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ABSTRACT:

Physical growth in children is a fundamental aspect of development, characterized by significant changes in height, weight, body composition, and overall physical capabilities. This study investigates the physical growth patterns of the Lodha children under five years of age in rural Paschim Medinipur, West Bengal, India. Using data from 192 children across eight villages, age-sex differences in height, weight, MUAC, and head circumference were analyzed using Student's t-test and one-way ANOVA. Results indicate better growth patterns for boys than girls in most age groups regarding growth indicators like height, weight, head circumference, and chest circumference. Sex difference between Lodha boys and girls were statistically significant in most age groups; in mean height, the sex difference is statistically significant in 2+ (t=2.377; p≤0.05) and 4+ (t=2.778; p≤0.05) years age group and in mean weight, in 2+ (t=2.437; p≤0.05), 3+ (t=2.118; p≤0.05), 4+ (t=3.138; p≤0.05) years age group. Compared to international standards, the overall growth of the Lodha boys and girls is very concerning as only a few children (percentile chart) exhibited satisfactory growth, which is concerning. The differences in growth indicators like height and weight between present study participants and international growth standard are significant in all age-sex groups, where the present study participants show significantly lower growth values. The findings highlight the need for targeted nutritional and care interventions to improve growth outcomes.

KEYWORDS: *Anthropometry, Growth Trend, Sex Difference, Tribal, Under Five Children*

INTRODUCTION:

Physical growth in children is a fundamental aspect of development, characterized by significant changes in height, weight, body composition, and overall physical capabilities. This growth is a complex interplay of genetic, nutritional, environmental, and social factors, collectively shaping a child's physical development trajectory (Balasundaram & Avulakunta, 2024). Children's physical growth occurs in distinct stages, each marked by unique growth patterns and rates. Preschool and early school years see a more gradual growth rate, with

children, on average, gaining about 3 inches in height and about 4 pounds in weight annually (Levine, 2023).

Several factors influence physical growth in children. Genetics is one of the most significant determinants, as a child's height and body composition are often inherited from parents. However, genetic potential can only be fully realized if environmental factors, particularly nutrition and health, support it (Czerwinski et al., 2007). Nutrition plays a critical role in the growth process. A balanced diet rich in essential nutrients, including proteins, vitamins, and minerals, is vital for growth and development (De and De, 2019). According to Branca and Ferrari (2002), children who receive adequate nutrition exhibit healthier growth patterns, while those with nutritional deficiencies are at risk for stunted growth and developmental delays. Micronutrients like calcium and vitamin D are essential for bone health, while iron is crucial for cognitive development. Ensuring that children have access to a diverse and balanced diet is vital to supporting their physical growth.

Children living in impoverished conditions may face food insecurity, leading to nutritional deficiencies that hinder growth (Chilton et al., 2007). Social factors, including family dynamics and cultural practices, also influence children's growth. Family support, encouragement for physical activity, and positive reinforcement of healthy eating habits can significantly affect a child's development (Scaglioni et al., 2018). For example, a study by Utter et al. (2018) found that children who engage in family meals are more likely to consume a balanced diet, which is linked to healthier growth outcomes. Most cases of abnormal growth are caused by preventable factors such as nutritional deficiencies, parasitic infections, and psychosocial issues. However, in India, these factors contribute to improper growth and underdevelopment in millions of children, which is both undesirable and alarming (Roy & Roy, 2019). If developmental problems are widespread and children significantly lag in acquiring competencies, there is a compelling argument for implementing developmental surveillance in primary health care. This approach would be similar to the current monitoring of physical growth for millions of young children in India (Dabar et al., 2016).

UNICEF states that a baby's brain continues to develop rapidly after birth, profoundly influencing their physical, intellectual, and emotional well-being, learning potential, and future earning capacity. Alarmingly, more than 43 percent of children under the age of five are at risk of not achieving their full developmental potential. The WHO Child Growth Standards serve as a key diagnostic tool for evaluating growth and nutritional health of infants and young

children globally. Notably, around 45% of deaths in this age group are associated with undernutrition (WHO, 2024). Considering the importance of proper child growth and their vulnerability, the present study was conducted to understand following objectives.

Objectives:

The present study aims to investigate the growth patterns of the Lodha children (under five years of age) and examine the sex differences. Furthermore, the study also aims to compare the growth indicators of the present study children with international growth standards to better understand their growth conditions.

METHODOLOGY:

This study was carried out in the rural areas of Narayangarh Block-1, located in the Paschim Medinipur district of West Bengal, India. This district has the highest concentration of Lodha tribes in the state, with a total Lodha population of 40,517. Narayangarh Block has 12,099 Lodha individuals (District Human Development Report, 2011). One hundred ninety-two participants from eight villages within this block were selected for the study, focusing exclusively on children under five years. Fast-hand data were collected from every participant in the last half of 2024. This study focused on the Lodha children aged between 1 and 5 years, including boys and girls. Objectives of the study were clearly explained to the guardian of the children and consent were taken before data collection. Ethical clearance was taken prior to data collection from the Institutional Ethics Committee of Vidyasagar University (NO: VU/IHEC-5/4-24 Date: 06/09/2024) Children with physical disabilities and those whose measurements could not be obtained were not included in the study. Additionally, children whose family members or mothers did not consent to participate were also excluded from the research. Martin's anthropometer, analogue weighing machine, Holtain's skinfold calliper and steel tape were used to measure the height (ht), weight (wt), skin fold and Mid Upper Arm Circumference (MUAC), respectively. Anthropometric measurements were measured following standard procedure (Lohmann et al., 1988). Age is a key factor in children's growth studies, and this information was gathered from children's birth certificates or immunization cards. Data were entered and analyzed in the Statistical Package for Social Science (SPSS) Version 16. Age groups were determined according to the age of the last birthday and grouped as 1+,2+, 3+ and 4+. Student's t-test and one-way ANOVA were performed to assess the age-sex differences in mean height, weight, MUAC and head circumference. The percentile distribution of the study participants' height, weight, and head circumference was calculated

and compared with NCHS (1977) and WHO (2006) growth standards, which are presented in the growth chart. A p-value of less than or equal to 0.05 was considered statistically significant in this study.

RESULTS:

Table 1 details the mean, standard deviation (SD) and age-sex differences in mean values for Lodha boys' and girls' height/length, weight and BMI. Boys have statistically significantly higher mean height compared to girls in the 2+ (t=2.377; p≤0.05) and 4+ (t=2.778; p≤0.05) age groups. In terms of weight, boys have a higher mean value than girls. Notably, significant differences in weight between the sexes are observed in 2+ (t=2.437; p≤0.05), 3+ (t=2.118; p≤0.05) and 4+ (t=3.138; p≤0.05). Regarding BMI, the analysis showed no statistically significant differences between boys and girls. Overall, the data suggest that boys exhibit better growth patterns in height and weight. The mean height (F=90.337; p≤0.05) and weight (F=58.897; p≤0.05) of boys increased statistically significantly with the increase in age. The girls also show statistically significant increases in height (F=114.360; p≤0.05) and weight (F=54.563; p≤0.05) with increasing age.

Table 1: Mean difference in height/length, weight and BMI between Lodha boys and girls:

Differences in Mean Height / length (cm)							
Age (in years)	*Boys*			*Girls*			*t value*	*p-value*
	No.	*Mean*	*SD*	*N*	*Mean*	*SD*		
1+	20	73.45	3.97	23	73.74	4.33	-.234	.816
2+	24	82.90	4.85	23	79.92	3.70	2.377	.022
3+	27	89.33	7.20	24	89.10	5.51	.126	.900
4+	21	100.82	4.93	30	96.73	5.33	2.778	.008
ANOVA	F= 90.337; p=.000			F= 114.360; p= .000				
Differences in Mean Weight (kg)							
Age (in years)	*Boys*			*Girls*			*t value*	*p-value*
	N	*Mean*	*SD*	*N*	*Mean*	*SD*		
1+	20	8.25	1.30	23	7.85	1.33	1.00	.323
2+	24	9.88	1.52	23	8.85	1.37	2.437	.019
3+	27	11.85	1.57	24	11.02	1.22	2.118	.039
4+	21	14.12	1.62	30	12.60	1.81	3.138	.003
ANOVA	F= 58.897; p= .000			F= 54.563; p= .000				
Differences in Mean BMI (kg/m^2)							
Age (in years)	*Boys*			*Girls*			*t value*	*p-value*
	N	*Mean*	*SD*	*N*	*Mean*	*SD*		
1+	20	15.26	1.78	23	14.36	1.64	1.715	.094
2+	24	14.35	1.56	23	13.80	1.46	1.243	.220
3+	27	14.97	2.30	24	13.91	1.42	1.950	.057
4+	21	13.87	1.00	30	13.42	1.16	1.439	.157
ANOVA	F= 2.691; p= .051			F= 1.978; p= .122				

Table 2 presents the mean and standard deviation (SD) values for mid-upper arm circumference (MUAC), head circumference, and chest circumference between boys and girls. The mean MUAC values were similar for both sexes across all age groups. There was a statistically significant increase in MUAC, head circumference, and chest circumference with the increasing age of both sexes. The difference in mean head circumference is statistically significant in 3+ (t=3.549; p≤0.05) and 4+ (t=5.679; p≤0.05) age groups. In chest circumference, the mean difference between boys and girls is statistically significant in 2+ (t=3.3557; p≤0.05), 3+ (t=2.403; p≤0.05) and 4+ (t=3.551; p≤0.05). This table also indicates that physical growth conditions are better for boys than girls.

Table 2: Mean difference in MUAC, head circumference, and chest circumference between Lodha boys and girls

Differences in Mean MUAC (cm)							
Age group (years)	Boys			Girls			t value	p-value
	N	Mean	SD	N	Mean	SD		
1+	20	13.27	1.09	23	13.40	.87	-.450	.655
2+	24	13.85	1.07	23	13.63	1.05	.698	.489
3+	27	14.55	1.23	24	14.30	.89	.805	.425
4+	21	14.74	1.18	30	14.31	1.13	1.312	.195
ANOVA	F= 7.439; p= .000			F= 5.394; p= .002				
Differences in Mean Head circumference (cm)							
Age group (years)	Boys			Girls			t value	p-value
	N	Mean	SD	N	Mean	SD		
1+	20	44.60	1.53	23	43.94	1.47	1.441	.157
2+	24	46.12	2.78	23	44.88	1.527	1.875	.067
3+	27	47.70	1.33	24	46.15	1.76	3.549	.001
4+	21	48.78	1.21	30	46.72	1.31	5.679	.000
ANOVA	F= 20.795; p= .000			F= 17.461; p= .000				
Differences in Mean Chest circumference (cm)							
Age group (years)	Boys			Girls			t value	p-value
	N	Mean	SD	N	Mean	SD		
1+	20	44.21	1.83	23	43.67	2.08	.900	.374
2+	24	47.03	2.03	23	44.94	2.24	3.357	.002
3+	27	49.10	2.09	24	47.71	2.04	2.403	.020
4+	21	51.07	2.17	30	49.09	1.80	3.551	.001
ANOVA	F= 43.240; p= .000			F= 38.609; p= .000				

Table 3 presents age-sex group-wise mean and standard deviation (SD) of biceps and triceps measurements for boys and girls. Throughout the examined age ranges, differences in biceps measurements between boys and girls are not statistically significant, although girls tend to show slightly higher mean values in most age groups. In the triceps skinfold measurements, girls again show higher values in most age groups (1+, 2+, 4+), except in the 3+ age group.

Significant sex differences in mean triceps values can be observed only in the 4+ age group (t=-2.955; p≤0.05). Overall, girls demonstrate higher mean skinfold measurements than boys in most age groups, but the difference is not statistically significant.

Table 3: Mean difference in biceps and triceps skinfold between Lodha boys and girls

Differences in Mean Biceps Skinfold (mm)								
Age group (years)	*Boys*			*Girls*			*t value*	*p-value*
	N	*Mean*	*SD*	*N*	*Mean*	*SD*		
1+	20	4.66	.97	23	5.07	1.13	-1.282	.207
2+	23	5.26	1.30	23	5.01	1.14	.686	.496
3+	27	5.34	.85	24	5.61	1.50	-.781	.440
4+	21	4.60	1.22	30	5.13	1.15	-1.617	.112
ANOVA	F= 2.934; p= .038			F= 1.167; p= .327				
Differences in Mean Triceps Skinfold (mm)								
Age group (years)	*Boys*			*Girls*			*t value*	*p-value*
	N	*Mean*	*SD*	*N*	*Mean*	*SD*		
1+	20	7.96	1.87	23	8.06	1.89	-.175	.862
2+	23	8.27	2.07	23	8.88	1.71	-1.095	.279
3+	27	9.74	1.65	24	9.63	1.49	.243	.809
4+	21	7.86	1.62	30	9.11	1.39	-2.955	.005
ANOVA	F= 5.834; p= .001			F= 3.880; p= .011				

Table 4: Comparisons of the mean height/length of present study boys and girls with the World Health Organization (WHO 2006) reference data

Comparison of Mean height/length (cm) of boys								
Age group (years)	*WHO*			*Present Study*			*t value*	*p-value*
	N	*Mean*	*SD*	*N*	*Mean*	*SD*		
1+	444	82.26	2.70	20	73.45	3.97	-9.937	.000
2+	480	90.41	3.29	23	82.90	4.85	-7.591	.000
3+	525	98.63	3.88	27	89.33	7.20	-6.710	.000
4+	507	105.56	4.34	21	100.82	4.93	-4.406	.000
Comparison of Mean height/length (cm) of girls								
Age group (years)	*WHO*			*Present Study*			*t value*	*p-value*
	N	*Mean*	*SD*	*N*	*Mean*	*SD*		
1+	472	80.71	2.90	23	73.74	4.33	-7.708	.000
2+	470	89.10	3.43	23	79.92	3.70	-11.903	.000
3+	490	97.75	3.98	24	89.10	5.51	-7.691	.000
4+	469	105.05	4.46	30	96.73	5.33	-8.552	.000

Table 4 illustrates the differences in mean height/length between participants in the present study and the WHO (2006) reference values, providing a clearer perspective on the growth patterns of the study group relative to international standards. The mean height/length of the study participants, both boys and girls, is statistically significantly lower than the WHO (2006) standard in every group. Table 5 presents an age-sex group-wise comparison of the mean weight between participants in the present study and the WHO (2006) reference data. The mean

weight of the study participants in all age groups is significantly lower than the WHO (2006) growth reference. The observed differences in mean height and weight are concerning, and this disparity is statistically significant in all age groups for both sexes.

Table 5: Comparisons of the mean weight of present study boys and girls with the World Health Organization (WHO 2006) reference data

Comparison of Mean weight (cm) of boys							
Age group (years)	*WHO*			*Present Study*		*t value*	*p-value*
	N	*Mean*	*SD*	*N*	*Mean*	*SD*	
1⁺	442	10.94	1.0	20	8.25	1.30	-9.234	.000
2⁺	477	12.93	1.1	23	9.88	1.52	-9.848	.000
3⁺	512	15.01	1.4	27	11.85	1.57	-10.467	.000
4⁺	489	17.01	1.6	21	14.12	1.62	-8.181	.000
Comparison of Mean weight (cm) of girls							
Age group (years)	*WHO*			*Present Study*		*t value*	*p-value*
	N	*Mean*	*SD*	*N*	*Mean*	*SD*	
1⁺	469	10.23	0.9	23	7.85	1.33	-8.612	.000
2⁺	459	12.31	1.1	23	8.85	1.37	-12.131	.000
3⁺	480	14.60	1.2	24	11.02	1.23	-14.267	.000
4⁺	453	16.79	1.5	30	12.60	1.81	-12.666	.000

Table 6: Age group-wise percentile distribution of height/length of Lodha boys and girls and 50th percentile of NCHS 1977 & WHO 2006 growth standard

Percentile for Height/length of Boys (in cm)							
Age group (years)	*5th percentile*	*25th percentile*	*50th percentile*	*75th percentile*	*95th percentile*	*NCHS (1977) 50th percentile*	*WHO (2006) 50th percentile*
1⁺	69.00	70.05	71.75	76.75	82.06	82.3	82.3
2⁺	69.58	80.18	83.65	86.40	89.15	92.3	91.9
3⁺	72.00	85.00	90.70	94.40	99.62	100.5	99.0
4⁺	93.25	96.50	100.70	104.30	111.73	107.4	106.7
Percentile for Height/length of Girls (in cm)							
Age group (years)	*5th percentile*	*25th percentile*	*50th percentile*	*75th percentile*	*95th percentile*	*NCHS (1977) 50th percentile*	*WHO (2006) 50th percentile*
1⁺	66.08	70.20	73.10	76.50	83.90	80.8	80.7
2⁺	72.08	79.10	81.80	84.40	86.98	91.4	90.7
3⁺	75.58	86.70	90.10	94.10	97.35	99.1	99.0
4⁺	83.10	94.85	96.80	100.25	105.85	106.2	106.2

Tables 6, 7, and 8 represent the percentile distribution of height/length, weight and head circumference for boys and girls in the current study. To provide context for the growth status of the participants, the tables also include the 50th percentile values from the World Health Organization (WHO, 2006) and the National Center for Health Statistics (NCHS, 1977). Notably, in terms of height, the 50th percentile values from both WHO and NCHS closely align

with the 95th percentile height of the present study population. In most age groups, the median standard value is greater than the 95th percentile value of the present study population, which indicates that nearly 95% of the present study participants have lower growth than the average growth of the international standards. Similar trends are observed in the weight and head circumference percentiles. The girls' 95th percentile weight and head circumference fall below the 50th percentile of the growth references, indicating that many children are struggling to meet even average weight and head circumference growth standards.

Fig 1: Age group-wise percentile distribution of height/length of Lodha boys
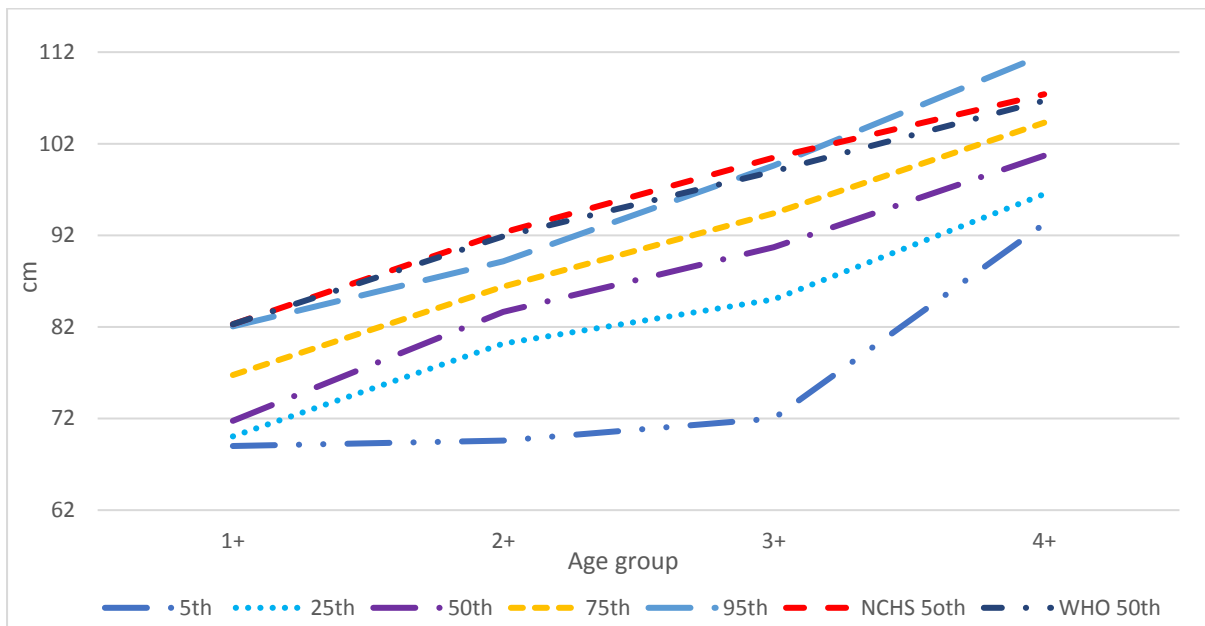
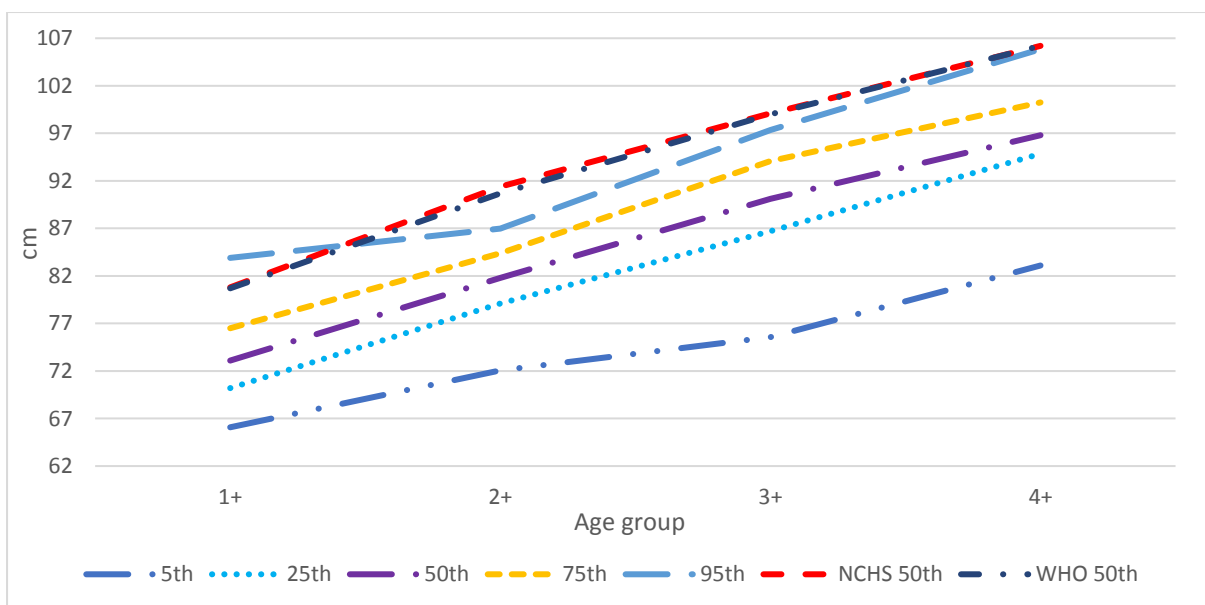**Fig 2: Age group-wise percentile distribution of height/length of Lodha girls**

Table 7: Age group-wise percentile distribution of weight of Lodha boys and girls and 50th percentile of NCHS 1977 & WHO 2006 growth standard

Percentile for Weight of Boys (in kg)						
Age group	*5th percentile*	*25th percentile*	*50th percentile*	*75th percentile*	*95th percentile*	*NCHS (1977) 50th percentile*	*WHO 50th percentile (2006)*
1+	6.53	7.00	8.00	9.00	10.95	11.45	10.9
2+	7.00	9.00	10.00	10.75	12.88	13.62	13.3
3+	9.00	11.00	12.00	13.00	14.00	15.57	15.3
4+	11.55	13.00	14.00	15.75	16.9	17.60	17.3
Percentile for Weight of Girls (in kg)						
Age group (years)	*5th percentile*	*25th percentile*	*50th percentile*	*75th percentile*	*95th percentile*	*NCHS (1977) 50th percentile*	*WHO 50th percentile (2006)*
1+	5.20	7.00	8.00	9.00	10.00	10.78	10.2
2+	7.00	8.00	9.00	10.00	11.70	12.93	12.7
3+	8.25	10.13	11.00	11.50	13.00	14.90	15.0
4+	9.55	11.75	12.00	14.00	16.00	16.81	17.2

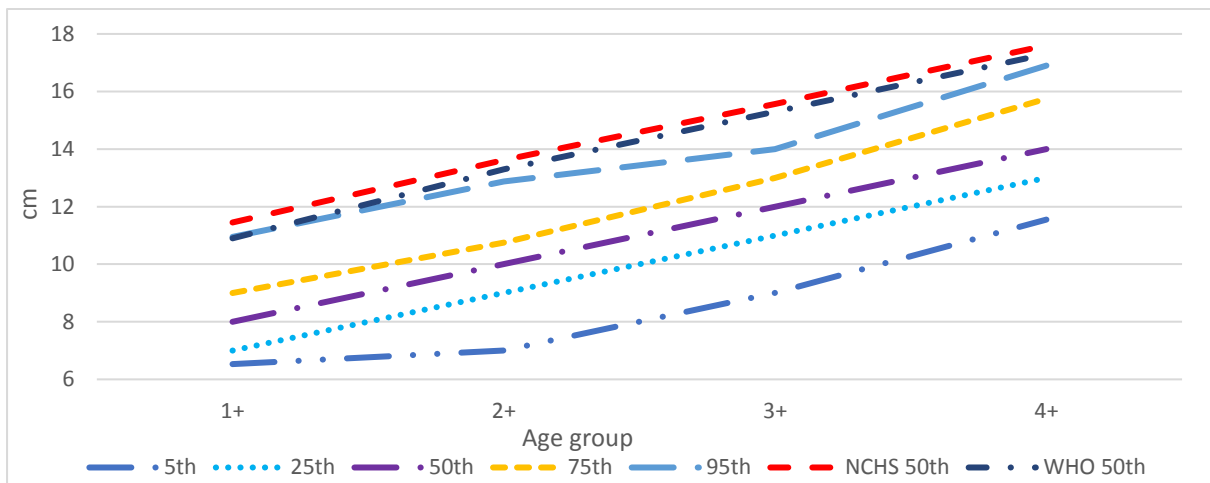**Fig 3: Age group-wise distribution of percentiles of weight of Lodha boys**

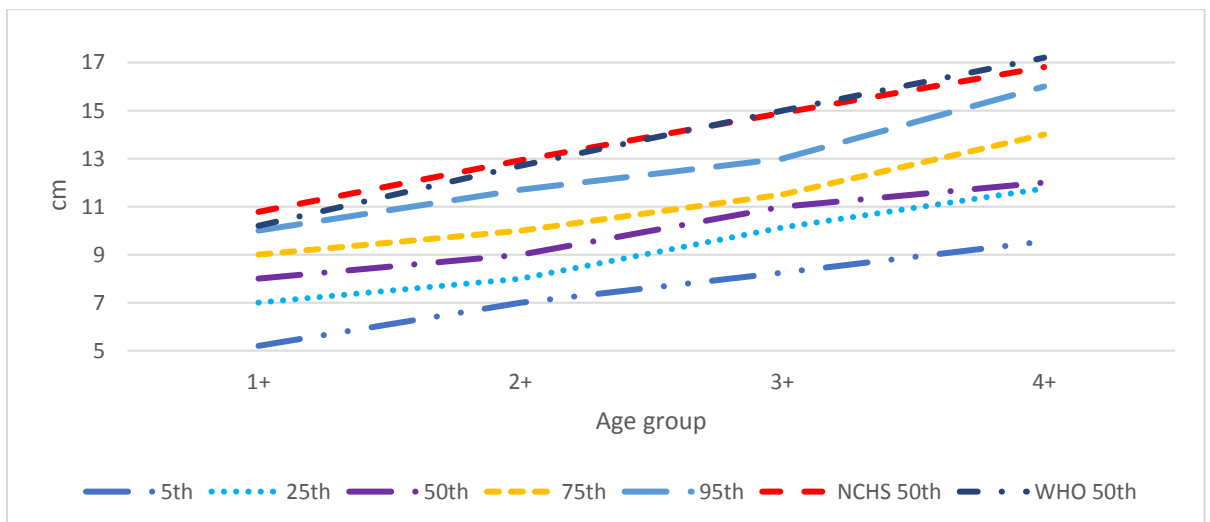**Fig 4: Age group-wise distribution of percentiles of weight of Lodha girl**

Table 8: Age group-wise percentile distribution of head circumference of Lodha boys and girls and 50th percentile NCHS 1977 & WHO 2006 growth standard

Percentile for Head circumference of Boys (cm)						
Age group	*5th percentile*	*25th percentile*	*50th percentile*	*75th percentile*	*95th percentile*	*NCHS (1977) 50th percentile*	*WHO (2006) 50th percentile*
1⁺	42.00	43.13	44.90	45.45	47.93	48.3	47.4
2⁺	37.58	45.33	46.00	47.43	50.60	50.0	48.9
3⁺	44.60	46.80	48.00	48.70	49.50	50.9	49.9
4⁺	47.00	47.90	48.60	49.35	51.45	51.4	50.5
Percentile for Head circumference of Girls (cm)						
Age group	*5th percentile*	*25th percentile*	*50th percentile*	*75th percentile*	*95th percentile*	*NCHS (1977) 50th percentile*	*WHO (2006) 50th percentile*
1⁺	41.10	43.00	44.00	45.00	47.14	47.1	46.2
2⁺	41.20	44.00	45.00	46.10	47.00	48.7	47.9
3⁺	41.60	45.43	46.10	47.30	48.73	49.6	49.0
4⁺	43.78	46.00	47.00	47.58	48.79	50.3	49.6

Fig 5: Age group-wise distribution of percentiles of head circumference of Lodha boys
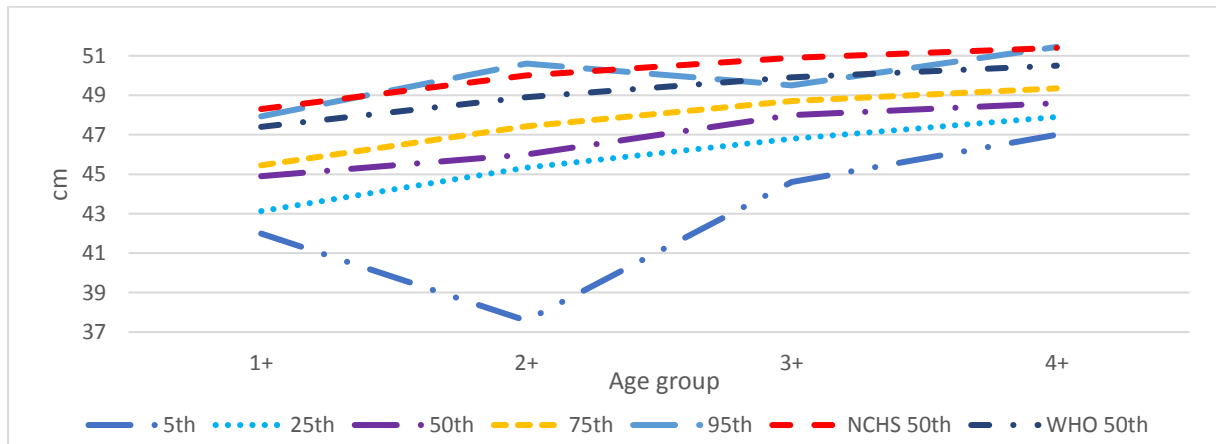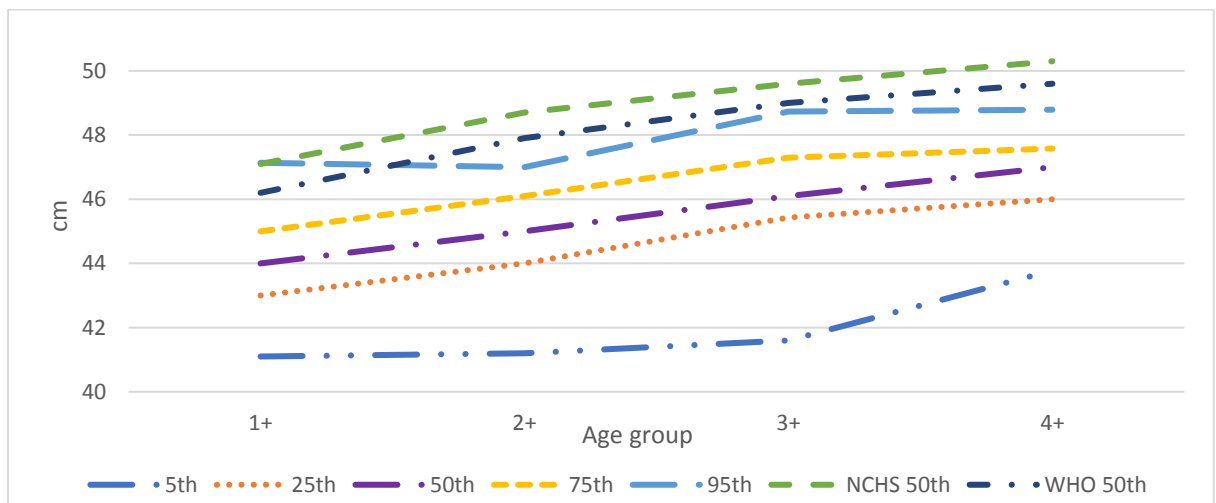

Fig 6: Age group-wise distribution of percentiles of head circumference of Lodha girls

Discussion:

Physical growth in children is a key indicator of a population's overall health and well-being. The preschool age, characterized by rapid growth, provides an ideal opportunity to observe secular changes. This period is particularly sensitive, as growth retardation in early life can significantly impact growth during adolescence and influence final adult size (Rao et al. 2012). Child growth and nutritional development are significantly influenced by living conditions, including socio-economic, cultural, demographic, and climatic factors that can vary widely across nations. There is a need for attention towards the improvement of child growth conditions, is especially pronounced in a country like India. Despite recent advances, Indian children remain shorter than their counterparts in other developing nations with similar economic conditions (Striessnig & Bora, 2020).

Tables 9, 10, and 11 represent the mean heights, weights, and head circumferences (in centimetres) and standard deviations (SD) for children from various earlier studies, segmented by age groups (1+, 2+, 3+, 4+) and compared with the present study.

Table 9 provides data that compares the mean height/length (with standard deviations) of boys and girls across various age groups (1+ to 4+ years) from different studies, including the present study. For boys, the present study's findings align closely with earlier research but exhibit some variation, particularly at age 4+, where the mean height (100.82 cm) is slightly higher than most other studies except for Mahapatra et al. 2020 (99.66 cm). For girls, the present study shows generally lower mean heights compared to other studies, particularly at ages 2+ and 3+, where the values (79.92 cm and 89.10 cm, respectively) are below those of Mahapatra et al., 2020 and Samsuddin et al., 2024.

Table 10 highlights variations in the mean weights (with standard deviations) of boys and girls aged 1 to <5 years across multiple studies. The present study shows similar trends for boys to other research, with weights increasing progressively across age groups. In the age group 4+, the present study reports the highest mean weight (14.12 kg), exceeding that of other studies. Girls in the present study show slightly lower weights than other studies, especially at 2+ and 3+ years, where weights (8.85 kg and 11.02 kg) are among the lowest, possibly indicating growth disparities.

Table 11 compares the mean head circumference (with standard deviations) of boys and girls aged 1+ to 4+ years across different studies, highlighting both consistencies and variations. For boys, the present study shows gradual increases in head circumference, with values closely

aligning with Debsarma et al., 2021 (Rajbanshi children) but slightly lower than Verma et al., 1980 (Rural children) at all age groups. For girls, the present study also reveals a steady rise in head circumference with age. However, the values are generally lower than those of Verma et al., 1980 but comparable to those of Debsarma et al., 2021 at younger ages.

Table 9: Mean height/lenght of boys and girls in different studies in India compared with the present study

Mean Height/length of Boys (in cm)				
Other studies	Age group Wise Mean Height (SD)			
	1+	2+	3+	4+
Das & Bose, 2008	-	82.89 (6.6)	87.78 (6.4)	95.26 (7.7)
Das & Banik, 2011	-	84.9 (5.8)	90.0 (6.4)	98.4 (6.4)
Bisai, 2014	72.2 (3.8)	82.0 (4.2)	87.7 (1.8)	92.4 (3.9)
Mahapatra et al., 2020	74.04 (3.55)	84.67 (4.78)	93.42 (4.12)	99.66 (4.18)
Samsuddin et al., 2024	-	85.84 (9.42)	92.22 (5.60)	98.34 (6.12)
Present study	73.45 (3.97)	82.90 (4.85)	89.33 (7.20)	100.82 (4.93)
Mean Height/length of Girls (in cm)				
Other studies	Age group Wise Mean Height (SD)			
	1+	2+	3+	4+
Das & Bose, 2008	-	85.92 (10.5)	91.11 (8.6)	96.33 (10.1)
Das & Banik, 2011	-	82.5 (4.3)	92.0 (5.8)	99.0 (5.8)
Bisai, 2014	71.0 (4.5)	79.7 (3.1)	86.9 (3.3)	90.6 (3.3)
Mahapatra et al., 2020	74.24 (3.41)	83.25 (4.47)	92.65 (4.96)	100.03 (4.04)
Samsuddin et al., 2024	-	85.28 (7.78)	92.62 (4.31)	94.78 (5.75)
Present study	73.74 (4.33)	79.92 (3.70)	89.10 (5.51)	96.73(5.32)

Table 10: Mean weight of boys and girls in different studies in India compared with present study

Mean Weight of Boys (in kg)				
Other studies	Age group Wise Mean Weight (SD)			
	1+	2+	3+	4+
Das & Bose, 2008	-	10.07 (1.3)	11.11 (1.4)	13.03 (2.0)
Das & Banik, 2011	-	11.1 (1.6)	12.0 (1.6)	13.8 (2.0)
Bisai, 2014	7.9 (1.0)	9.9 (1.3)	11.3 (1.2)	12.8 (1.5)
Mahapatra et al., 2020	8.11 (0.96)	10.28 (1.42)	12.75 (1.48)	13.76 (1.39)
Samsuddin et al., 2024	-	10.49 (1.61)	11.92 (1.92)	13.73 (2.07)
Present study	8.25 (1.30)	9.88 (1.52)	11.85 (1.57)	14.12 (1.62)
Mean Weight of Girls (in kg)				
Other studies	Age group Wise Mean Weight (SD)			
	1+	2+	3+	4+
Das & Bose, 2008	-	10.00 (1.9)	11.67 (1.8)	13.03 (2.5)
Das & Banik, 2011	-	10.1 (1.6)	12.3 (1.4)	14.2 (1.9)
Bisai, 2014	7.5 (0.7)	9.0 (0.9)	10.9 (1.4)	11.8 (0.7)
Mahapatra et al., 2020	8.11 (0.97)	9.80 (1.06)	11.91 (1.64)	13.67 (1.69)
Samsuddin et al., 2024	-	10.22 (1.61)	11.47 (1.62)	12.70 (1.72)
Present study	7.85 (1.33)	8.85 (1.37)	11.02 (1.23)	12.60 (1.81)

Table 11: Mean head Circumference of boys and girls in different studies in India compared with present study

Mean Head Circumference of Boys (in cm)				
Other studies	*Age group Wise Mean Head Circumference (SD)*			
	1+	*2+*	*3+*	*4+*
Verma et al., 1980	45.8 (2.4)	47.3 (1.9)	47.9 (2.4)	49.0 (2.3)
Giri et al., 2018	-	-	46.53 (2.60)	47.81 (1.51)
Debsarma et al., 2021	42.7 (3.7)	45.6 (1.5)	47.0 (1.5)	48.6 (1.9)
Present study	44.60 (1.53)	46.12 (2.78)	47.70 (1.33)	48.78 (1.21)
Mean Head Circumference of Girls (in cm)				
Other studies	*Age group Wise Mean Head Circumference (SD)*			
	1+	*2+*	*3+*	*4+*
Verma et al., 1980	43.9 (2.4)	46.1 (2.0)	47.2 (2.3)	48.2 (2.1)
Giri et al., 2018	-	-	46.77 (1.73)	46.55 (1.17)
Debsarma et al., 2021	41.6 (2.3)	44.9 (2.4)	46.7 (1.7)	46.5 (2.4)
Present study	43.94 (1.47)	44.88 (1.53)	46.15 (1.76)	46.72 (1.31)

The result shows that Lodha boys grow slightly better than the Lodha girls. The result also shows that the overall growth of the Lodha children compared to the growth standard is very low and needs attention. In all age-sex groups, the Lodha children show considerable differences in mean height and weight compared to the growth standard. The percentile graphs can also confirm this result. The percentile distribution reveals a significant gap between the lower and higher percentiles. At the same time, most participants demonstrated slow or below-average growth rates compared to international growth standards. The percentile tables indicate that nearly all study participants had height, weight and head circumference values below the 50th percentile of international growth standards.

The growth and nutritional conditions of children in most tribal communities are profoundly concerning and reflect significant health and nutritional challenges (Roy and Roy, 2019; Roy et al., 2020; Stiller et al., 2020; Chandra et al., 2021; Das et al., 2021). These alarming growth conditions not only impact children's physical development but also hinder their cognitive and social progress, perpetuating cycles of poverty and poor health. Immediate and sustained interventions focusing on nutrition, healthcare, sanitation, and education are crucial to addressing these challenges and improving the overall well-being of children in tribal communities.

CONCLUSION:

The present study shows a trend of lower mean heights and weights across all age groups compared to most other studies, particularly in the earlier years. In conclusion, the study highlights a considerable disparity in growth rates among participants, with the majority falling below average in height and weight compared to international growth standards. However, some of the study participants show similar growth to international growth standards, suggesting the potential for improvement with appropriate nourishment and care. This may suggest that targeted interventions could significantly enhance growth outcomes for these children.

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