Human Biology Review
www.humanbiologyjournal.com

Human Biology Review (ISSN 2277 4424) 11(2) 2022
Original scientific paper (Gharami et al., 79-86)
Revised and Accepted on April 1, 2022

Growth of stature and Body weight during Childhood: A Study among the Ladiya of Madhya Pradesh

A. K. Gharami[1], N. Bharali[2], A. Mishra[3] and D. K. Adak[4]

Citation: Gharami AK, BharaliN, Mishra A and Adak DK. 2022. Growth of stature and Body weight during Childhood: A Study among the Ladiya of Madhya Pradesh. Human Biology Review, 11 (2), 79-86.

[1]Ajay Kr. Gharami: Development and Research Services Pvt. Ltd., New Delhi 110029.
E-mail: agharami@gmail.com
[2]Nitamoni Bharali: Anthropological Survey of India, 27 Jawaharlal Nehru Road, Kolkata 700016.
E-mail: nmbharali@gmail.com
[3]Anandmurti Mishra: SoS in Anthropology and Tribal Studies, Bastar University, Jagdalpur, Chhattisgarh
E-mail: amishra96@yahoo.com
[4]D.K. Adak: Anthropological Survey of India, 27 Jawaharlal Nehru Road, Kolkata 700016.
E-mail: adakdipak@gmail.com

Corresponding Author: Dr. Nitamoni Bharali, Anthropological Survey of India, 27 Jawaharlal Nehru Road, Kolkata 700016.
E-mail: nmbharali@gmail.com

ABSTRACT

Background:*Measurement of stature and weight are considered to be the simplest by which progress and group abnormalities of the child can be evaluated. And Body Mass Index (BMI= weight/height^2, kg/m^2) considered to be the standard procedures to access the nutritional status of any particular population.****Aims and objective:*** *To examine the growth pattern and Nutritional status of the Ladiya community's children as a depressed class of Madhya Pradesh.* ***Materials and Methods:*** *Altogether 711 Ladiya School children (353 boys and 358 girls) of Pathariya Jat and surrounding villages of Sagar district, Madha Pradesh were measures by stature and weight. BMI for age was calculated to find out the level of nutrition.* ***Results:*** *The children were found to be taller and heavier as well as Shorted and lighter in the some ages then that of the National average Nutritional Status was found to be very poor interestingly, no overweight boy and girl found in any age category.* ***Conclusion****: Poor dietary pattern of the studied population found to be the probable reason behind poor status of nutrition. Urgent intervention program is needed to improve the nutritional level among the children.*

Key words: Physical growth. Body height and Weight. 5-16 years. Nutrition. Offshoot Ladiya. Central India. Body Mass Index.

INTRODUCTION

Growth is predetermined by hereditary components but could be influenced by several exogenous agencies. Similarly, development of certain organs may have hereditary bases but manifestation may be influenced by external factors (Das 2008). Studies on growth and physical development of infants and

children are important as they provide determinants of a nation's health. Appraisal of the progress of a country in the field of health can be made from time to time with the help of such studies. Measurements of height and weight are still the simplest and one of the reliable means by which the progress of a normal child is evaluated and gross abnormalities detected even when no other clinical sign of illness is manifested (ICMR 1989).

The growth of children in a population reflects their nutritional status and indirectly determines their living standard in general. Growth is also influenced by dietary pattern, expenditure behind food and general health condition of an individual. Slowing or cessation of growth is one of the first observable responses to nutritional inadequacy. A well-designed growth study may provide a powerful tool to identify the health and nutritional status of any population or community (Tiwari et al. 2007).

Growth studies among the children have always occupied a very prominent position in the scientific research curriculum and have always received serious attention of the researchers engaged in the field of both medical science and physical anthropology all over the world (Sharma 1970).

Central India has had a strong tradition of growth study among the children. One can find out a good number of such studies here in the recent pasts (Patni et al. 2001; Gautam. 2007; Tiwari et al. 2007; Wankhede et al. 2015; Thakur and Gautam 2017 and many others).Patni et al. (2001) examined physical growth progression among Kayasth girls of Sager division, Madhya Pradesh. Anthropometric measurements shown the trend of a gradual increase with advancing age. Physical growth and nutritional status were conducted by Tiwari et al.(2007) among the primitive tribe, namely the Bharia of Central India. All Anthropocentric measurements except skinfold exhibit uniform increase with age in both sexes. Age-specific Body Mass Index (BMI) indicates substantial changes and falls during pre-school age and rise in adolescence. Gautam (2007) studied physical growth and body composition among the female population of central India, namely the Baiga and Brahmins. Again, the relationship between weight, height, head and chest circumference in children between 3 to 5 years age was examined in the Malwa region of Madhya Pradesh by Wankhede et al. (2015). According to this study, at birth the circumference of head was larger than the circumference of chest in both the sexes. The head and chest circumference equalize at the age of 3 years. After the age of 3 years, the chest circumference exceeds the head circumference. Thakur and Gautam (2017) studied the difference in growth pattern of different body dimensions among boys and girls during the pre-school and post-pubertal span of life among central Indian populations. The study depicts no sexual dimorphism in growth patterns of boys and girls up to puberty. After puberty, the boys exceed the girls and sexual dimorphism is apparent.

In this study, an attempt was made to examine the growth pattern of stature and body weight of during childhood and adolescence (5-16 years of age) among the Ladiya of Sagar District, Madhya Pradesh.

MATERIAL AND METHODS

For the sake of present study the Ladiya residing in Pathariya Jat and surrounding villages of Sagar district, Madhya Pradesh was considered. Material was collected from educational institution of Pathariya Jat village. Here only stature and body weight of the school boys and girls (5 to 16 years of age) were measured. Altogether 711 children (353 boys and 358 girls) were measured. Age of the boys and girls were determined from school records. Subjects who looked apparently healthy and active were

included in the study. Efforts were made to exclude those with physical deformities. Standing height was measured to the nearest cm using anthropometric rod. Weight was measured with a physician's beam balance scale to the nearest 0.5 kg. To assess child nutrition percentile values of BMI for age were calculated. In this connection CDC growth chart developed by the National Centre for Health Statistics, USA (2000) was followed.

The Ladiya are landless people with dependence on labour in urban areas. Their men are mainly engaged as daily labourer (30.21%), bidi worker (26.56%) and masonry (25%), whereas most of the women are engaged in bidi making occupation (75.53%). However, a good number of them are also housewives (Adak and Bharati 2011).

REESULTS AND DISCUSSION

Mean values of stature increased steadily from 5 to 16 years among the Ladiya boys (Table 1a). Highest increment in stature is found between 8-9 years (6.36 cm) and next highest is in between 10-11 years (5.76 cm) and then in 9-10 years (5.26 cm). Total increment between 5 and 16 years is 38.74 cm. There are five growth spurts between the ages of 7 and 8 years, 8 and 9 years, 9 and 10 years, 10 and 11 years and 12 and 13 years among the Ladiya boys. The highest of this is observed between 8 and 9 years. Per cent growth per annum is highest in 9 years (5.38 cm) and lowest is in 16 years (0.59 cm).

Table 1a: Age-wise stature (cm): boys

Age (in years)	No.	Mean±SE	S.D±SE	Difference between mean	Per cent growth per annum
5	30	108.76±1.01	5.54±0.71	0.74	0.68
6	29	109.5±1.03	5.69±0.74	3.68	3.36
7	30	113.18±1.07	5.88±0.76	4.82	4.25
8	29	118.00±0.76	4.09±0.53	6.36	5.38
9	26	124.36±0.96	4.94±0.68	5.26	4.22
10	26	129.62±0.77	3.94±0.54	5.76	4.44
11	29	135.38±0.84	4.53±0.58	1.05	0.77
12	32	136.43±0.65	3.71±0.46	4.77	3.49
13	32	141.20±1.45	5.19±0.64	4.27	3.02
14	28	145.47±1.38	7.31±0.97	1.16	0.79
15	32	146.63±1.29	7.34±0.91	0.87	0.59
16	30	147.50±1.34	7.26±0.93	-	-

Like boys in the girls also means of stature increased as age increases (Table 1b). Highest increment is noticed between 7-8 years (8.27 cm) and next highest is in between 12 and 13 years (7.07 cm) and then in 8-9 years (6.10 cm). Total increment between 5 and 16 years is 39.86 cm among the Ladiya girls. There are five growth spurts between the ages of 7 and 8 years, 8 and 9 years, 10 and 11 years, 11 and 12 years and 12 and 13 years. The highest is observed between the ages 7 and 8 years. Per cent growth per annum is highest in 8 years (7.59 cm) and lowest is in 15 years 0.08 cm).

Table 1b: Age-wise Stature (cm): girls

Age (in years)	No.	Mean±SE	S.D±SE	Difference between mean	Per cent growth per annum
5	30	103.77±0.74	4.08±052	1.83	1.76
6	30	105.60±0.85	4.70±0.60	3.25	3.07
7	30	108.85±0.97	5.32±0.68	8.27	7.59
8	30	117.12±0.57	3.15±0.40	6.1	5.20
9	30	123.22±0.60	3.33±0.46	1.78	1.44
10	30	125.00±0.81	4.48±0.57	5.56	4.44
11	30	130.56±0.97	5.35±0.69	5.18	3.96
12	30	135.74±0.49	2.71±0.35	7.07	5.20
13	28	142.81±0.90	4.81±0.64	-0.47	-0.32
14	30	142.34±0.86	4.73±0.61	0.12	0.08
15	30	142.46±0.85	4.70±0.60	1.17	0.82
16	30	143.63±0.81	4.43±0.57	-	-

Growth of body weight of Ladiya boys and girls is presented in Tables 2a, 2b and respectively. Like stature mean values of weight increased steadily from 5 to 16 years among the Ladiya boys (Table 2a). Highest increment in weight is noticed between 12 and 13 years, and next highest is noticed between 9 and 10 years and then is in between 8 and 9 years. Total increment between 5 and 16 years is 19.54 kg. There are three growth spurts among the boys. These are between the ages of 99 and 10 years, 11 and 12 years and 12 and 13 years. Highest of the same is noticed between 12 and 13 years. Per cent growth per annum is found to be highest in 13 years (20.57 kg) and lowest is in 15 years (0.73 kg).

Table 2a: Age-wise Weight (kg): boys

Age (in years)	No.	Mean±SE	S.D±SE	Difference between mean	Per cent growth per annum
5	30	15.96±0.32	1.79±0.23	0.41	2.56
6	29	16.37±0.38	2.09±0.27	0.59	3.60
7	30	16.96±0.37	2.03±0.26	1.52	8.96
8	29	18.48±0.40	2.16±0.28	2.75	14.88
9	26	21.23±0.39	2.00±0.27	3.15	14.83
10	26	24.38±0.28	1.44±0.20	-0.01	-0.04
11	29	24.37±0.57	3.11±0.40	2.94	12.06
12	32	27.31±0.41	2.37±0.29	5.62	20.57
13	32	32.93±0.58	3.13±0.39	1.28	3.88
14	28	34.21±0.73	3.89±0.51	0.25	0.73
15	32	34.46±0.78	4.42±0.55	1.04	3.01
16	30	35.50±0.81	4.44±0.57	-	-

Among the Ladiya girls highest increment in weight is noticed between 11 and 12 years, and next highest is in between 11 and 12 years and then is in between 13 and 14 years (Table 2b). Total increment between 5 and 16 years is 19 kg. There are three growth spurts among the girls. These are between 11 and 12 years, 12 and 13 years and 13 and 14 years, Highest of this is noticed between 12 and 13 years. Per cent growth per annum is found to be highest is 13 years (18.24 kg) and lowest is in 6 years (1.35 kg).

Table 2b: Age-wise Weight (kg): girls

Age (in years)	No.	Mean±SE	S.D±SE	Difference between mean	Per cent growth per annum
5	30	14.73±0.02	1.14±0.14	0.20	1.35
6	30	14.93±0.27	1.48±0.19	0.57	3.81
7	30	15.50±0.28	1.57±0.20	1.36	8.77
8	30	16.86±0.24	1.33±0.17	2.77	16.42
9	30	19.63±0.31	1.73±0.24	2.17	11.05
10	30	21.8±0.34	1.90±0.24	1.3	5.96
11	30	23.1±0.41	2.29±0.29	3.26	14.11
12	30	26.36±0.48	2.65±0.34	4.81	18.24
13	28	31.17±0.28	1.49±0.19	3.09	9.91
14	30	34.26±0.32	1.79±0.23	-2.46	-7.18
15	30	31.8±0.62	3.41±0.44	1.93	6.06
16	30	33.73±0.48	2.63±0.34	-	-

Comparison of stature and weight of the present study with that of Indian rural boys and girls (ICMR 1989):

Stature

It is seen from Table 3a that Ladiya boys are taller than the Indian rural boys in 5, 6, 9, 10 and 11 years. The difference is found to be small in 7 and 8 years, However, Indian rural boys are taller in higher age groups from 12 to 16 years than that of the Ladiya boys. The Ladiya girls are taller than that of the Indian rural girls in 5, 9 and 13 years of age. The difference is small in 8 and 11 years in this respect. Indian rural girls are taller in 10, 12, 14, 15 and 16 years.It may be due to the fact that in some particular ages the Ladiya boys and girls are not growing at the normal rate of their age. Poor living condition and dietary pattern of the studied population may be the underlying cause behind this condition.

Table 3a: Comparison of stature of the Ladiya with Indian rural boys and girls (ICMR 1989)

Age (in years)	Ladiya boys		Indian rural boys		Ladiya girls		Indian rural girls	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
5	108.76	5.54	101.1	6.25	103.77	4.08	99.5	7.18
6	109.50	5.69	107.4	6.37	105.60	4.70	106.3	7.92
7	113.18	5.88	113.2	8.10	108.85	5.32	111.9	7.25
8	118.00	4.09	118.6	7.31	117.12	3.15	117.2	7.40
9	124.36	4.94	123.0	8.64	123.22	3.33	122.2	6.51
10	129.62	3.94	128.1	8.04	125.00	4.48	126.7	7.01
11	135.38	4.53	132.4	8.31	130.56	5.35	131.2	7.25
12	136.43	3.71	137.4	7.96	135.74	2.71	136.7	8.16
13	141.20	20.26	143.5	9.06	142.81	4.81	141.5	7.26
14	145.47	7.31	148.3	9.08	142.34	4.73	145.3	7.22
15	146.63	7.34	153.1	9.06	142.46	4.70	147.7	6.87
16	147.50	7.26	157.5	8.76	143.63	4.43	149.6	5.99

Weight

Table 3b depicts that Ladiya boys are heavier that the Indian rural boys in 5, 6, 10, 13 and 14 years. The difference is small in 9 and 12 years in this respect. Indian rural boys in turn are heavier than the Ladiya boys in 7, 8, 11, 15 and 16 years. The Ladiya girls are heavier than that of the Indian rural girls in 5, 13 and 14 years. The Indian rural girls are heavier than that of the Ladiya girls in 7, 8, 9, 11, 12, 15 and 16 years. The difference is found to be small in 6 and 10 years in this respect.

Table 3b: Comparison of weight of the Ladiya with Indian rural boys and girls (ICMR 1989)

Age (in years)	Ladiya boys		Indian rural boys		Ladiya girls		Indian rural girls	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
5	15.96	1.79	14.4	2.09	14.73	1.14	13.9	2.32
6	16.37	2.09	15.9	2.81	14.93	1.48	15.4	2.48
7	16.96	2.03	17.6	3.09	15.50	1.57	17.2	2.92
8	18.48	2.16	19.3	3.60	16.86	1.33	18.8	3.17
9	21.23	2.00	21.1	3.80	19.63	1.73	20.8	3.44
10	24.38	1.44	23.1	3.96	21.8	1.90	22.5	4.28
11	24.37	3.11	25.1	4.66	23.1	2.29	24.5	4.62
12	27.31	2.37	27.8	6.42	26.36	2.65	27.3	5.70
13	32.93	3.13	31.0	6.11	31.17	1.49	30.6	6.58
14	34.21	3.89	33.7	7.36	34.26	1.79	33.5	5.69
15	34.46	4.42	37.1	7.66	31.8	3.41	35.4	6.78
16	35.50	4.44	41.2	7.34	33.73	2.63	37.9	5.81

Child nutrition:

To assess child nutrition percentile values of BMI for age was calculated. In this connection CDC growth chart as developed by the National Centre for Health Statistics, USA was followed. BMI for age according to percentile values were furnished in Table 4a and Table 4b for Ladiya boys and girls respectively. Among the boys percentage frequency of underweight is considerably high in 5, 7, 8, 9, 11 and 16 years, which ranges between 70 and 82.75 per cent. Thus majority of the boys fall in the category of underweight. However, frequency of healthy weight is considerably high in 6, 10, 13 and 14 years. This is interesting to note that in the category of overweight no boy is recorded.

Among the girls frequency of underweight is considerably high in 8, 9, 11, 12 and 15 years. This is interesting to note that in 8 years of age 96.66 per cent of the girls fall in the category of underweight. Like the boys majority of the girls fall in category of underweight. However, frequency of healthy weight is considerably higher in 5, 6, 13, 14 and 16 years. However, no overweight girl is recorded in the present study (Table 4b).

Table 4a: BMI for age (5-16 years): Boys

Age in years	No.	PERCENTILE VALUE		
		$<5^{th}$ (Underweight) (%)	5^{th}-85^{th} (Healthy weight) (%)	85^{th}-95^{th} (Overweight)
5	30	21 (70.00)	9 (30.00)	0
6	29	15 (51.72)	14 (48.27)	0
7	30	22 (73.33)	8 (26.66)	0
8	29	24 (82.75)	5 (17.24)	0
9	26	19 (73.07)	7 (26.92)	0
10	26	9 (34.61)	17 (65.38)	0
11	29	21 (72.41)	8 (27.58)	0
12	32	21 (65.62)	11 (34.37)	0
13	32	13 (40.62)	19 (59.37)	0
14	28	16 (57.14)	12 (42.85)	0
15	32	21 (65.62)	11 (34.37)	0
16	30	21 (70.00)	9 (30.00)	0

Table 4b: BMI for age (5-16 years): Girls

Age in years	No.	PERCENTILE VALUE		
		$<5^{th}$ (Underweight) (%)	5^{th} -85^{th} (Healthy weight) (%)	85^{th} -95^{th} (Overweight)
5	30	14 (46.66)	16 (53.33)	0
6	30	18 (60.00)	12 (40.00)	0
7	30	20 (66.66)	10 (33.33)	0
8	30	29 (96.66)	1 (3.33)	0
9	30	25 (83.33)	5 (16.66)	0
10	30	19 (63.33)	11 (36.66)	0
11	30	22 (73.33)	8 (26.66)	0
12	30	22 (73.33)	8 (26.66)	0
13	28	9 (32.14)	19 (67.85)	0
14	30	6 (20.00)	24 (80.00)	0
15	30	24 (80.00)	6 (20.00)	0
16	30	19 (63.33)	11(36.66)	0

It can be stated that though the stature and weight are more in some ages in the present studied population than that of the national standard (ICMR 1989) child nutrition (according to BMI for age) in

this population is very poor. No overweight boy and girl are observed in the present study. Majority of the boys and girls, fall in the category of underweight. In this respect it can be mentioned herewith that living condition of the studied population is deplorable, characterized with marked poverty, lack of sewage and housing which consisted mostly of one or two living rooms per household. A high percent of the womenfolk among them are not literate. It goes without saying that their dietary pattern is very poor than recommended diet. These may be the possible reasons behind their poor status of nutrition.

REFERENCES

Adak DK, Bharati P. 2011. Position of women in the Ladiya Society: Demographic Perspectives. *Coll. Anthropol*., 35:319-24.

Das BM. 2008. *Outline of Physical Anthropology*. Kitab Mahal, Allahabad.

Gautam RK.2007. Physical Growth and Body Composition among two female populations of Central India—Baiga (Primitive Tribe) and Brahmin. *Contemporary Studies in Anthropometry*.(E.d)Sarup and Sons,New Delhi, 139-47.

ICMR. 1989. Growth and Physical Development of Indian Infants and Children. *Indian Council of Medical Research*, New Delhi.

NCCD, 2000. *National Centre for Chronic Disease Prevention and Health Promotion*, *NCCD.* USA. 2000.

Patni S,Choube R, Yadav A. 2001. Physical growth progression among the Kayasth girls of Sagar Division, Madhaya Pradesh: A study. *Man in India*, 81:385-389.

Sharma JC. 1970. *Physical growth and development of the Maharashtrians*. Ethnographic and Folk Culture Society, Lucknow.

Thakur R, Gautam RK. 2017. Pre and post pubertal growth difference among boys and girls of 5-18 years of age: a cross sectional study among central Indian Population. *Human Bio Rev*,6:164-187.

Tiwari MK, Sharma KKN, Bharati S, Adak DK, Ghoosh R and Bharati P. 2007. Growth and nutritional Status of the Bharia – A Primitive Tribe of Madhya Pradesh. *Coll. Anthropol*, 31: 95-101.

Wankhede, S.K., Bhandari, M. and Jain, R. 2015. A study of relationship between weight, height, head & chest circumference in children between 3 to 5 years in the Malwa region of Madhya Pradesh', *J Evol Med Dental Sci*, 4: 5658-5668.