe that not following this restriction will result in blemish or pimples on the face. Similar taboo against looking at their reflection has been reported among Nepalese and Gujjar girls (Water Aid Nepal 2009; Dhingra *et al.*, 2009). Menstruating girls are considered polluted (Shukla 2005). There are restrictions against taking bath or head bath during menstruation. 32.9% girls in the present study reported prohibition against taking head bath. It is believed

that water sources should be protected from such pollution as running water or rivers represent embodiment of Hindu gods/goddesses (Joshi and Fawcett, 2006). That is why there are prohibitions on using water resources during menstruation as reported in Gujjar communities (Dhingra *et al.*, 2009)

Various restrictions in daily activities during menstruation, similar to the present findings have been reported by a number of studies (Center for Social Research, 1990; Talwar, 1997; Audinarayana *et al.*, 2005; Deo and Ghattargi, 2005; Khanna *et al.*, 2005; Puri and Kapoor, 2006; Sharma *et al.*, 2006; Singh, 2006; Singh *et al.*, 2006; Paul, 2007; Dasgupta and Sarkar, 2008; Mudey *et al.*, 2010 and Salve *et al.*, 2012).

CONCLUSION

It can be concluded from the above study that median age at menarche among semi-rural adolescent girls of Ambala was found to be 13.65±1.05 years. The menstrual flow period was on an average of 4.60±1.36 days and mean interval between cycles was 28.04±2.63 days. Mothers were the main source of knowledge regarding menstruation for majority of girls. Most common menstrual complaint was pain in abdomen and the most common restriction was prohibition to visit a religious place. Though a higher percentage of girls used hygienic sanitary pads, few were still using cloth due to financial constraints. It is suggested that awareness and knowledge about the menarche and its management should be spread, especially in the rural and semi-rural areas. To facilitate hygienic practices, low cost sanitary napkins should be distributed free of cost. There is also a need to logically consider the restrictions which are being practiced by the girls and find a way forward on this issue.

Table 1: Educational & Occupational status of Parents

Educational status	Fathers		Mothers	
	(N)	(%)	(N)	(%)
Illiterate	16	5.6	58	19.5
Primary School	37	13.0	47	15.8
Middle School	56	19.6	30	10.1
High School	53	18.6	50	16.8
Intermediate or Post High School	63	22.1	50	16.8
Graduate or Postgraduate	55	19.3	62	20.9
Professionals	5	1.8	-	-
Occupational Status	(N)	(%)	(N)	(%)
Housewife	-	-	266	89.3
Unskilled	99	34.7	10	3.35
Semi-Skilled	6	2.1	6	2.01
Skilled	37	13.0	1	0.3
Service	110	38.6	3	1.01
Business	29	10.2	12	4.02
Professional	4	1.4	-	-

Table 2: Total number and percentage of adolescent girls who attained menarche

Age	Number of girls	Number of girls with menarche Occurred	Percentage	Probit Value
11	24	6	25.0%	4.32
12	34	8	23.5%	4.27
13	51	30	58.8%	5.22
14	62	60	96.8%	7.15
15	59	59	100.0%	-
16	50	50	100.0%	-
17	20	20	100.0%	-
Total	300	233	-	-

Table 3: Mean and Standard Deviation of duration of menstrual flow and interval of menstrual cycle of different age-groups

Age (Years)		11	12	13	14	15	16	17	Total	F-value (p-value)
Duration	Mean	4.16	5.25	5.17	4.50	4.69	4.42	4.20	4.60	1.85 (0.09)
	SD	0.75	0.89	1.56	1.21	1.44	1.30	1.47	1.36	
Interval	Mean	26.00	29.00	28.07	28.3	27.64	28.38	27.85	28.04	1.27 (0.27)
	SD	2.37	1.07	2.03	1.89	2.74	3.16	3.69	2.63	

Table 4: Source of Knowledge regarding menstruation among the adolescent girls

Source of Knowledge	No. of girls	Percentage
Mother	158	60.3%
Sister/cousin	13	5.0%
Friend	46	17.6%
Aunt	5	1.9%
Grandmother	2	0.8%
Teacher	11	4.2%
Internet	20	7.6%
Books/Magazines	5	1.9%
Doctor	2	0.8%

Table 5: Type of Absorbent Material used during menstruation

Material used during menstruation	No. of girls	Percentage
Sanitary pads	172	73.81%
Cloth	48	20.6%
Both	13	5.57%

Table 6: Problems during menstruation

<i>Menstrual Problems</i>	<i>Number*</i>	<i>Percentage</i>
No Complaints	40	16.3%
Irritability	86	35.1%
Low appetite	34	13.8%
Heaviness/Water retention	18	7.3%
Depression/low esteem	12	4.89%
Dysmenorrhoea	32	13.06%
Abdominal pain	108	44.08%
Headache	26	10.6%
Acne	14	5.7%
Tiredness	98	40%
Vomiting/ Nausea	16	6.5%
Body ache	19	7.7%

*multiple response

Table 7: Restrictions practised during menstruation

<i>Restrictions during menstruation</i>	<i>Number*</i>	<i>Percentage</i>
Avoid puja/visiting temple	188	80.3%
Avoid watering plants	53	22.6%
Avoid looking into the mirror	44	18.8%
No entry in the kitchen	29	12.4%
Avoid outdoor activities	70	29.9%
Avoid head bath	77	32.9%
Avoid heavy weight	61	26.06%
Not touching pickles	112	47.8%
No restrictions	8	3.4%

*multiple response

Table 8: Mean/Median Age at Onset of Menarche in different populations of India

<i>Author(Year)</i>	<i>Area</i>	<i>Population</i>	<i>N</i>	<i>Mean age at menarche (years)</i>
Dubey & Shrivastava (1963)	Uttar Pradesh	Pooled	361	13.57±0.06
		Hindu	-	13.62±0.07
		Muslim	-	13.37±0.26
Ghosh & S. Kumari (1973)	Delhi	Punjabi Khatri	248	13.93±0.08
Talwar <i>et al.</i> , (1987)	Chandigarh	Punjabi HSES	110	12.65
		Punjabi LSES	113	13.87
Bhargava <i>et al.</i> , (1980)	Delhi	Punjabi girls	-	11.20
		Sindhi girls	421	13.78±0.07
Sharma <i>et al.</i> , (1988)	Chandigarh Ludhiana	Punjabi girls	147	13.03

contd. table 8

<i>Author(Year)</i>	<i>Area</i>	<i>Population</i>	<i>N</i>	<i>Mean age at menarche (years)</i>
Kaul <i>et al.</i> , (1997)	Chandigarh	Punjabi LSES	-	13.18
		Punjabi USES	-	12.54
Talwar and Kaur (1999)	Mandi Gobindgarh, Punjab	Bania	284	12.88±0.72
Khanna and Kapoor (2004)	New Delhi	Punjabi Arora	159	12.8±1.04
Talwar and Bajwa (2005)	Solan (H.P)	Rajput	200	13.00±0.06
Sharma and Shandilya (2005)	Naraingarh, Haryana	Scheduled caste	194	13.40±2.71
Mokha <i>et al.</i> , (2006)	Ludhiana	Jat Sikh	-	13.31
		Rural	-	13.62
Acharya <i>et al.</i> , (2006)	South Delhi	Urban slum girls	250	13.34±1.26
Sharma <i>et al.</i> , (2006)	Jammu	Brahmin	50	13.857±0.013
		Rajput	50	13.859±0.013
Dahiya & Rathi (2010)	NCR region	Adolescent girls	100	14.7 Median
Talwar <i>et al.</i> , (2010)	Thoeg (H.P)	Rajput	220	13.70±0.92
Prakash <i>et al.</i> , (2010)	Haldwani, Uttarakhand	Pooled	450	13.6 (±1.1)
		Plain		13.18±1.31
		Hilly		14.21±1.46
		Pooled	150	12.43±1.49
Khatoon <i>et al.</i> , (2011)	Lucknow (U.P)	Urban		12.37±1.6
		Rural		12.51±1.55
		Pooled	150	12.43±1.49
Talwar <i>et al.</i> , (2012)	Nalagarh (H.P)	Rural Punjabi girls	229	12.88±1.23
Bano (2012)	Aligarh (U.P)	Adolescent girls	700	12.36
Sachan <i>et al.</i> , (2012)	Lucknow (U.P)	Pooled	847	12.84 (1.4)
		Urban		12.67(1.4)
		Rural		13.19 (1.5)
Goyal <i>et al.</i> , (2012)	Punjab	Adolescent girls	417	13.25±0.65 Median
Chopra & Sharma (2014)	Yamunanagar (Haryana)	Adolescent girls	120	13.4±0.99
Saxena (2014)	Ghaziabad (U.P)	Adolescent girls	300	12.24±1.15
Kaur & Pathak (2014)	Sirmaur (H.P)	Adolescent girls	286	13.90±0.85 Median
Ahamed <i>et al.</i> , (2015)	Panipat (Haryana)	Married women	344	14.3±1.2
Sharma <i>et al.</i> , (2015)	Bhaniyawal, Uttarakhand	Adolescent girls	50	12.74±0.98
Sharma <i>et al.</i> , (2016)	Agroha village (Haryana)	Adolescent girls	150	12.76±0.936
Goyal <i>et al.</i> , (2016)	Punjab	Bania girls	200	12.3 Median
Present study	Ambala	Adolescent girls	300	13.65 Median

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