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Patterns of Growth and Menarcheal Age among the Adolescent Tea Garden Worker Girls of Dibrugarh District, Assam

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ABSTRACT

The present study intends to look into the pattern of adolescent growth with age at menarche among the tea garden girls of Dibrugarh district, Assam. The adolescent girls, belonging to the age group of 9-17 years were measured for nine anthropometric traits i.e. stature, sitting height, lower extremity length, girth of bicep, girth of calf, waist circumference, hip circumference, chest circumference and body weight. Growth in all the measurements increases with age, though not uniformly. For most of the traits the highest growth spurt is observed between the age group of 9-11 years. The mean age at menarche was found to be 12.88±0.07yrs .The difference in mean menarcheal age of girls between the joint family and nuclear family and between the girls from families with different monthly income was also not found to be significant. The difference in the mean age at menarche of caste groups, namely Karmakar, Sabor, Tanti and Oraon was found to be statistically insignificant. No variation in respect of menarcheal age therefore exists among the caste groups of Tea garden workers. This is pointing towards the fact that all the caste groups of the Tea garden workers might possess similar genetic endowment and may be there also exists a similar environmental condition among them.

Key words: *Tea garden workers, adolescent girls, growth status, age at menarche, environmental factors*

INTRODUCTION

Body size and composition, growth velocity and maturational rate offer important clues to the cumulative effects of genetic and environmental conditions. Thus, growth data as an indicator of public health and nutritional status of children, assume ever increasing importance because growth monitoring in children can serve as a powerful tool for appropriate action to promote improved health and nutritional status (Eveleth and Tanner, 1990).Growth during puberty appears to be strictly genetically regulated. From 50% to 80% of the variation in the timing of puberty has been found to be because of genetic differences between individuals (Silventoinen *et al*., 2008). Pubertal growth and biological maturation are dynamic processes regulated by a variety of genetic and environmental factors.

Final height is influenced by both height and the age of onset of the PGS (Pubertal Growth Spurt) in normal maturing children. A normal but early puberty exerts a negative effect on final height. A delayed PGS exerts a positive effect on final height (Limony *et al.,* 2015).

Age at onset of pubertal growth spurt was negatively associated with BMI from 1 to 10 years of age and stature in early adulthood. The age at PHV was found to correlate with childhood BMI and stature in early adulthood. These associations were explained by common genetic factors. There is also evidence that a new set of genes affecting height may be turned on during the pubertal growth spurt and then turned off. Not only precocious puberty but also an early puberty that occurs within the normal limits exerts a significantly negative effect on final height (Fischbein and Pedersen, 1987; Phillips and Matheny, 1990).

Differences in growth and development also vary as a function of sex and ethnic origin. Overall size and rate of development vary significantly among ethnic populations. Black infants tend to be smaller at birth but experience an acceleration of linear growth that results in greater height than in white children during the first few years of life. Skeletal maturity in black children, especially girls, also tends to be more advanced and the age at peak height velocity earlier. Black girls also tend to be taller and heavier than white girls during puberty and have a tendency toward greater body mass index and greater skinfold-thickness measurements (Rogol, *et al*., 2000)

In a multiethnic and geographically vast country like India, where there is great cultural and economic diversity, studies on growth pattern are more relevant. Numerous studies on Indian populations highlighting the differential growth patterns of rural and urban children and children belonging to different socio-economic classes have been reported (ICMR, 1972). Besides, information on age at menarche in Indian populations has also been obtained to investigate the range of variation in this practical indicator of sexual maturity (Talwar *et al*, 1994). Menarcheal age is the most widely used indicator of sexual maturation and is known to be influenced by genetic factors, environmental conditions, body stature, family size, body mass index (BMI), socioeconomic status and level of education (Chumlea *et al*, 2003). It is the most accurately recalled indicator of puberty among girls (Cole, 2003). It varies between individuals and populations (Lassek and Gaulin, 2007). To augment data in this direction, the present study aims to study the growth pattern in respect of some anthropometric measurements and menarcheal age - its relation to some social factors among the tea-garden adolescent girls of Dibrugarh district, Assam.

MATERIALS AND METHOD

The tea garden workers communities constitute the oldest amongst Assam's in-migrant groups that was recruited by the British Tea Planters from the present day Jharkhand, Chattisgarh, Bihar, Andhra Pradesh, Orissa, Uttar Pradesh and West Bengal between 1861 until the early 20th century to work as indentured labour in tea plantation in Assam. They are called as the tea garden workers communities. Most of the tea garden workers belong to any of the tribal groups such as Santhals, Mundas, Oraons, Kharias, Gonds, and Khonds. Comprising of a plethora of communities, having their own unique origin with a diverse social, ethno-lingual and economic background, the tea tribes stands apart from rest of the Mongoloid groups in the surroundings. Today the demand for Scheduled Tribe status has taken precedence over the demand for social and economic security by the tea plantation community.

The sample of the present cross-sectional study was mainly collected from Sessa Tea-Garden as well as from a few state Government run schools of Dibrugarh District. The schools are Jokai M.E. and L.P. School, Khanikar L.P. School and Nirmali L.P. and M.E. School. A total number of 469 girls were measured whose age ranged between the age group of 9-17 years. The girls were divided in to nine age groups at an interval of one year each. They were measured for the

following nine anthropometric measurements viz: Stature, Sitting height, Lower extremity length, Girth of bicep, Girth of calf, Waist circumference, Hip circumference, Chest circumference and Body weight.

Date of birth of the subjects were obtained from the Institutional records and cross-checked by employing indirect methods like festivals and ceremonies because in the tea-gardens, it is very common to see that many of the labourers are not aware of their own and their children's age. But since the children are going to schools these days parents have become conscious to record the dates of birth of their children.

All the measurements were taken using standard instruments following the protocols of Weiner and Lourie (1981). Body weight was measured using portable weighing machine, anthropometer for stature and sitting height and non-stretchable measuring tape was used for measuring circumferential measurements. For recording age at menarche, retrospective method was followed.

RESULTS AND DISCUSSION

The analysis of the statistical constants for all the measurement reveals that the mean value increases with the increase in age. However, this increase in not found to be uniform in all the measurements and at all the age groups.

Table: 1 shows the statistical constants of anthropometric measurements among the adolescent tea-garden girls belonging to the age group of 9-17 years. It shows the total increment of 18.52 cm in stature from 9 to 17 years. The highest increment in stature and sitting height could be seen between 10-11 years which is 5.64cm and 2.91cm respectively. The total increase in sitting height from 9 to 17 yrs is 12.87cms. The lowest increment in stature (0.03cm) and sitting height (0.24cm) could be observed between 16-17 years of age.

A continuous increase in the mean values of lower extremity length could also be noticed with increasing age among the girls. This increase is different in its magnitude at all ages. The highest increment could be observed between 11-12 years of age in lower extremity length, girth of bicep and girth of calf. The lowest increase is between 15-16 years of age for both lower extremity length and girth of bicep. The total increment from 9-17 yrs of age in lower extremity length is 8.98 cm, 5.07cm for girth of bicep and 6.03cm in girth of calf.

In case of waist circumference, hip circumference, chest circumference and body weight, the highest increment is between the ages 11-12 yrs. The magnitude of increase though is not uniform in all the age groups. The total growth between 9-17 yrs of age in case of waist circumference is 10.32cm, for hip circumference it is 18.24 cm, chest circumference it is 16.27cm and body weight it is 17.37cm.

The highest increase therefore is between 11-12 yrs of age in all the circumferential measurements. This could be the age of adolescent spurt among the Tea Garden worker girls. In linear measurements the highest increase is between 10-11 yrs except lower extremity length which is between 11-12 years.

Human growth pattern is not steady and uniform process of acceleration in which all parts of the body enlarge at the same rate and the increment of one year are equal to that of the preceding or succeeding years. Body weight and age at menarche are two measures of growth which, on account of their eco-sensitivity and the relative ease with which they can be rapidly recorded in large samples of children, are widely used by auxologists for epidemiological purposes, for e.g., for measuring the socio-economic inequalities in a society (Milicer 1968, Tanner 1981).

From the distribution of menarcheal age among the adolescent girls (Table: 2 & Figure: 1), it could be seen that the mean menarcheal age is 12.88±0.07 years. A maximum of 33.22% of girls reported to have experienced their first menstruation between 12-12.9 yrs followed by girls at 13-13.9yrs (30.23%). The Tea garden girls start menstruating as early as between 9-9.9yrs (0.98%).

When the mean menarcheal age is seen in relation to family type (Table: 3 & Figure: 2), the girls from joint family have mean age at menarche of 13.03 ± 0.11 years and the girls from nuclear family have 13.06 ± 0.09 years respectively. The difference in the mean menarcheal age is statistically not significant at the level of 5% (t= 0.211).

The size of the joint family is expected to play a role in the maturity status as observed in studies like Bielicki et.al (1986), when the menarcheal age of Polish school girls from the three largest cities tends to increase with decrease in parental education, occupation,

family income, family size and dwelling condition. Similarly, countryside girls having higher age at menarche, was reported by Rosenberg (1991).

However, in the present study, such trend is not observed. The mean menarcheal age in relation to family type is not statistically significant. The reason may be, the living conditions forming the social environment of tea-garden workers is the same among the family types. The women of every household work in the tea garden for their living, whether nuclear or joint family doesn't make any difference. So the concept of joint family with the elderly and women staying at home and giving the care to the young ones is not prevalent in this particular community. The amount of money spent in food per person, the quality of food consumed, the income earned does not differ among them. The Tea garden workers get subsidized ration every week. This makes them different from the farming communities where joint family structure may matter.

For studying the mean age at menarche in relation with family income (Table: 4 & Figure: 3) an income of Rs. 4000 has been kept as a baseline considering the fact that the tea-garden population living in Dibrugarh district are below the poverty line and the average tea-garden laborers earner around Rs.3500 as their monthly income. The mean menarcheal age in relation to income (below Rs. 4000/month and above Rs 4000/month), is 13.05±0.08 years and 13.04±0.12 years respectively. This difference in the mean age at menarche is statistically insignificant at the level of 5% (t=0.069). In the families with higher income above Rs 4000/- , highest percentage of girls (38.89%) have been observed to have attained menarche at the age between 12-12.9yrs. The highest percentage of girls (31.28%) who have attained menarche is between 13-13.9yrs in the families with income below Rs 4000/- per month. The difference in the monthly family income of Rs. 4000/- has not made any significant effect on the menarcheal age of the girls. This could be because, even though the families with income more than 4000/- have been considered separately but the difference in both these categories is not considerable enough to make any life style changes among these people. So the effect is not prominent enough to be reflected in their menarcheal age.

The Tea garden population of Dibrugarh has been divided in to four caste groups, namely Karmakar, Sabor, Tanti and Oraon. The mean age at menarche (Table: 5) is found to be 12.91±0.81 years among the Karmakar, 13.47±0.22 years among the Sabor, 12.92±0.26 years

among the Tanti and 13.40±0.29 years among the Oraon respectively. The difference in mean menarcheal age among the four caste groups (Table: 6) is statistically insignificant.

The reason of insignificant difference in the age at menarche between the caste groups could be because of the fact that they do not maintain any barrier between the castes in any aspect including marriage. Castes do not have their regular bindings. Though they have migrated to the present study area from different states, but now they all live together as a single community and have become homogenous enough. After decades of settlement in the same area, admixture might have taken place which might be the reason that there is no difference between them in respect of menarcheal age. This indicates similar genetic and environment endowment among them. Whatever social class differences in menarcheal age occur in an ethnically homogenous population, they have no genetic components and thus can be regarded as 'pure' reflection of inequalities in living condition (Bielicki et.al, 1986).

The age at menarche of the present study is compared with other Indian populations in Table: 7.The mean menarcheal age of the present study (12.88±0.07 years) is lower than that of Assamese Muslims (13.27±0.05 years), Nagas (13.80±0.26 years) and the Adis (13.47±0.36 years). But it is higher than that of the Ahoms (12.25±0.13 years), Sonowal Kachari (12.22±0.18 years), Manipuri Brahmins (12.45±0.08 years) and Meities (12.77±0.04 years).

The difference of the menarcheal age between all the above mentioned populations could be because of the fact that the populations are genetically different and living under completely different environmental conditions.

Conclusion

Growth in all the measurements increases with age, though not uniformly. All the circumferential measures have achieved the highest growth spurt between the age group of 11-12 years whereas the linear measurements except lower extremity length have it between 10-11 years. The lower extremity has the highest spurt between 11-12 years.

Mean menarcheal age has been found to be 12.88±0.07 years. Mean age at menarche was not found to be significantly related to family type, family income and different caste groups existing among them. This is pointing towards the fact that the caste groups of the Tea garden

workers possess similar genetic endowment. May be there also exists a similar environmental condition among them.

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Table 1: Statistical Constants of anthropometric measurements of the Adolescent Tea garden Worker Girls

Age (yrs)	No. of girls n=469	Stature Mean ± SD (cm)	Sitting Height Mean ± SD (cm)	Lower extremity length Mean ±SD (cm)	Girth of Bicep Mean ±SD (cm)	Girth of Calf Mean ±SD (cm)	Waist Circum-ference Mean ±SD (cm)	Hip Circum-ference Mean ±SD (cm)	Chest Circum-ference Mean ±SD (cm)	Body Weight Mean ±SD (kg)
9+	30	130.18±1.59	65.41±0.74	63.26±1.01	16.73±0.22	23.66±0.30	53.43±0.82	63.88±0.96	62.33±0.87	22.30±0.63
10+	42	133.06±1.03	68.73±0.81	64.23±0.83	16.99±0.22	24.25±0.27	54.08±0.65	64.69±0.73	63.76±0.62	23.91±0.55
11+	44	138.70±0.92	71.64±0.55	66.33±0.54	17.77±0.20	25.37±0.22	56.26±0.63	68.53±0.66	67.23±0.59	26.39±0.65
12+	70	143.87±0.61	74.23±0.37	69.83±0.41	19.58±0.19	27.47±0.22	59.93±0.49	75.19±0.59	72.90±0.59	32.89±0.61
13+	87	146.30±0.60	75.85±0.36	70.97±0.35	20.22±0.18	27.29±0.24	60.40±0.47	77.35±0.50	75.47±0.53	34.72±0.54
14+	73	147.95±0.66	76.47±0.42	71.63±0.57	21.32±0.19	28.83±0.21	62.60±0.46	79.86±0.52	77.46±0.54	37.54±0.56
15+	50	148.47±0.85	77.44±0.42	71.66±0.50	21.36±0.25	28.83±0.31	63.45±0.75	80.27±0.51	78.60±0.60	38.70±0.76
16+	44	148.67±0.85	78.04±0.54	71.74±0.54	21.40±0.27	29.50±0.29	63.72±0.52	81.34±0.79	78.60±0.72	38.75±0.82
17+	29	148.70±0.99	78.28±0.81	72.24±0.59	21.80±0.31	29.69±0.26	63.75±0.60	82.12±0.85	78.60±0.73	39.67±0.54

MATURITY STATUS

Table 2: Distribution of Menarcheal Age among the Tea garden Worker Girls

Menarcheal age (yrs)	No. of Girls n=301	Percentage of Girls
9-9.9	01	0.332%
10-10.9	13	4.319%
11-11.9	38	12.625%
12-12.9	100	33.223%
13-13.9	91	30.233%
14-14.9	35	11.628%
15-15.9	20	6.645%
16-16.9	03	0.997%
Total	301	100%

Mean menarcheal age: 12.88±0.07 years

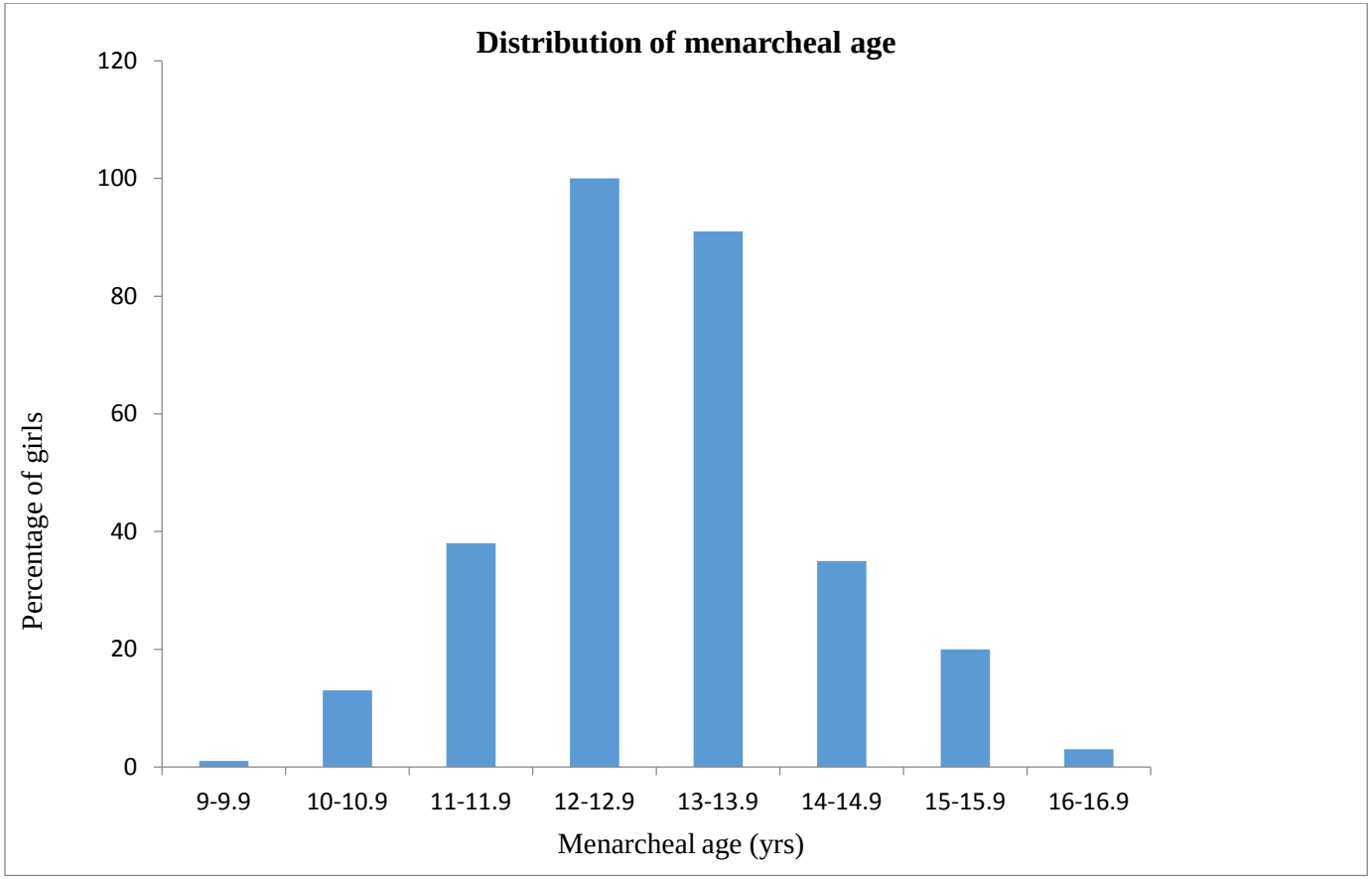

Figure 1: Distribution of Menarcheal Age among the Tea garden Worker Girls

Table 3: Age at Menarche as per Family Type among the Tea garden Worker Girls

Menarcheal age (yrs)	Joint Family		Nuclear Family	
	No.	%	No.	%
9-9.9	00	0	01	0.48
10-10.9	03	3.30	10	4.76
11-11.9	09	9.89	29	13.81
12-12.9	35	38.46	65	30.95
13-13.9	28	30.77	63	30
14-14.9	13	14.29	22	10.48
15-15.9	03	3.30	17	8.10
16-16.9	00	0	03	1.43
Total	91		210	

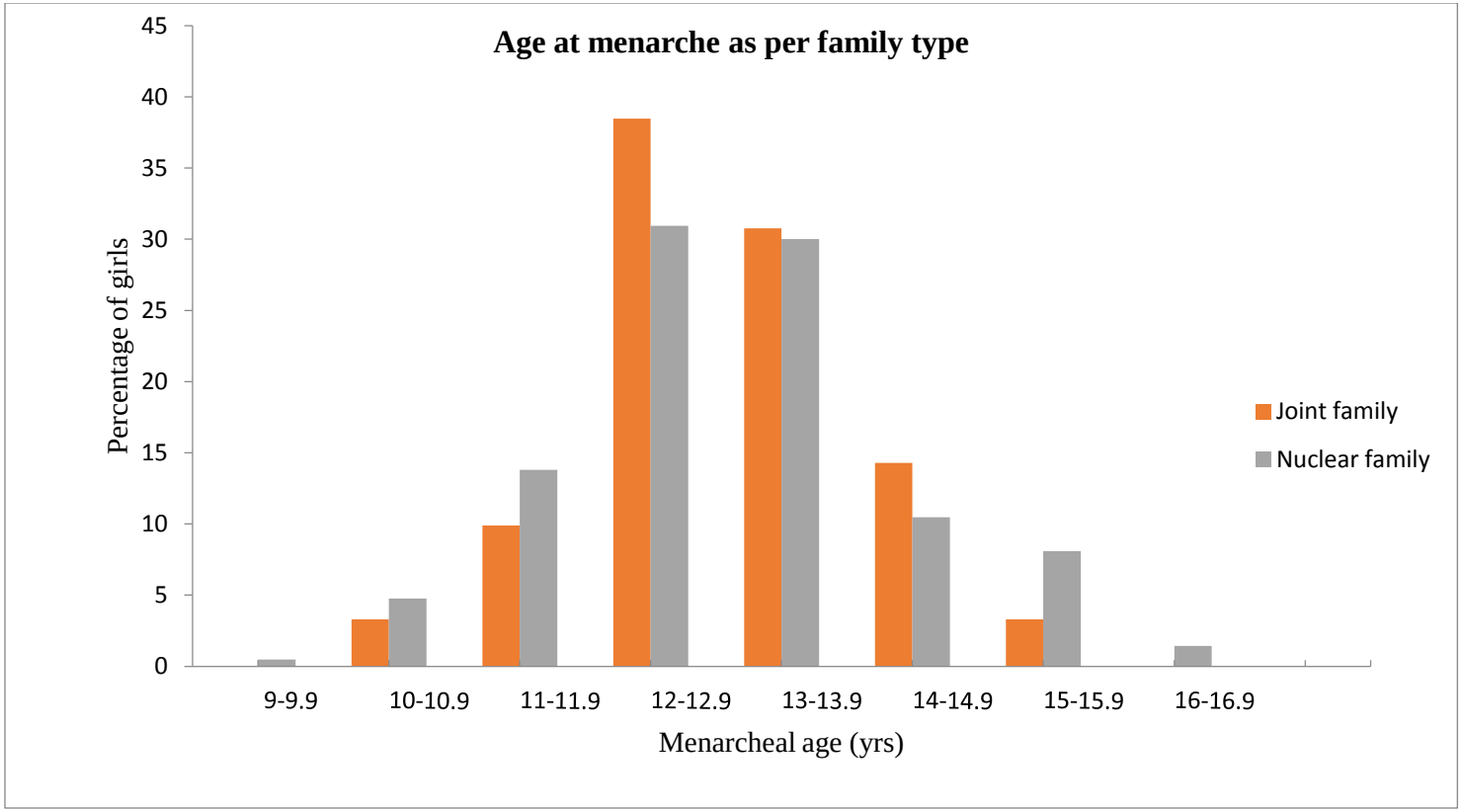

Fig. 2: Age at Menarche of the girls as per Family Type

Mean Menarcheal Age in Joint Family: 13.03±0.11 years

Mean Menarcheal Age in Nuclear Family: 13.06±0.09 years

It is statistically insignificant at the level of 5%

Table 4: Age at Menarche as per Monthly Family Income among the Tea garden Worker Girls

Menarcheal age (yrs)	Monthly income Below 4000 Rs.		Monthly Income Above 4000 Rs.	
	No. of girls	Percentage	No. of girls	Percentage
09-9.9	01	0.47%	00	0%
10-10.9	08	3.79%	05	5.56%
11-11.9	30	14.22%	08	8.89%
12-12.9	65	30.81%	35	38.89%
13-13.9	66	31.28%	25	27.78%
14-14.9	25	11.84%	10	11.11%
15-15.9	14	6.64%	06	6.67%
16-16.9	02	0.95%	01	1.11%
Total	211		90	

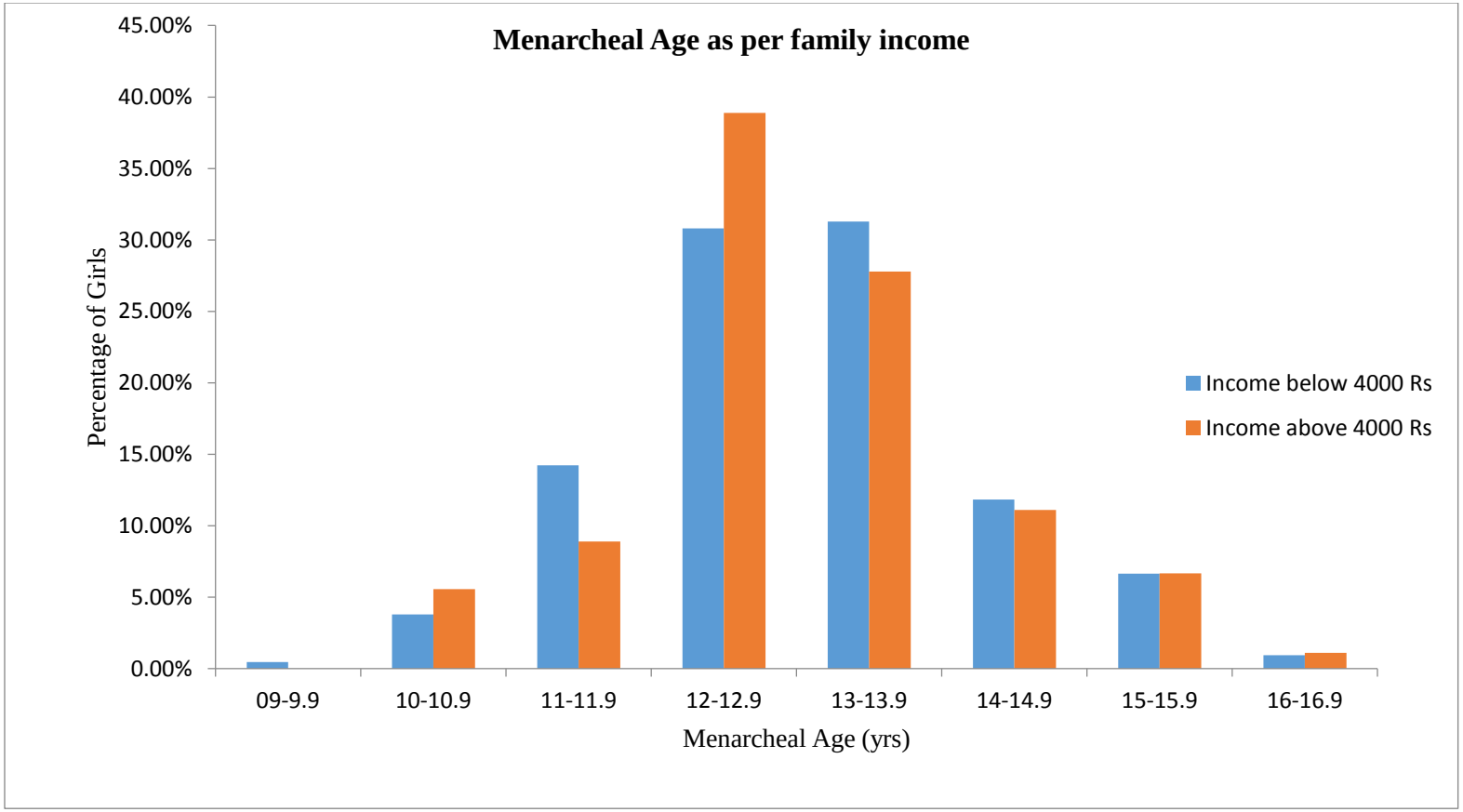

Fig 3: Age at Menarche as per Family Income among the Tea garden Worker Girls

Mean Menarcheal Age in Family Income Below 4000/Month: 13.05±0.08 years

Mean Menarcheal Age In Family Income Above 4000/Month: 13.04±0.12 years

It is statistically insignificant at 5% level

Table 5: Age at Menarche in different Caste Groups among the Tea garden Worker Girls

Menarcheal age (yrs)	Karmakar		Sabor		Tanti		Oraon	
	No.	%	No.	%	No.	%	No.	%
09-9.9	01	1.961	00	0	00	0	00	0
10-10.9	03	5.882	01	2.941	02	7.692	00	0
11-11.9	05	9.801	02	5.882	02	7.692	03	15
12-12.9	19	37.255	10	29.412	08	30.769	06	30
13-13.9	16	31.373	11	32.353	12	46.154	05	25
14-14.9	03	5.882	04	11.765	01	3.845	02	10
15-15.9	03	5.882	06	17.647	01	3.845	04	20
16-16.9	01	1.961	00	0	00	0	00	0
Total	51		34		26		20	

Mean Menarcheal Age Among Karmakar: 12.91±0.81 years

Mean Menarcheal Age Among Sabor: 13.47±0.22 years

Mean Menarcheal Age Among Tanti : 12.92±0.26 years

Mean Menarcheal Age Among Oraon: 13.40±0.29 years

Table 6: Level of significance in Menarcheal Age among the Tea garden tribes

Populations	t-values
Karmakar x Sabor	0.67
Karmakar x Tanti	0.012
Karmakar x Oraon	0.57
Sabor x Tanti	1.615
Sabor x Oraon	0.192
Tanti x Oraon	1.414

All the t values are statistically insignificant at the level of 5%

Table 7: Menarcheal Age of Tea Garden worker girls with other population of North-East and India

Population Group	Menarcheal Age(yrs) Mean±S.E.	Source
Tea-garden (Dibrugarh)	12.88±0.07	Present study
Muslims (Barpeta *char* area)	13.81± 0.08	Medhi and Begum, 2016
Muslims (Barpeta non-*ch*ar area)	12.56± 0.07	Medhi and Begum, 2016
Assamese Muslims (Kamrup dist)	13.27±0.05	Begum, 1994
Ahom	12.25±0.13	Balgir, 1994
Sonowal Kachari	12.22±0.18	Balgir, 1994
Naga	13.80±0.26	Balgir, 1994
Adis	13.47±0.36	Balgir, 1994
Manipuri Brahmins	12.45±0.08	Devi and Singh, 1982
Meities (Manipur)	12.77±0.04	Devi and Singh, 1982