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Research Article

Nutritional Status of Under Five -Children in Urban Slums: A Cross-Sectional Study in Sambalpur District, Odisha

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Abstract

Background: The nutritional status of children under five in slums is vital for evaluating the overall health of these populations. Malnutrition in these children reflects broader issues of inadequate nutrition and poor living conditions. Limited accesses to essential resources in slum environments exacerbate their vulnerability to growth problems and infectious diseases.

Methods: A community-based cross-sectional study was carried out from 2022 to 2023 in urban slums of Sambalpur District, involving 550 children aged 6-60 months selected via simple random sampling from 20 urban slums. Data were gathered through home visits and interviews with mothers using a pre-designed, pre-tested interview schedule. Anthropometric measurements and nutritional assessments followed WHO (2006) guidelines.

Results: In the study of 550 children, the analysis showed that stunting was the most prevalent i.e. 42.8%, followed by underweight 34.7%, and wasting at 22.4%. The rates of overweight were 1.5% in boys and 2.1% in girls. The study found no significant association between malnutrition and gender.

Conclusion: Malnutrition among under-five children was notably high. Childhood malnutrition results from multiple factors, addressing it effectively requires a comprehensive, multifaceted approach rather than focusing on a single cause.

Keywords: Mild; Moderate; Severe; Stunting; Wasting; Underweight; Under-Nutrition

Abbreviation

WHO: World Health Organization; DSWO: District Social Welfare Officer; MUAC: Mid-Upper Arm Circumference; HC: Head Circumference; SFT: Skin Fold Thickness; SPSS: Statistical Package for Social Sciences; NFHS: National Family Health Survey

Introduction

Nutrition is crucial for a child's health, playing a vital role in preventing disease and reducing mortality. Malnutrition is a multifaceted issue that encompasses several categories: undernutrition, which includes wasting, stunting, and underweight; micronutrient deficiencies; and conditions such as overweight, obesity. This global challenge affects every country. According to the WHO, approximately 45 million children under five years old are wasted, with 17 million of these being severely wasted. Additionally, 155 million children are stunted, and 41 million are either overweight or obese. Malnutrition remains a leading cause of mortality in children under five, accounting for nearly half of all deaths in this age group. Furthermore, low- and middle-income countries are experiencing a growing prevalence of childhood overweight and obesity. In India, malnutrition among children under five is a significant public health issue. Odisha is one of the poor state of India, faces significant malnutrition issues, particularly in urban slum areas where inadequate healthcare infrastructure and a large migrant population exacerbate child health problems. Sambalpur, located in western Odisha, is notably affected due to its substantial slum population, and there is a lack of recent research on malnutrition in under five children in this region.

Objectives

To determine the prevalence of stunting, underweight, and wasting among children under five in the urban slums of Sambalpur District.

Materials and Methods

An observational, descriptive, community-based cross-sectional study was conducted among under-five children in the urban slums of Sambalpur District, Odisha, after getting permission from the DSWO. The study was conducted during 2022-23.

- **Sample size:** The sample size was determined based on a stunting prevalence of 40.7% in Sambalpur District. By using the formula $4PQ/L^2$, P = Prevalence of malnutrition (taking as 40.7%), Q = 100-P. L = Allowable error (5%) = 4*40.7*59.3/5*5 = 387.However, the study included 550 subjects for study.
- **Inclusion criteria:** All under-five children whose mothers consented to participate in the study and children present during household visits and not seriously will, were included.
- **Exclusion criteria:** Children with congenital malformations, mental disabilities, or serious illness were excluded, as were those whose mothers did not consent to participate in the study.
- **Data Collection:** Twenty urban slums were randomly selected for the study. Data were collected through interviews with mothers or caregivers present during house visits using a pre-designed, pre-tested questionnaire. Anthropometric measurements followed WHO guidelines: weight was recorded in kilograms with minimal clothing, length was measured using an infant-meter for children under two, and height was measured with a stadiometer or tape for those who could stand. MUAC and Head Circumference (HC) were assessed with appropriate measuring tools. Nutritional status was evaluated based on height-for-age (stunting), weight-for-age (underweight), and weight-for-height (wasting). Nutritional grades were categorized as normal, mild, moderate, or severe according to WHO standards. A total of 550 children (268 boys and 282 girls) were included in the study.
- **Study tools:** Using WHO Anthro Software version 3.2.2, Z-scores for various nutritional conditions, including height-for-age, weight-for-age and weight for height, were plotted according to WHO standards.
- **Data Analysis:** The data was coded and entered into Microsoft Excel, and the analysis was performed using SPSS version 23.

S. No.	Level of Nutritional status	Z score	Boys (n = 268)		Girls (n = 282)		χ^2	P-value
			n	%	n	%		
1	Normal	< 0 to -1 SD	100	37.3	94	33.3	5.1	.166^{NS}
2	Mild stunting	< -1 SD to -1.99 SD	61	22.8	71	25.2		
3	Moderate stunting	< -2 SD to -2.99SD	56	20.9	72	25.5		
4	Severe stunting	< -3 SD	51	19.0	45	16.0		

Table 1: Comparison of gender wise nutritional status of children based on height-for-age Z-score (stunting).

NS: Not Significant.

Results and Discussion

Table 1 presented a comparison of nutritional status by gender based on height-for-age Z-scores. Among boys, 37.3% were normal, while 22.8% had mild stunting, 20.9% had moderate stunting, and 19.0% had severe stunting. For girls, 33.3% were normal, with 25.2% experiencing mild stunting, 25.5% moderate stunting, and 16.0% severe stunting. Gender did not significantly influence the prevalence of stunting among the children. In a similar study by Gautam S.K., *et al.* (2018) [1], it was observed that severe stunting was more prevalent among males (14.81%) compared to females (12.44%). However, the relationship between gender and height-for-age was not statistically significant ($p > 0.05$).

S. No.	Level of Nutritional status	Z score	Boys (n = 268)		Girls (n = 282)		χ^2	P-value
			n	%	n	%		
1	Overweight	>0 to 1SD	4	1.5	6	2.1	4.98	.289^{NS}
2	Normal	< 0 to -1 SD	114	42.5	114	40.4		
3	Mild underweight	< -1 SD to -1.99 SD	50	18.7	71	25.2		
4	Moderate underweight	< -2 SD to -2.99SD	64	23.9	64	22.7		
5	Severe underweight	< -3 SD	36	13.4	27	9.6		

Table 2: Comparison of gender wise nutritional status of children based on weight-for-age Z-score (Under-weight).

NS: Not Significant.

Table 2 detailed the nutritional status of boys and girls based on weight-for-age Z-scores. Among boys, 1.5% were overweight, 42.5% were normal, 18.7% were mildly underweight, 23.9% were moderately underweight, and 13.4% were severely underweight. For girls, 2.1% were overweight, 40.4% were normal, 25.2% were mildly underweight, 22.7% were moderately underweight, and 9.6% were severely underweight. The chi-square test revealed that no significant difference between boys and girls, indicating similar

patterns of underweight and overweight across genders. A similar study done by Camala B. (2019) [2], reported a slightly different distribution but similar trends. Among boys, 42.25% were well-nourished, while the percentages for mild, moderate, and severe underweight were 29.41%, 19.25%, and 9.09%, respectively. For girls, 40.71% were well-nourished, with 37.17% mildly underweight, 15.93% moderately underweight and 6.19% severely underweight. A chi-square test indicated no significant difference in nutritional status between boys and girls based on weight-for-age.

Another study done by Gupta V., *et al.* (2019) [3], moderate underweight was observed to be more common in girls (29.7%) compared to boys (25.2%). On the other hand, severe underweight was more prevalent among boys (11.6%) than girls (10.6%). However, these differences were found to be statistically insignificant.

S. No.	Level of Nutritional status	Z score	Boys (n = 268)		Girls (n = 282)		χ^2	P-value
			n	%	n	%		
1	Normal	< 0 to -1 SD	162	60.4	161	57.1	3.98	0.263^{NS}
2	Mild Wasting	< -1 SD to -1.99 SD	42	15.7	62	22.0		
3	Moderate Wasting	< -2 SD to -2.99SD	42	15.7	36	12.8		
4	Severe Wasting	< -3 SD	22	8.2	23	8.2		

Table 3: Comparison of gender wise nutritional status of children based on weight-for height Z-score (Wasting).

NS: Not Significant.

Table 3 displayed the nutritional status of boys and girls based on weight-for-height Z-scores. Among boys, 60.4% were classified as normal, 15.7% had mild wasting, 15.7% had moderate wasting, and 8.2% had severe wasting. For girls, 57.1% were normal, 22.0% had mild wasting, 12.8% had moderate wasting, and 8.2% had severe wasting. There was no significant gender difference for wasting. In a study by Gupta V., *et al.* (2019), it was observed that moderate wasting was more prevalent among girls (13.3%) compared to boys (12.2%). Conversely, severe wasting was more common in boys (6.8%) than in girls (4.2%). However, these differences were found to be statistically insignificant.

S. No.	Level of Nutritional status	Z score	Boys (n = 268)		Girls (n = 282)		χ^2	P-value
			n	%	n	%		
1	Normal	< 0 to -1 SD	115	42.9	94	33.3	5.96	0.113^{NS}
2	Mild HC	< -1 SD to -1.99 SD	77	28.7	102	36.2		
3	Moderate HC	< -2 SD to -2.99SD	53	19.8	58	20.6		
4	Severe HC	< -3 SD	23	8.6	28	9.9		

Table 4: Comparison of gender wise nutritional status of children based on based on Head Circumference-for-Age Z-score.

NS: Not Significant

Table 4 compared head circumference (HC) nutritional status between boys and girls. Among boys, 42.9% had normal head circumference, 28.7% had mild HC, 19.8% had moderate HC, and 8.6% had severe HC. For girls, 33.3% had normal HC, 36.2% had mild HC, 20.6% had moderate HC, and 9.9% had severe HC. There was no significant gender difference ($\chi 2 = 5.96$, $p = 0.113$), showing that head circumference status was similar between boys and girls. A study done by Tigga PL., *et al.* (2016) [3], it was found that the overall prevalence of undernutrition, as assessed by head circumference, was slightly higher among girls compared to boys. The prevalence of severe undernutrition was lower than that of moderate undernutrition for both genders. While the differences in the overall age-specific prevalence of undernutrition between boys and girls were not statistically significant, both sexes were equally affected.

Table 5 showed the distribution of wasting among boys and girls. Normal nutritional status was observed in 54.1% of boys and 51.1% of girls. Mild wasting affected 30.2% of boys and 34.8% of girls, while moderate wasting was seen in 13.1% of boys and 11.7% of girls. Severe wasting was present in 2.6% of boys and 2.5% of girls. The chi-square test indicated no significant gender difference, similar levels of wasting among both genders.

Table 6 compared the prevalence of nutritional issues among boys and girls, focusing on underweight, stunting, wasting, MUAC, and HC below -2 SD. In boys, 37.3% were underweight, 42.2% were stunted, 23.9% had wasting, 15.7% had low MUAC, and 28.4% had low head circumference. Among girls, the corresponding figures were 32.3% underweight, 43.6% stunted, 20.9% wasted, 14.2% with low MUAC, and 30.5% with low head circumference.

S. No.	Level of Nutritional status	Z score	Boys (n = 268)		Girls (n = 282)		χ^2	P-value
			n	%	n	%		
1	Normal	< 0 to -1 SD	145	54.1	144	51.1	1.32	0.724^{NS}
2	Mild wasting	< -1 SD to -1.99 SD	81	30.2	98	34.8		
3	Moderate wasting	< -2 SD to -2.99SD	35	13.1	33	11.7		
4	Severe wasting	< -3 SD	7	2.6	7	2.5		

Table 5: Comparison of gender wise nutritional status of children based on MUAC-for-Age Z-score.

NS: Not Significant.

Gender	Underweight		Stunting		Wasting		MUAC		Head Cir.		χ^2	P-value
	n	%	n	%	n	%	n	%	n	%		
Boys (< -2SD)	100	37.3	113	42.2	64	23.9	42	15.7	76	28.4	2.4	0.66^{NS}
Girls (< -2SD)	91	32.3	123	43.6	59	20.9	40	14.2	86	30.5		

Table 6: Association of gender with nutritional status among the participants.

NS: Not Significant

It showed highest prevalence of stunting followed by underweight and least for wasting. Similar trends for prevalence were noticed in NFHS-5 of Odisha (stunting 31.0%, underweight 29.7%, and wasting 18.1%) and Sambalpur District (stunting 40.7%, underweight 36.3%, and wasting 25.5%). There was no significant gender difference in these nutritional parameters. Both boys and girls had similar prevalence of malnutrition. A similar study done by Camala B. (2019), the overall prevalence of underweight was 28.3% among boys and 22.1% among girls, while stunting was more common in boys at 28.9% compared to 14.2% in girls. Wasting prevalence was 29.9% for boys and 23.0% for girls, with MUAC Z-scores showing 20.3% in boys and 26.6% in girls, and SFT Z-scores indicating 26.7% in boys and 25.7% in girls. The chi-square test revealed no significant gender differences in these nutritional indicators. Another study done by Bisai S., *et al.* (2010) [5]. It was noted that boys were more malnourished in the form of underweight, stunted and wasted (65.5%; 53.5%; 23.8%;) than the girls (60.9 %; 51.6%; 19.6%), but this was not statistically significant. However, prevalence of severe underweight was significantly higher among boys 19.3 % than their girls 12.8% [6-22].

S.No.	Location of studies /StudyArea	Age	Sample Size	Stunting %	Under wt. %	Wasting %	References
1	Urban slums Berhampur, Odisha	6-59 Months	385	41.43	39.48	37.2	Nanda PA., *et al.* (2023)
2	Urban area of South Delhi	<1-5 years	1332	27.3	24.5	17.8	Goyal M., *et al.* (2023)
3	Bankura Municipality, West Bengal	< 5 years	163	15.9	22.1	27.6	Biswas A and Biswas B (2023)
4	Top & bottom five states in India (2015-2016)	< 5 years		38.4	35.7	21.0	Prusty KR., *et al.* (2022)
5	Slum Amritsar City, Panjab	< 5 years	1136	50	45	8	Singh J., *et al.* (2021)
6	Urban slums, Maharastra	< 5 years	3671	45.9	35.4	17.1	Murakar S (2020)
7	Urban Slum area in Vijayawada & Guntur	4 14 years	208	46.63	68.27	48.08	Twinkle V., *et al.* (2020)
8	NFHS-5 (2019-21) India	< 5 years		35.5	32	19.3	NFHS-5 (2019-21)
9	NFHS-5 (2019-21) Odisha	< 5 years		31.0	29.7	18.1	NFHS-5 (2019-21)
10	IIPS (2017) Odisha	< 5 years		34.1	34.4	20.4	Saigal N and Srivastava S (2021)
11	NFHS-5 (2019-21) Sambalpur	< 5 years		40.7	36.3	25.5	NFHS-5 (2019-21)
12	Rural area of Haryana, India	<1-5 years	600	41.3	38.3	18.4	Gupta V., *et al.* (2019)
13	Slums area Jaipur City, Rajasthan	6-59 Months	2007	43	35.7	10.5	Choudhary P., *et al.* (2019)
14	Urban slums Mumbai, Maharastra	10-18 Months	323	31.2	25.1	9	Huey LS., *et al.* (2019)
15	Urban slum area of Berhampur Southern City of Odisha	6 Month-5 year	150	42	55.3	50	Sethy G., *et al.* (2017)
16	Rural areas of Srikakulam District of Andhra Pradesh	< 4 years	615	20.7	20.1	12.9	Ram SA and Rao MM (2016)
17	Rural area of Bhubaneswar, Odisha	2-5 years	144	42.4	44.4	17.4	Sethy S G P., *et al.* (2014)
18	Urban slums of Sambalpur District, Odisha	6-60 months	550	42.8	34.7	22.4	Present study

Table 7: Studies on Malnutrition among five-year children in India. Comparison with others studies.

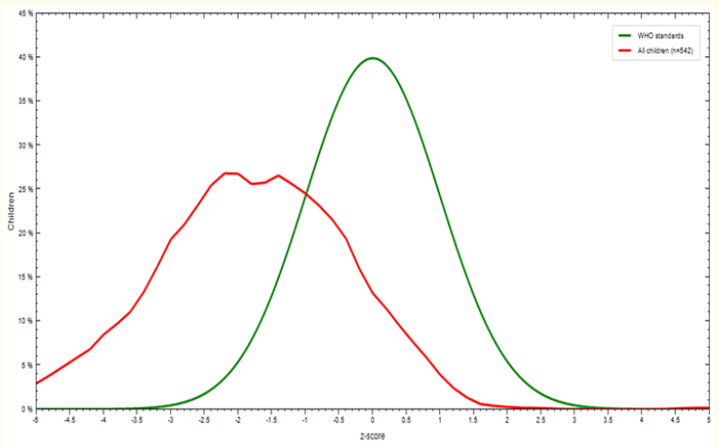

Figure 1: Stunting (Height for age) in under five children.

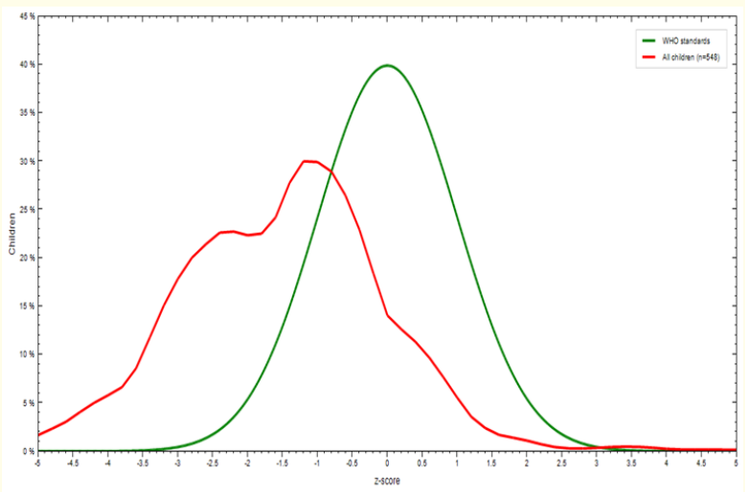

Figure 2: Underweight (Weight for age) in under five children.

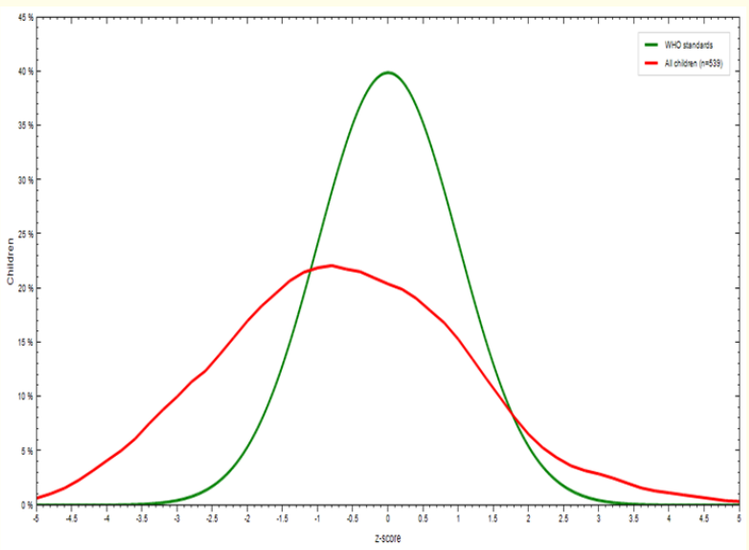

Figure 3: Wasting (Weight for height/length) in under five children.

Table 7 revealed varying prevalence rates of stunting, underweight, and wasting across different study locations, shedding light on regional differences compared to the urban slums of Sambalpur District, Odisha. Stunting rates in Sambalpur (42.2%) were similar to those in Berhampur, Odisha (42%), suggesting common socio-economic and environmental challenges, such as poor living standards and limited nutrition. Conversely, higher stunting rates in Amritsar City, Punjab (50%), and Vijayawada and Guntur (46.63%) may reflect more severe socio-economic hardships, including poverty and inadequate sanitation. In contrast, lower stunting rates in Bankura Municipality, West Bengal (15.9%), and Srikakulam District, Andhra Pradesh (20.7%) suggest better healthcare access and improved living conditions. These variations underscore the significant impact of socio-economic factors, healthcare, and local interventions on child nutrition.

Conclusion

The study found that stunting, underweight, and wasting rates in slum areas exceeded both national and state averages (NFHS-5), though wasting rates was lower than those in District Sambalpur. This highlights a higher incidence of malnutrition among children in slum areas. The analysis showed that malnutrition rates were comparable between boys and girls. Notably, the prevalence of stunting and underweight was more pronounced compared to wasting.

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