DoI: https://doi.org/10.58537/jorangrau.2025.53.2.07

J. Res. ANGRAU 53 (2) 55-62, 2025

GROWTH PATTERNS OF CHILDREN UNDER FIVE IN URBAN SLUMS IN SAMBALPUR DISTRICT OF ODISHA

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Date of Receipt : 03-03-2025 Date of Acceptance : 27-06-2025

ABSTRACT

A community based cross sectional study was conducted in the years 2022-23 among under-five children living in urban slums of Sambalpur district, Odisha. The proposed study aimed to determine the levels of malnutrition among under-five children and to evaluate the growth of these children by anthropometric measurements. A total sample size of 550 (268 boys and 282 girls) aged between 6 months to 5 years were randomly selected from 20 slums. The data was collected with the help of a predesigned and pretested interview schedule to collect the information on anthropometric measurements and nutritional status of the children. The results of the study revealed that more percentage of actual mean deficits was found in Head Circumference (HC) & Mid-Upper Arm Circumference (MUAC) of the boys. The nutritional status of girls was found to be less in comparison with boys in Grade-I, Grade-II, Grade-III level of malnutrition, both according to Gomez Classification and Indian Academy Pediatrics (IAP) classification.

Keywords: Head Circumference, Height, Malnutrition, Mid-Upper Arm Circumference, Under-Five Children, Weight

INTRODUCTION

The most vulnerable group in a nation is children under the age of five.Their mortality rate and nutritional condition serve as sensitive indicators of nutrition and population health. In India, malnutrition is one of the main public health issues, particularly for children under five. According to National Family Health Survey–5 (NFHS-5, 2019-21) data, 32.1% (Urban-27.3%, Rural-33.8%) under-five children were underweight, 35.5% (Urban-30.1%, Rural-37.3%) were stunted, 19.3% (Urban-18.5%, Rural-19.5%) were wasted and 7.7% (Urban 7.6%, Rural 7.7%) were severely wasted in India. Similarly NFHS-5 data of Odisha revealed 29.7% (Urban-21.5%, Rural-31.0%) under-five children were underweight, 31.0% (Urban-24.9%, Rural-32.0%) were stunted, 18.1% (Urban-14.9%, Rural-18.6%) were wasted and 6.1% (Urban 3.9%, Rural 6.4%) were severely wasted. NFHS-5 data for Sambalpur District revealed 36.3% under-five children were underweight, 44.8% were stunted, 22.4% were wasted and 7.6% were severely wasted. The substandard housing, overcrowding, bad drinking water, and inadequate sanitation that urban slum inhabitants experience are compounded by their low socioeconomic level, lack of access to basic health care services, ignorance, and illiteracy. According to Panigrahi and Das, (2014), children who live in such situations are always at a significant risk of developing health

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Table 1. Distribution of respondents based on age and gender **n=500**

S.No.	Age (Yrs.)	Boys		Girls	
		n	%	n	%
1	6 months-1	30	46.8	34	53.1
2	>1-2	61	57.5	45	42.4
3	>2-3	43	41.7	60	58.2
4	>3-4	70	54.6	58	45.3
5	>4-5	64	42.9	85	57.0
	Total	268	48.7	282	51.3

and nutritional issues. Slum children have the worst health indices of any urban group and are significantly poorer than the norm for rural areas.According to the 2011 Census, 13.7 million Indians live in slums, making up over 17% of the nation's urban households.The children living in slums are worse affected as not only deprived of the basic services but also not recognized as an important segment, by the urban planners and developer. The prevalence of undernutrition in urban slums is also clearly significantly greater than the national average for both rural and urban areas.Many children in slum areas are susceptible to vicious cycle of malnutrition and infection which contributes to high child mortality and morbidity. Therefore it is highly essential to monitor the growth pattern of children periodically to assess their nutritional status for their proper care and treatment.

MATERIAL AND METHODS

A cross-sectional study was conducted in the years 2022 to 2023 in slum areas of Sambalpur District, Odisha. A total number of 550 (268 boys and 282 girls) children between aged 6 months to 5 years from 20 slum areas of Sambalpur district were selected by simple random sampling method. The data was collected by house to house visit with a pre-designed, pre-tested interview schedule. The World Health Organization's (WHO) Growth Standards-2006 were compared with the anthropometric measurements of the children, including their height, weight, head circumference (HC), and mid-upper arm circumference (MUAC) (different for boys and girls). Indian Academy of Pediatrics (2015) classification was utilized for assessment of nutritional status of the children to know their severity of malnutrition.

RESULTS AND DISCUSSION

Table 1 shows the information on age and gender of the respondents. Although it was noted that there were more girls (51.3%) than boys (48.7%), the difference was not statistically significant. Additionally, it was noted that a higher proportion of males were in the 1-2 year and 3-4 year age groups, while a higher proportion of girls were in the 6 months–1 year, 2-3 year, and 4-5 year age groups. Similar findings was observed by Gautam *et al*., (2018), who reported that 51.46% female and 48.46 % male in their study whereas Sharma *et al.,* (2016), reported 51.6% female and 48.6% male in their study which is at par with the findings of the study.

Table 2 depicts that boys were slightly taller than girls. Boys' and girls' heights increased gradually with age, however the observed values fell well short of the WHO growth criterion for height across all age categories (2006).The negative deviation in actual mean height was found from 9.3% to 13.7% in boys whereas it was 8.5% to 12.3% in case of girls. The highest deviation in height

Table 2. Actual mean height of under five children in comparison with WHO standard height (2006)

S.No.	Age (Yrs.)	Height of boys (cm.)					Height of girls (cm.)				
		Actual Mean Ht. ±SD	Std. Ht.	%Mean diff.	t value	P value	Actual Mean Ht. ±SD	Std. Ht.	%Mean diff.	t value	P value
1.	6 months-1	67±4.8	75.7	-10.5	-9.12	.000*	66.6±6.3	74	-9.9	-6.76	.000*
2.	>1-2	75.8±5.7	87.8	-13.7	-16.35	.000*	75.2±4.9	85.7	-12.3	-14.50	.000*
3.	>2-3	86.1±5.6	96.1	-10.7	-12.11	.000*	85±5.9	95.1	-10.7	-13.28	.000*
4.	>3-4	93.4±5.6	103.3	-9.6	-14.69	.000*	92.1±5.9	102.7	-10.7	-15.59	.000*
5.	>4-5	100.5±5.9	110	-9.3	-13.68	.000*	100.1±5.4	109.4	-8.5	-15.99	.000*

®Ref: As per standard mentioned by WHO - 2006 ; *Significant at 5% level

Table 3. Actual mean weight of children in comparison with WHO standard weight.

S.No.	Age (Yrs.)	Weight of Boys (Kg)					Weight of Girls (Kg)				
		Actual Mean Ht. ±SD	Std. Ht.	%Mean diff.	t value	P value	Actual Mean Ht. ±SD	Std. Ht.	%Mean diff.	t value	P value
1.	6 months-1	9.1±2.8	9.6	-5.5	-1.01	0.32^{NS}	8.3±2.2	8.9	-7.0	-0.62	$.106^{NS}$
2.	>1-2	9.5±1.6	12.2	-22.0	-13.02	.000*	9.1±1.3	11.5	-20.6	-12.32	.000*
3.	>2-3	10.9±2	14.3	-23.6	-11.30	.000*	10.7±1.7	13.9	-23.3	-14.55	.000*
4.	>3-4	12.7±2	16.3	-22.0	-15.08	.000*	12.1±2.2	16.1	-24.7	-13.83	.000*
5.	>4-5	14.1±2.2	18.3	-23.0	-15.05	.000*	14.4±2.3	18.2	-21.0	-15.47	.000*

®Ref: WHO, 2006 *Significant at 5% level NS- Non significant

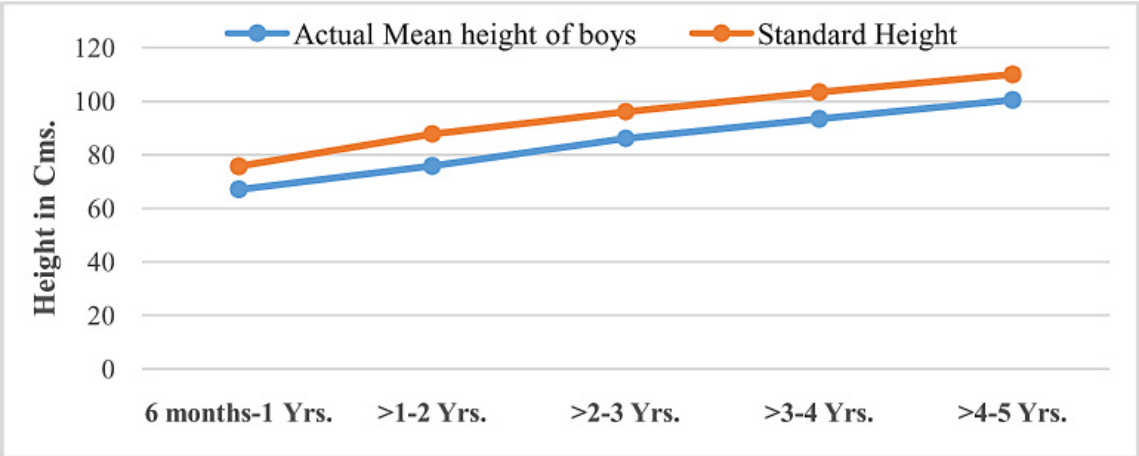

Figure 1 Comparision of actual mean height of boys with WHO growth standards

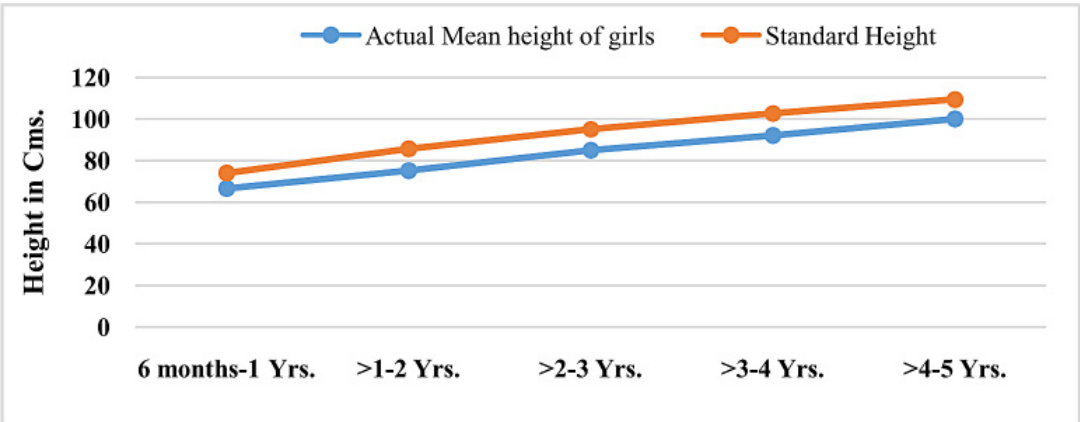

Fig. 2. Comparision of actual mean height of girls with WHO growth standards.

was noted in age group of >1-2 years in both boys & girls.The discrepancy between the respondents' actual mean height and standard height for both boys and girls was highly statistically significant, irrespective of their age when compared (at 95% confidence level, p<0.000).Das *et al.,* (2014) found nearly identical results, reporting that the average height of boys and girls at ages 3, 4, and 5 was 75.2, 97.3, 100.35 and 82.75, 95.4, 101.38, respectively. Another study by Mandal *et al.,* (2020) found that the average height of boys and girls at the ages of 2, 3, and 4 was 78.7, 86.25, 90.8, 97.93 and 75.29, 84, 90.79, and 95.08, respectively, with the exception of the age of 5, which was somewhat lower than the study's findings.

Fig. 1. and 2 shows that the reduced height observed in both boys and girls, as compared to WHO standard values (2006) may be attributed to several factors, including inadequate nutrition, nutrient deficiencies, illnesses, limited access to healthcare, exposure to unsanitary environmental conditions and genetic factors.

The actual mean weight of both boys and girls was found to be lower than the WHO standard values, as shown in Table 3. Additionally, it was noted that the percentage of the actual mean weight difference compared to WHO standard values was lower for both boys and girls between the ages of six months and one year, whereas the mean difference increased as age increased.The prevalence

Table 4. Actual mean Head circumference of children in comparison with WHO standard HC.

S.No.	Age (Yrs.)	Head circumference of boys (cm.)					Head circumference of girls (cm.)				
		Actual Mean Ht. ±SD	Std. Ht.	%Mean diff.	t value	P value	Actual Mean Ht. ±SD	Std. Ht.	%Mean diff.	t value	P value
1.	6 months-1	44.4±2.2	46.1	-3.7	-4.15	.000*	42.8±1.9	44.9	-2.1	-6.66	.000*
2.	>1-2	45.2±1.7	48.3	-6.4	-13.95	.000*	44.7±1.8	47.2	-2.6	-9.70	.000*
3.	>2-3	46.7±1.7	49.5	-5.7	-11.23	.000*	45.5±1.3	48.5	-3.0	-17.65	.000*
4.	>3-4	47.0±2.0	50.2	-6.3	-13.59	.000*	45.7±2.2	49.3	-3.6	-12.65	.000*
5.	>4-5	47.7±2.1	50.7	-5.9	-11.13	.000*	47.3±1.7	49.9	-2.6	-14.20	.000*

®Ref: WHO, 2006 *Significant at 5% level

of underweight in varying degrees, however, may be caused by poor feeding practices, frequent illnesses, inadequate nutrition, and economic factors like poverty and poor sanitation. The weight deficit was found to be between 5.5% and 23.6% for boys and 7% and 24.7% for girls. For males aged 2-3 years, the gap was greater (23.6%), but for girls, it was greater in the age group of 3-4 years (24.7%). Regardless of age or gender, there was a statistically significant discrepancy between the actual mean weight and the WHO standard values from 2006 in this study, with the exception of the 6–1 year age group. Biswas *et al.,* (2018) conducted a similar study and found that the average weight of boys and girls at ages 3, 4, and 5 was 11.94, 12.9, 14.78, and 11.57, 12.76, 14.35, respectively.

Table 4 depicts that the actual mean head circumference values of both boys and girls which were found to be lower than the WHO standard values (2006). There was a progressive difference in head circumference with increased age in comparision to WHO standard, found in boys & girls from 6 months to 4 year of age. However, the percentage of head circumference deficit was found within the range of 3.7% to 6.4% in boys and 2.1% to 3.6% for girls.Boys aged 1-2 years (6.4%) and girls aged 3-4 years (3.6%) had a greater deficit. Regardless of age or gender, there was a statistically significant discrepancy between the actual mean head circumference and WHO standard values in this investigation. Tigga *et al.,* (2016) observed nearly identical results, with the mean head circumferences of boys and girls at ages 2, 3, 4, and 5 being 48.48, 46.59, 45.53, 46.29 and 45.22, 44.31, 45.37, and 47.57, respectively.

Table 5 reveals both boys' and girls' mean MUAC values, which were found to be below WHO (2006) growth guidelines values. It was intriguing to observe that the mid-upper arm circumference saw a progressive deficit that grew with age and was statistically

Table 5. Actual mean Mid-Upper Arm Circumference of children in comparison with standard MUAC.

S.No.	Age (Yrs.)	MUAC of boys (Cms.)					MUAC of girls (Cms.)				
		Actual Mean Ht. ±SD	Std. Ht.	%Mean diff.	t value	P value	Actual Mean Ht. ±SD	Std. Ht.	%Mean diff.	t value	P value
1.	6 months-1	14±1.0	14.6	-4.4	-3.34	.002	13.4±1.1	14.2	-0.9	-4.62	.000*
2.	>1-2	13.8±1.3	15.2	-9.1	-8.53	.000*	13.4±1.0	14.9	-1.5	-10.52	.000*
3.	>2-3	14.2±1.3	15.7	-9.8	-8.07	.000*	13.9±0.8	15.6	-1.7	-15.79	.000*
4.	>3-4	14.4±1.0	16.1	-10.7	-13.89	.000*	14.1±1.2	16.2	-2.1	-13.28	.000*
5.	>4-5	14.6±1.1	16.5	-11.3	-13.37	.000*	14.6±1.0	16.9	-2.3	-22.52	.000*

®Ref: WHO, 2006 *Significant at 5% level

significant at both the 5% and 1% levels. However, when compared to WHO standard values (2006), the MUAC deficiency was found to be between 4.4% and 11.3% for males and 6% and 13.8% for girls.In the 4–5 age range, there was a greater deficit in boys (11.3%) and girls (16.9%), respectively. The rise in the percentage of mean difference MUAC between the age groups of 6 months and 5 years may be the result of recurrent episodes of diseases such as respiratory infections and diarrhea, which raise nutrient demands while lowering intake. In the end, this results in muscular atrophy. The discrepancy between the actual mean mid-upper arm circumference and the WHO standard values was statistically significant.

Table 6 describes the deficiency was higher in boys (11.3%) and girls (16.9%) in the 4–5 age group, respectively. Recurrent episodes of illnesses such respiratory infections and diarrhea, which increase nutrient demands while lowering intake, may be the cause of the increase in the percentage of mean difference MUAC between the age groups of 6 months and 5 years. This ultimately leads to muscle atrophy. There was a statistically significant difference between the WHO standard values and the actual mean mid-upper arm circumference.It was found that majority of boys (42.5%) and girls (46.1%) were under Grade I malnutrition, followed by 23.1% boys and 25.9% girls were under Grade II and 3.4% boys and 3.5% girls were under Grade III malnutrition, respectively.Malnutrition was more common in females than in boys, however the differences between the sexes were not statistically significant (P>0.05).

Table 7 depicts children's nutritional status according to their IAP classification. The majority of girls (53.5%) and boys (61.6%) were judged to have normal nutritional status. Compared to girls, boys had a superior nutritional state. 25% of boys and 24.5% of girls were found to be suffering from Grade I malnutrition, followed by 10.1% of boys and

Table 6. Nutritional profile of children based on Gomez classification (1956)

S.No.	Gomez classification	Boys		Girls			P
	Nutritional Status	N	%	N	%	÷2	value
1.	Normal (>90%)	83	31.0	69	24.5	2.93	0.402[NS]
2.	Grade I Malnutrition (75-90%)	114	42.5	130	46.1		
3.	Grade II Malnutrition (60-75%)	62	23.1	73	25.9		
4.	Grade III Malnutrition (<60%)	9	3.4	10	3.5		

NS- Non significant

18.1% of girls suffering from Grade II malnutrition, and 3.4% of boys and 3.9% of girls suffering from Grade III malnutrition. It was discovered that none of the responders fell into the grade IV malnutrition level. At the 5% level of significance, the prevalence of malnutrition disparities between boys and girls were determined to be statistically significant (P<0.05).A study carried out by Bhadoria (2023), in rural area of Barabanki District revealed that nutritional status of under five (according to IAP classification of malnutrition) children was as follows *i.e.* 33.3% were normal, 28.3% were mild, 16.7% moderate, 12.2% severe and 9.4% were very severely malnourished.

CONCLUSION

Results revealed that the prevalence of malnutrition was higher in females than in boys, according to the results. Malnutrition was also seen to be more common as people aged, which could be because of the continued presence of unsanitary environmental variables. The percentage of boys in the 1-2 year age group who had a mean deficit in height was similarly higher (13.7%), but the percentage of boys in the 2-3 year age group who had a mean deficit in weight was higher. Similarly, in case of head circumference, the actual mean difference in comparison to standard was more in the age group of 3-4 years boys *i.e.* 6.3%, whereas the actual mean mid-upper arm circumference was more deficit in case of girls belong to 4-5 years of age group *i.e.* 16.9%. However results on prevalence of malnutrition as per Gomez and IAP classifications showed that more percentage of girls suffers from malnutrition in comparison to boys which might be due to gender disparity in care and availability of health facilities.

Table 7. Nutritional Status of Children based on Indian Academy Pediatrics Classification (2015) n=500

S.No.	Level of	Boys		Girls			P
	Nutritional Status	n	%	n	%	÷2	value
1.	Normal (>80%)	165	61.6	151	53.5	7.883	0.048*
2.	Grade I Malnutrition (70-80%)	67	25.0	69	24.5		
3.	Grade II Malnutrition (60-70%)	27	10.1	51	18.1		
4.	Grade III Malnutrition (50-60%)	9	3.4	11	3.9		
5.	Grade IV Malnutrition (<50%)	0	0.0	0	0.0		

*Significant at 5% level

REFERENCES

Bhadoria, A. 2023. A study on association of sociodemographic factors with nutritional status of under-five age group in rural area of Barabanki District, Journal of Medicine and Public Health. 4 (Article 1077): 0118-0121.

Biswas, S., Giri, S. P and Bose, K. 2018. Assessment of nutritional status by composite index of anthropometric failure (CIAF): a study among preschool children of Sagar Block, South 24 Parganas District, West Bengal, India. Available online at: https://content.sciendo.com/anre,DOI: 10.2478/anre-2018-0022.

Das, A.,Lenka, Ch and Behera S. 2014. Health status of urban slum children (3-5 Yrs.): A study in Sikharchandi area, Khurda, Bhubaneswar. Journal of Extension Education, 19 (2): 113-120.

District Fact Sheet Sambalpur Odisha. The National Family Health Survey 2019-21 (NFHS-5). Provides information on population, health and nutrition for India. From the website (https://rchiips.org›nfhs›nfhs-5 ›Sambalpur).

Gautam, S. K., Verma, M., Barman, S. K and Arya, A. K. 2018. Nutritional status and its corelates in under five slum children of Kanpur Nagar, India. International Journal of Contemporary Pediatrics, 5(2):584-590.

India Fact Sheet. The National Family Health Survey 2019-21 (NFHS-5). Provides information on population, health and nutrition for India. From the website (https://rchiips.org›nfhs ›factsheet_NFHS-5).

Indian Academy of Pediatrics. 2015. Nutritional standards for children. Available on : https://iapindia.org›iap

Mandal, G and Bose A. 2020. Assessment of Nutritional Status of Pre-School Children: A Key Indicator of Sustainable Development in Slum Areas of Raiganj City, West Bengal, India. In Book: Socio-Economic Development and Environmental sustainability: The Indian Perspective, published by Namya Press: pp 181-196. "DOI:10.5281/Zenodo.4716298.

Panigrahi, A. and Das, S. C. 2014. Undernutrition and its correlates among children of 3-9 years of age residing in slum areas of Bhubaneswar, India. The Scientific World Journal, 2014, Article ID 719673. https://doi.org/10.1155/2014/719673

Sharma, A. K., Baig, V. N., Yaday, A. K., Bharadwaj, A. K and Singh, R. 2016. Prevalence and risk factors for stunting among tribal under-five children at south-west, Rajasthan, India. National Journal of Community Medicine, 7(6): 461-67.

State Fact Sheet Odisha. The National Family Health Survey 2019-21 (NFHS-5). Provides information on population, health and nutrition for India. From the website (https://rchiips.org›nfhs›NFHS-5 FACTS› Odisha).

Tigga, P.L., Mandal, N and Sen, J. 2016. Head circumference as an indicator of undernutrition among tribal pre-school children aged 2-5 years of North Bengal, India. Human Biology Review, 5 (1): 17-33.

WHO. 2006. Child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development. From the website (https://www.who.int›Publications › i › item.

Kumari, T., Lenka, C. and Guru, P. 2025. Growth Patterns of Children under five in urban slums in Sambalpur District of Odisha. The Journal of Research ANGRAU, 53(2), 55–62. https://doi.org/10.58537/jorangrau.2025.53.2.07