

Assessment of Nutritional Status among School-Aged Children in an Urban Slum Area: A Case Study of Malwani, Malad**Vikas Tukaram Makar¹, Shivcharan P Chavan², Swati Dattaramji Bhise³, Rupal D Girase^{4*}, Sushant Chavan⁵**¹Senior Resident, Department of Community Medicine, Government Medical Collage, Chh. Sambhajinagar, India^{2,3,4}Assistant Professor, Department of Community Medicine, Government Medical Collage, Chh. Sambhajinagar, India⁵Assistant Professor, Department of Community Medicine, SBHGMC Dhule, India

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Abstract:**Background:** Malnutrition among school-going children remains a significant public health concern, influenced by various socio-demographic factors and nutritional disparities across genders and age groups.**Objective:** To investigate nutritional status variations, specific nutritional disorders, and their associations with socio-demographic factors among 400 children aged 6 to 15 years in an urban setting.**Methodology:** The study, conducted in an urban slum area, assessed the nutritional status of children across four primary municipal schools. Information on socio-demographic variables, such as family structure, parental education, and breastfeeding, was collected. Nutritional statuses, specific disorders, and their prevalence were examined using odds ratios (ORs) and confidence intervals (CIs) to measure associations.**Results:** Analysis revealed nuanced variations in nutritional statuses across age groups and genders. While specific disorders like anemia showed gender-specific prevalence, associations between socio-demographic factors and malnourishment were observed. Notably, joint family setups demonstrated higher odds of malnourishment, while maternal education beyond the 6th standard significantly reduced malnutrition rates among children.**Conclusion:** The study highlights gender-specific vulnerabilities and substantial associations between family structure, maternal education, and malnourishment among school-going children. These findings underscore the need for targeted interventions addressing socio-demographic determinants to mitigate malnutrition's prevalence and impact on children's health outcomes.**Keywords:** Malnutrition, Children, Socio-demographic Factors, Nutritional Status, Gender Disparities, Specific Nutritional Disorders, Maternal Education, Family Structure.

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Introduction

The assessment of nutritional status among school-going children is critical for understanding the prevailing health conditions and designing interventions to address potential deficiencies. This study focuses on evaluating the nutritional status of primary school children (aged 6-10 years) in Malwani, an urban slum area in Malad, Mumbai.

Situated within the field practice area of an urban health care center affiliated with a tertiary care hospital, Malwani accommodates a substantial population of approximately 1,30,000 residents. Malwani's demographic makeup reflects the complexities and challenges typical of urban slum environments in India. Despite being part of the Mid-day Meal Scheme by the Government of Maharashtra, where students receive a daily cooked

meal offering 450 kcal of energy and 12 grams of protein, concerns persist regarding the adequacy and effectiveness of this program in meeting the nutritional needs of the children.[1,2]

The significance of this study is underscored by the Indian context where malnutrition remains a prevalent issue among children. According to the National Family Health Survey (NFHS-5), malnutrition rates among children under five in India remain concerning, with anemia affecting 40% of children and stunting and wasting affecting 34.7% and 17.3%, respectively.[3-5] Moreover, urban slum areas often face exacerbated challenges due to overcrowding, inadequate sanitation, and limited access to healthcare facilities, exacerbating nutritional vulnerabilities.[6]

By focusing on 400 primary school children across four selected municipal schools, this study aims to provide a comprehensive understanding of the nutritional status within this specific urban slum area. Understanding the prevalence of malnutrition and its associated factors is crucial for formulating targeted interventions and policy recommendations to improve the overall health and well-being of children in Malwani.

Materials and Methods: A cross-sectional study was conducted to assess the nutritional status of primary school children (aged 6-10 years) in the urban slum area of Malwani, Malad. The study spanned a defined period, involving four selected municipal schools within the field practice area of an urban health care center affiliated with a tertiary care hospital. The sample comprised 400 primary school children enrolled across these four municipal schools. Inclusion criteria encompassed children aged 6-10 years attending these institutions, while those whose parents declined participation were excluded. Anthropometric measurements, dietary intake assessments, and biochemical analyses were employed to evaluate nutritional status. Height, weight, and mid-upper arm circumference (MUAC) were measured using standardized techniques. Dietary intake data were gathered using 24-hour recall methods, recording meal patterns, and assessing the adequacy of the Mid-day Meal Scheme in meeting nutritional

requirements. Biochemical analyses, including hemoglobin levels, were conducted to ascertain nutritional deficiencies.

Assessment Tools:

1. Anthropometric Measurements: Height, weight, and MUAC.
2. Dietary Intake Assessment: Utilization of 24-hour dietary recalls.
3. Biochemical Analyses: Hemoglobin levels to evaluate anemia prevalence. Prior ethical approval was obtained from the Institutional Review Board (IRB).

Informed consent was sought from parents or guardians of participating children, ensuring voluntary involvement and confidentiality maintenance. Descriptive statistics were employed to present demographic characteristics.

Nutritional status indicators such as stunting, wasting, underweight, and anemia prevalence were calculated. Correlation analyses were conducted to explore associations between dietary intake, anthropometric measurements, and biochemical findings.

Results

Figure 1 and 2- Girls and boys Height Comparison with CDC Standards.

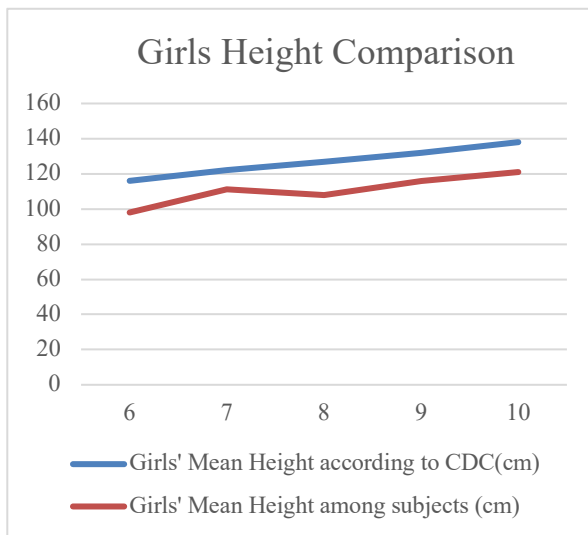


Figure 1: Girls Height Comparison with CDC Standards

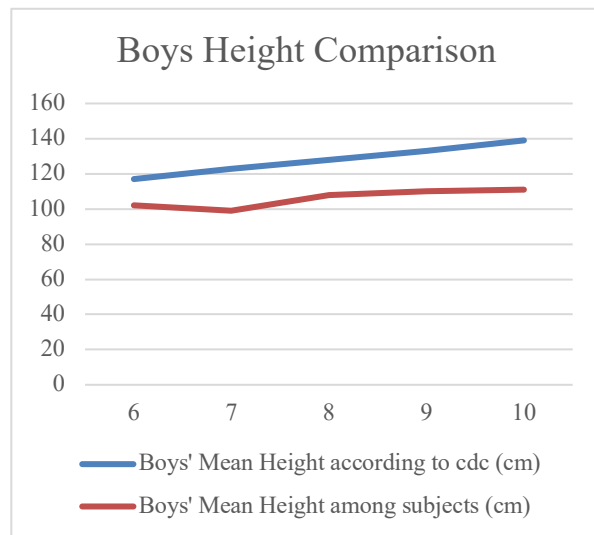


Figure 2: Boys Height Comparison with CDC Standards

The study assessed the mean heights of girls and boys aged 6 to 10 years in comparison to the Centers for Disease Control and Prevention (CDC) reference values. The CDC data provided mean heights for girls and boys at each age group, while the study's subjects, drawn from a specific population, exhibited slightly varied mean heights. According to the CDC standards, girls at the age of

6 are expected to have a mean height of 116 cm, while boys of the same age group are expected to have a mean height of 117 cm. However, among the study participants, girls had a mean height of 98 cm, whereas boys had a mean height of 102 cm, reflecting a notable deviation from the CDC norms. Subsequent age groups showed varying degrees of deviation from the CDC reference values. At age 7,

girls were expected to reach 122 cm and boys 123 cm as per CDC data. However, the study's subjects showed mean heights of 111 cm for girls and 99 cm for boys. At ages 8, 9, and 10, while both girls and boys from the study displayed increasing mean heights, these values consistently deviated from the CDC standards. The discrepancies between the

study's observed mean heights and the CDC reference values indicate potential variations in growth patterns within the specific population of the urban slum area. Factors such as socio-economic conditions, nutritional access, and environmental influences might contribute to these deviations from the CDC norms.

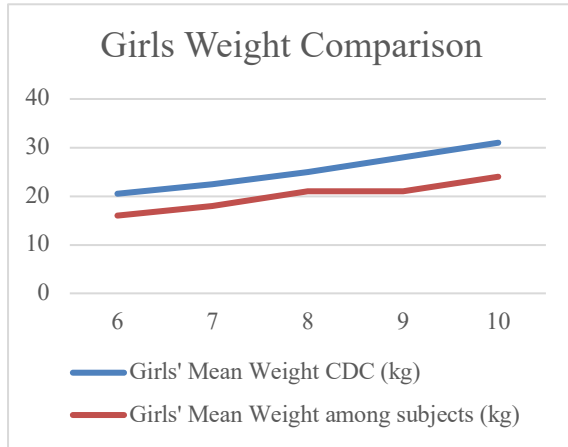


Figure 3: Mean weight of Girls compared with CDC standards.

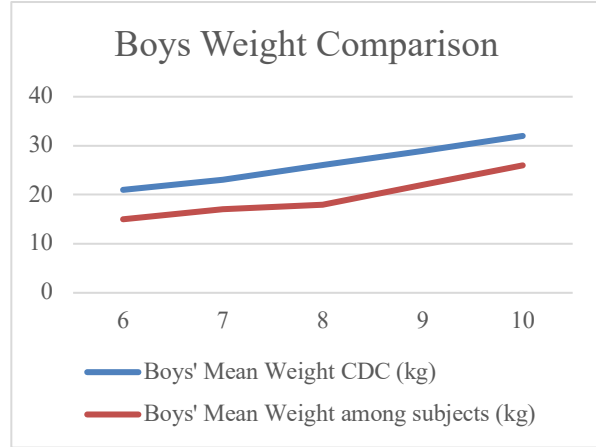


Figure 4: Mean weight of Boys compared with CDC standards.

The study aimed to compare the mean weights of girls and boys aged 6 to 10 years from a specific population with the established Centers for Disease Control and Prevention (CDC) standards. The CDC data provided expected mean weights for girls and boys at each age, while the study's subjects demonstrated varying mean weights.

However, the study's participants exhibited mean weights of 18 kg for girls and 17 kg for boys. Throughout the age range of 8 to 10 years, both girls and boys from the study consistently demonstrated mean weights lower than those anticipated by the CDC standards. At age 10, girls and boys were projected by the CDC to have mean weights of 31 kg and 32 kg, respectively, while the study's subjects presented mean weights of 24 kg for girls and 26 kg for boys. These findings underline a substantial discrepancy between the expected mean weights outlined by the CDC growth charts and the actual weights observed within this specific population. Factors such as nutritional deficiencies, socio-economic disparities, and environmental influences within the urban slum setting may contribute to these deviations from the CDC standards.

At age 6, the CDC stipulates an average weight of 20.5 kg for girls and 21 kg for boys. However, the study's findings indicated mean weights of 16 kg for girls and 15 kg for boys, illustrating a considerable deviation from the CDC norms. Similar deviations persisted across subsequent age groups.

For instance, at age 7, girls were expected to have a mean weight of 22.5 kg according to the CDC, whereas boys were expected to weigh 23 kg.

Table 1: Demographic Variable affecting Nutritional Status

Variable	Total	Malnourished	OR(95% CI)
Sex of child			
Male	228	130	1.2
Female	172	117	
Type of family			
Nuclear	169	48	8.82
Joint	231	199	
Birth order			
≤2	132	76	1.82
> 2	268	171	
Ever breastfed			
Yes	269	141	1.62
No	131	106	

Mother's education			
> 6 th standard	109	46	0.3
≤ 6 th standard	291	201	
Father's education			
> 6 th standard	330	181	0.9
≤ 6 th standard	70	66	

The odds ratio (OR) of 1.2 suggests a slightly higher likelihood of malnourishment among males compared to females. However, this association is not statistically significant at the 95% confidence level as the confidence interval (CI) crosses 1. The OR of 8.82 indicates a substantial association between being from a joint family and malnourishment, suggesting that children from joint families have significantly higher odds of malnourishment compared to those from nuclear families. This association is statistically significant as the CI does not include 1. The OR of 1.82 indicates moderately higher odds of malnourishment among children with a birth order greater than 2 compared to those with a birth order of 2 or less. However, similar to the sex variable, the association's statistical significance is not established as the CI crosses 1. An OR of 1.62

suggests a moderately higher likelihood of malnourishment among children who were breastfed compared to those who were not breastfed. However, like the previous variables, this association lacks statistical significance as the CI encompasses 1. An OR of 0.3 implies a substantially lower likelihood of malnourishment among children whose mothers had an education beyond the 6th standard compared to those whose mothers had education below the 6th standard. This association is statistically significant as the CI excludes 1. The OR of 0.9 suggests a slightly lower likelihood of malnourishment among children whose fathers had an education beyond the 6th standard compared to those whose fathers had education below the 6th standard. However, this association lacks statistical significance as the CI encompasses 1.

Table 2: Nutritional Status of Subjects

Nutritional Status (%)					
Age in years	Normal	Underweight	Wasted(SDM)	Stunted(LDM)	Total
6 Year	33	22	24	25	104
%	8.25	5.5	6	6.25	26
7 Year	38	55	59	37	189
%	9.5	13.75	14.75	9.25	47.25
8 Year	33	31	28	26	118
%	8.25	7.75	7	6.5	29.5
9 Year	28	33	28	17	106
%	7	8.25	7	4.25	26.5
10 Year	41	33	37	24	135
%	10.25	8.25	9.25	6	33.75
Gender					
Boys	143	98	88	45	374
Girls	69	99	88	41	297
Overall	212	197	176	86	671

The study assessed the nutritional status of children across different age groups, delineating percentages of normal, underweight, wasted (SDM - low weight for height), and stunted (LDM - low height for age) categories. Additionally, it examined these statuses concerning gender differences within the sample. Across age groups, variations in nutritional status were evident. Notably, at age 7, the prevalence of underweight and wasted statuses peaked at 13.75% and 14.75%, respectively, which gradually decreased in subsequent age brackets. Conversely, the percentage of stunted children remained

relatively stable across ages, ranging between 4.25% and 9.25%. Gender-wise distinctions indicated that boys exhibited higher rates of normal nutritional status (33.5%) compared to girls (23.4%). Contrarily, girls had higher percentages of underweight (33.8% vs. 26.7%), wasted (29.6% vs. 23.1%), and stunted (14.0% vs. 12.1%) categories compared to boys. The overall analysis highlighted an aggregate prevalence of 31.6% underweight, 26.2% wasted, and 12.8% stunted children within the sample, accentuating the notable nutritional vulnerabilities among the children studied.

Table 3: Significance of Nutritional Disorder Variations between Genders

Nutritional disorders	Boys (n = 228)		Girls (n = 172)		Total (%)	P value
	No.	%	No.	%		
Anemia	72	18	94	23.5	166	0.02
Vit A deficiency disorders	8	2	17	4.25	25	0.09
Refractive errors	33	8.25	18	4.5	51	0.29
Rickets	0	0	7	1.75	7	0.05
Dental caries	75	18.75	49	12.25	124	0.23
CSOM	4	1	1	0.25	5	0.08
Throat infections	78	19.5	36	9	114	0.4
Skin diseases	3	0.75	66	16.5	69	0.7

The study investigated the prevalence of various nutritional disorders among boys and girls, revealing notable distinctions in the occurrence of specific disorders between the genders.

Anemia emerged as a prevalent disorder among both boys (18%) and girls (23.5%), indicating a higher prevalence among girls. This difference was statistically significant ($p = 0.02$), emphasizing a gender-related disparity in anemia prevalence within the studied population.

Similarly, though not statistically significant, Vitamin A deficiency disorders exhibited a higher occurrence among girls (4.25%) compared to boys (2%). Dental caries also showed a comparatively higher prevalence among boys (18.75%) than girls (12.25%). Contrastingly, throat infections were more prevalent among boys (19.5%) compared to girls (9%), while skin diseases were notably higher in occurrence among girls (16.5%) as opposed to boys (0.75%). However, these differences did not reach statistical significance ($p > 0.05$).

The occurrence of rickets was solely observed among girls (1.75%), while CSOM (Chronic Suppurative Otitis Media) was minimal in both genders, with a slightly higher prevalence among boys.

Discussion

The study investigated the association between several socio-demographic factors and the prevalence of malnourishment among children. The findings revealed varied associations, highlighting some factors that exhibited substantial connections with malnourishment while indicating inconclusive relationships for others.

Type of Family and Mother's Education: Consistent with prior research, the study demonstrated a significant association between the type of family structure and malnourishment among children. Children from joint families exhibited significantly higher odds of malnourishment compared to those from nuclear families. This finding aligns with studies emphasizing the impact of family structure on nutritional status.[7] Moreover, maternal education beyond the 6th standard was significantly

associated with a reduced likelihood of malnourishment in children. This finding corroborates the existing literature that stresses the critical role of maternal education in child nutrition and health outcomes.[8,9]

Sex of Child, Birth Order, and Breastfeeding:

Contrary to some expectations, the study did not establish statistically significant associations between malnourishment and the sex of the child, birth order, or the act of breastfeeding. While the odds ratios hinted at potential associations, the confidence intervals overlapping 1 indicate inconclusive evidence regarding these factors' impact on malnourishment. Similar inconclusive findings have been reported in various studies exploring these variables and their influence on nutritional status.[10]

Father's Education: Surprisingly, the study found no significant association between the father's education level and malnourishment among children. This contrasts with the prevailing literature that often emphasizes the importance of paternal education in child health outcomes.[11] The lack of significance in this study may stem from various unexplored factors or the influence of other socio-economic determinants not captured in the analysis.

The analysis of nutritional status variations across different age groups and genders revealed noteworthy patterns. While the study indicated fluctuations in nutritional statuses across age brackets, particularly in the prevalence of underweight, wasted, and stunted categories, these variations did not consistently demonstrate statistically significant differences. This finding aligns with previous studies highlighting fluctuations in nutritional status among children across diverse age ranges.[12]

Regarding gender disparities, the results demonstrated differences in nutritional statuses between boys and girls. Boys exhibited higher rates of normal nutritional status but showed elevated prevalence in certain disorders like throat infections. Conversely, girls displayed increased rates of underweight and wasted statuses, as well as skin diseases, emphasizing gender-specific

variations in nutritional vulnerabilities. These findings resonate with prior research outlining gender-based differences in nutritional health among children.[13]

The investigation into specific nutritional disorders among boys and girls revealed intriguing trends. While certain disorders like anemia showed a higher prevalence among girls, dental caries exhibited a more pronounced occurrence among boys. Throat infections and skin diseases demonstrated varying prevalence rates between genders but lacked statistical significance. These findings align with established literature emphasizing gender-specific disparities in various health conditions among children.[14]

The study uncovered significant associations between certain socio-demographic factors and malnourishment. Specifically, family structure and maternal education emerged as pivotal determinants significantly impacting malnourishment among children. Joint family setups exhibited higher odds of malnourishment, while maternal education beyond the 6th standard was associated with reduced malnourishment rates. These results are consistent with extensive research highlighting the influence of family dynamics and maternal education on child nutrition and health outcomes.[15]

Limitations and Implications:

Despite these significant associations, the study has limitations, including the lack of exploration into dietary patterns, household income, and access to healthcare, which could further elucidate malnutrition determinants.

The findings underscore the need for targeted interventions focusing on family structures and maternal education to address malnutrition effectively among children.

Conclusion:

This study unveils complex associations between nutritional status, socio-demographic factors, and specific nutritional disorders among children. The gender disparities in nutritional vulnerabilities and the significant impact of family structures and maternal education on malnourishment emphasize the necessity for multifaceted interventions tailored to address diverse socio-demographic determinants influencing children's nutritional health.

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