

Pubertal Development During Adolescence Among Bhil Boys of Rajasthan

K. N. Reddy, S. Yousuf Basha and K. S. N. Reddy

Department of Anthropology, Sri Venkateswara University, Trupati 517 502, Andhra Pradesh, India

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ABSTRACT In this paper an attempt has been made to highlight the initiation and development of pubertal characters, such as male genitalia, pubic hair, facial hair and axillary hair during adolescence among 900 Bhil boys of Rajasthan using the scales of Tanner. The pattern of development of mean age of pubertal characters in the sequence are genitalia (15.45 years), pubic hair (16.33 years), facial hair (17.60 years) and axillary hair (17.95 years). The mean duration of the various stages of primary and secondary sexual characters indicates that the maturation of genitalia takes longer time (5.9 years) followed by the pattern of pubic hair (5.4 years), facial hair (2.6 years) and axillary hair (2.1 years). The boys who advanced in pubertal development in each year of age to that of boys of backward are compared with the growth characteristics such as height vertex, weight, biacromial breadth and hip width and the results are found to be higher for advanced boys at all ages. The present results of pubertal signs when compared with available Indian samples and American boys the tribal Bhil boys lag behind American boys and most of the Indian samples.

INTRODUCTION

Pubertal development is an important phase during adolescence. The period of pubescence influences growth characters during adolescence. Many of growth studies at adolescence in India have not given much attention so far to highlight the association of pubescence with adolescence (Sharma, 1970; Kaul, 1971; Prabhakar et al., 1972; Malik and Singh, 1978; Kaul et al., 1982; Kaul, 1987; Choudhary et al., 1994). Adolescence and pubescence are intimately linked to each other as that of growth and development. Physical changes occurring through pubertal development, stages of primary and secondary sexual characters are not well reported for the reasons of difficulty underlie in rating each stage of the scale (Tanner, 1962, 1978). It is important to report the association of adolescence to pubescence where most adult differences in morphology, composition and performance have their genesis (Malina, 1974). Furthermore, adolescence is relatively a new phase of growth wherein hormones from the gonads and adrenal combine

with growth hormone to produce the adolescent spurt (Tanner, 1977). The present paper is in this direction to show not only the developmental aspects of primary and secondary sexual characters, but also the influence of pubescence on certain growth characters during adolescence.

MATERIALS AND METHODS

The materials for the present study are 900 Bhil boys spread in 9 age-groups, i.e., 11+ to 19+ years. The study concerns the entire Bhil, the largest among the scheduled tribes in India and samples have been drawn from Udaipur district of Rajasthan where subjects of the study face the best available environment. Only normal and apparently healthy boys are included in the survey. Considerable care has been taken for minimising errors in estimating the date of births. The results of cross-sectional study covering growth and physical changes during adolescence among these boys are discussed elsewhere (Reddy, 1989). To highlight the present paper, incidence of only four pubertal characters such as male genitalia, pubic hair, facial and axillary hair are considered. The stages of pubertal development of all four characters are rated and recorded using the scales of Tanner (1962, 1978). Statistical considerations like percentage distribution, means, standard deviations and 't' tests are applied for proper evaluation of data.

RESULTS AND DISCUSSION

The attainment of selected puberty signs of the Bhil boys at different ages have been presented in tables 1 - 8. Results indicate that among subjects of lowest age category (11+ years) only 12.0% of boys are in G-2 stage of genitalia development. Although G-3 appears at 12+ years of age, its frequency is quite low (15.0%); G-4 appears at 13+ years of age and G-5 appears at

the age of 17+ years (Table 1). It can be interpreted from the same table that the development of genitalia is slow among the Bhil boys because, at only 19+ years of age 100.0% of the boys are in adult stage (G-5).

its lowest frequency (5.0%). The frequency has reached its maximum (100%) at the age of 17+ years. The maximum frequency (54.0%) is observed from age 14+ to 15+ years; where as minimum increase (6.0%) is noticed from 16+ to 17+

Table 1: Percentage frequency distribution of different developmental stages of pubertal characters by age in Bhil boys

Developmental stages of pubertal characters	Age in years								
	11+	12+	13+	14+	15+	16+	17+	18+	19+
Initiation of Genitalia(G)	12.0	71.0	96.0	100.0	100.0	100.0	100.0	100.0	100.0
G-1	88.0	29.0	4.0	-	-	-	-	-	-
G-2	12.0	56.0	41.0	7.0	-	-	-	-	-
G-3	-	15.0	49.0	62.0	27.0	4.0	-	-	-
G-4	-	-	6.0	31.0	73.0	96.0	65.0	1.0	-
G-5	-	-	-	-	-	-	35.0	99.0	100.0
Appearance of Pubic Hair(PH)	1.0	30.0	65.0	94.0	100.0	100.0	100.0	100.0	100.0
PH-1	99.0	70.0	35.0	6.0	-	-	-	-	-
PH-2	1.0	30.0	60.0	51.0	4.0	-	-	-	-
PH-3	-	-	5.0	34.0	72.0	48.0	4.0	-	-
PH-4	-	-	-	9.0	24.0	52.0	91.0	43.0	-
PH-5	-	-	-	-	-	-	5.0	57.0	100.0
Appearance of Facial Hair(FH)	-	-	5.0	31.0	85.0	94.0	100.0	100.0	100.0
FH-1	-	-	95.0	69.0	15.0	6.0	-	-	-
FH-2	-	-	5.0	31.0	85.0	93.0	87.0	14.0	-
FH-3	-	-	-	-	-	1.0	13.0	86.0	100.0
Appearance of Axillary Hair(AH)	-	-	-	15.0	44.0	67.0	100.0	100.0	100.0
AH-1	-	-	-	85.0	56.0	33.0	-	-	-
AH-2	-	-	-	15.0	44.0	66.0	97.0	48.0	1.0
AH-3	-	-	-	-	-	1.0	3.0	52.0	99.0

N= 100 for all characters

Pubic hair among the Bhil boys has made its first appearance as early as at the age of 11+ years with its lowest frequency. Only 1.0% of the boys at this age have developed pubic hair. The frequency reaches its maximum (100%) at the age of 17+ years. In other words, by this age all the boys are found to attain adult pubic hair (Table 1). A detailed examination of the development of pubic hair reveals that while only one boy is in PH-2 stage at 11+ years of age, 60.0% are in PH-2 stage and 5.0% are in PH-3 stage at 13+ years age. Among the boys of 11+ to 13+ years nobody is found in PH-4 and PH-5 stage. While, 34.0% are in PH-3 stage and 9.0% are in PH-4 stage at 14+ years age, 48.0% and 52.0%; 4.0% and 91.0% respectively are found in these stages at both 16+ and 17+ years of age; where as, last 3 age groups i.e., 17+, 18+ and 19+ show attainment of PH-5 stage indicating the gradual development of pubic hair with increase of age.

Facial hair among the Bhil boys has made its first appearance later at the age of 13+ years with

years of age (Table 1). A close observation of the development of facial hair reveals that while only 5 boys are in FH-2 stage at 13+ years of age, 1.0% is in FH-3 stage of facial hair development at 16+ years age. Among the boys of 11+ to 12+ years none are found to have any development of facial hair. Further, while age-groups from 13+ to 15+ years, none are found in FH-3 stage but are distributed in FH-1 and FH-2 stages. Age-groups from 17+ to 19+ years all have attained the FH-3 stage indicating the gradual development of facial hair.

Similar is the case with the appearance and development of axillary hair (Table 1). The incidence of the development of axillary hair increases with the increase of age. At 14+ years of age while only 15.0% of the boys are found with axillary hair, 48.0% of the boys of 18+ years have developed this trait. At 19+ years of age all the boys are found to have developed axillary hair.

Table 2 presents the average stages of primary and secondary sexual characters by age.

There seems to have a definite timing and sequence of initiation of each stage of all characters. Accordingly, all the stages of genitalia commences before the respective developmental stage of pubic hair. Like the same, timing and sequence is seen in case of facial and axillary hair, where facial hair advances to axillary hair. However, the initiation of these two characters begins at a later stage of adolescence, possibly after the spurt age completes. One notable feature of this table is, though the initiation of any of the four characters develops at a particular age, but the maturation completes by 19+ years among Bhil boys. The actual duration of each stage of specific character is shown in table 3.

Table 2: The average attainment stage of primary and secondary sexual characters by age

Age in years	Pubertal characters			
	Genitalia	Pubic hair	Facial hair	Axillary hair
11+	1.12	1.01	1.00	1.00
12+	1.86	1.29	1.00	1.00
13+	2.57	1.70	1.05	1.00
14+	3.24	2.46	1.31	1.15
15+	3.37	3.20	1.85	1.44
16+	3.84	3.52	1.95	1.68
17+	4.35	4.01	2.13	2.03
18+	4.99	4.57	2.86	2.52
19+	5.00	5.00	3.00	3.00

Table 3 shows the details of attainment of developmental stages of primary and secondary sexual characters and the average period covered in completing each stage respectively. The table highlights that an average Bhil boy takes about six years to reach the adult stage, of genitalia maturation, after the first descending of testicles and slight enlargement of penis. Considering the duration of each stage, from initiation to middle stage (i.e., from stage 2 to 3) the mean duration is shorter, while, the rest of stages (i.e., from stage 4 to 5) the duration is longer. The same trend is seen in case of pattern of pubic hair development. Here also the average Bhil boy takes about 5.4 years to reach the adult pattern of pubic hair distribution, after the first appearance of pubic hair. In case of pattern of facial and axillary hair development, it is interesting to note that the initiation of development takes place at a later stage than that of genitalia and pubic hair and completes their maturational time along with them.

Table 3: The mean duration of the various stages of primary and secondary sexual characters

Stages of pubertal characters	Attainment of mean age	S.D.	Period covered	Mean duration in years
Genitalia Maturation				
2	12.8	0.77	From stage 2 to 3	1.4
3	14.2	0.96	From stage 3 to 4	1.9
4	16.1	1.03	From stage 4 to 5	2.6
5	18.7	0.75	From stage 2 to 5	5.9
Pattern of Pubic Hair				
2	13.7	0.83	From stage 2 to 3	1.9
3	15.5	0.84	From stage 3 to 4	1.5
4	17.1	1.06	From stage 4 to 5	2.0
5	19.1	1.60	From stage 2 to 5	5.4
Pattern of Facial Hair				
2	16.3	1.11	From stage 2 to 3	2.6
3	18.9	0.68		
Pattern of Axillary Hair				
2	16.9	1.16	From stage 2 to 3	2.1
3	19.0	0.61		

An attempt is made in the present analysis to see the effect of pubertal development on important growth characters during adolescence. This can be better understood only when the boys of each age are divided in to two groups namely, advanced and backward, on the criteria of their pubertal development and especially genitalia and pubic hair as shown in the table 4. The criteria is chosen in such a way that the two groups form as near 50 per cent of the samples and they show the most marked distinction in pubertal development.

Table 5 presents the differentials in various growth characteristics, like, height vertex, weight, biacromial breadth and hip width. The results of the table clearly indicates that the boys more advanced in pubertal development appear to have attained significantly higher value in each growth character than the backward boys. This demonstrates that the hormonal influence over pubertal characters also influences bodily characters in rapid growth at adolescence. This associational growth study is important for better understanding of human growth processes.

Mean age of adult appearance of pubertal characteristics reveals that genital development is the first sign of pubertal characteristics to appear and attain maturity among the Bhil boys at the mean age of 15.45 years followed by the development of pubic hair at 16.33 years and

Table 4: Distribution of sample size, stages of pubertal development (Genitalis and Pubic hair) of two groups of boys (Advanced and Backward) in each year of age

Age (Years)	Sample size	Stages of pubertal development (Advanced)		Sample size	Stages of pubertal development (Backward)	
		Genitalis	Pubic hair		Genitalis	Pubic hair
11+	12	2	1	88	1	1
12+	30	2&3	1&2	70	1	1
13+	55	3	2	45	1&2	1
14+	31	4	3	69	2&3	1&2
15+	73	4	3&4	27	2&3	2
16+	52	4	4	48	3&4	3
17+	35	5	4 & 5	65	4	3&4
18+	57	5	5	43	4&5	4

Table 5: Mean difference of growth characteristics of two groups of boys (Advanced and Backward) differ in pubertal development in each year of age

Age in years	Pubertal development	Growth characteristics											
		Height vertex (cm)			Weight (kg)			Biacromial breadth(cm)			Hip width (cm)		
		M	S.D.	t	M	S.D.	t	M	S.D.	t	M	S.D.	t
11+	Advanced	133.7	1.6	7.9	24.9	1.1	2.7	28.2	0.4	4.5	22.0	0.2	5.8
	Backward	131.0	2.9		24.2	1.9		27.8	0.9		21.2	1.3	
12+	Advanced	136.4	2.4	6.5	26.1	1.2	4.2	28.8	0.7	5.2	22.7	0.9	7.0
	Backward	134.1	2.7		25.2	1.6		28.2	0.8		21.8	1.0	
13+	Advanced	141.2	3.7	7.3	28.5	2.7	4.0	29.8	1.3	3.5	23.5	1.0	5.0
	Backward	138.1	2.1		27.1	2.1		29.2	1.1		22.7	1.3	
14+	Advanced	149.1	2.5	10.3	34.5	3.6	7.8	31.4	1.4	5.1	25.6	0.9	9.4
	Backward	145.7	2.2		31.1	2.6		30.5	1.2		24.3	1.1	
15+	Advanced	155.5	3.6	0.4	39.2	4.5	2.2	33.3	2.1	2.1	27.1	1.0	3.2
	Backward	155.2	4.2		38.1	2.5		32.7	1.6		26.4	1.4	
16+	Advanced	159.9	2.9	1.8	42.4	4.1	2.3	33.7	2.9	1.3	27.8	1.4	3.8
	Backward	159.1	3.0		41.4	3.7		33.3	1.6		27.1	1.2	
17+	Advanced	163.9	3.3	4.2	46.1	3.6	4.6	35.2	1.9	2.5	28.3	1.1	2.6
	Backward	161.6	4.1		44.1	2.6		34.6	1.9		27.9	1.2	
18+	Advanced	164.9	5.4	4.5	47.4	3.3	3.4	35.6	1.9	2.2	28.5	1.1	2.0
	Backward	161.7	4.7		46.1	2.5		35.0	1.8		28.2	1.1	

facial hair at 17.60 years (Table 6). Development of the axillary hair is the last among the four signs studied, which has attained maturity at mean age of 17.95 years.

It has not been possible to compare the present data on pubertal development stages of primary and secondary sexual characters with available Indian data (Table 7) as the methods employed by them differ considerably. Some authors although considering Tanner's scoring rates yet for comparison purpose they have given

Table 6: Mean age of the adult appearance of different puberty signs in Bhil boys

Puberty signs	Mean age
Genitalia (G)	15.45
Pubic hair (PH)	16.33
Facial hair (FH)	17.60
Axillary hair (AH)	17.95

importance to mean or median age of adult attainment of puberty signs. Accordingly, the Bhil

Table 7: Comparison of age of various puberty signs among different samples of Indian boys

Sample locale	Puberty signs				Source
	Geni- talia	Pubic hair	Facial hair	Axillary hair	
Rajasthan Bhil boys	15.45	16.33	17.60	17.95	Present study
Jabalpur urban boys	9.83	10.96	-	13.41	Kaul et al., 1980
Gaddi boys (Himalayan region)	-	13.45	-	15.33	Singh, 1980
Orissa urban boys	-	14.60	-	14.59	ICMR, 1981
India urban (pooled) boys	-	13.82	-	14.25	ICMR, 1984
Koraput tribal boys	13.40	13.44	-	15.77	Choudhary et al., 1994

boys appear to lag behind all others, namely, Jabalpur urban boys, Gaddi boys, Orissa urban boys, Indian urban and rural boys and Koraput tribal boys. However, there appears to be some methodological problem in making comparison in this way.

It is, however, felt necessary to compare the data taking the stages of development into consideration. Such comparison is possible only with the data available with Fels Research Institute American boys (Reynolds and Wines, 1951) as provided in the table 8. The Bhil boys appear to lag behind by about a year in genitalia maturation and about 1.5 years for the adult pattern of pubic hair distribution over Fels Research Institute American boys. The adolescent Bhil boys start their genital development and also complete maturation at a later period. This comparison seems appropriate than making a comparison on overall attainment of adult puberty signs as given in table 7.

Table 8: Comparison of adult puberty signs of Bhil boys with American boys

Pubertal character	Stage	Approximate age in years	
		Bhils	Americans
Genitalia maturation	2	12.8	11.5
	3	14.2	12.5
	4	16.1	13.5
	5	18.7	17.5
Pattern of pubic hair	2	13.7	12.0
	3	15.5	13.5
	4	17.1	14.0
	5	19.0	16.0

From the above analysis it can be concluded that considerable variation exists with respect to region and population. The comparative analysis also reveals that the methods followed in assessing the various developmental stages are varied and suggests for uniform method of evaluation. Otherwise erroneous results would creep in. Therefore, it is stressed that any comparison of pubertal characters should match with

Tanner's (1962, 1978) pubertal ratings.

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