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Comparison of the Nutritional and Health Status of School-Going Children Aged 6–10 Years Attending Government and Private Schools in a Rural Community of Telangana: A Cross-Sectional Study

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ABSTRACT

Background: Undernutrition among school-going children remains a major public health challenge in India, particularly in rural communities. Evidence comparing the nutritional status of children attending government and private schools in rural Telangana is limited. **Methods:** A community-based comparative cross-sectional study was conducted between July 2005 and January 2006 among school-going children aged 6–10 years in Aliabad village, Medchal district, Telangana. All eligible children from government and private schools were included using a census approach. Nutritional status was assessed using the WHO 2007 Growth Reference through WHO AnthroPlus software and classified as normal, moderate undernutrition or severe undernutrition based on weight-for-age and BMI-for-age Z-scores. Clinical examination was performed to identify common co-morbidities. Data were analysed using descriptive statistics and the Chi-square test. **Results:** Overall, 409 children were studied, including 312 (76.3%) from government schools and 97 (23.7%) from private schools. Undernutrition was present in 218 (53.3%) children, comprising 116 (28.4%) with moderate and 102 (24.9%) with severe undernutrition. Government-school children had a significantly higher prevalence of undernutrition than private-school children (61.5% vs. 26.8%, $p<0.001$). Similar differences were observed among both boys and girls and across both age groups (6–7 and 8–10 years). Ear ailments were the most common clinical co-morbidity (28.6%). **Conclusion:** More than half of rural school-going children were undernourished, with the prevalence being more than twice as high among government-school children than private-school children. These findings highlight the need for regular nutritional assessment and targeted school health interventions.

KEYWORDS: Nutrition, Undernutrition, Protein energy malnutrition, Weight-for-age, School-going children, Socioeconomic Status

INTRODUCTION

Undernutrition remains a major public health challenge worldwide and is a leading contributor to impaired physical growth, poor cognitive development, increased susceptibility to infections, reduced educational attainment and diminished productivity later in life[1-3]. Although the greatest burden occurs during the first five years of life, nutritional deficits frequently persist into the school-age years, when children continue to grow physically while facing increasing educational demands. Adequate nutrition during this period is essential for normal growth, cognitive development, learning capacity and overall health[1-4].

Protein-energy malnutrition (PEM) is the most common form of childhood undernutrition and is manifested as underweight, stunting and wasting. Underweight reflects

a combination of acute and chronic undernutrition, stunting indicates long-term impairment of linear growth, whereas wasting represents acute malnutrition resulting from recent weight loss or inadequate dietary intake. For children aged 5–19 years, the World Health Organization (WHO) recommends assessment of nutritional status using the WHO 2007 Growth Reference based on height-for-age and BMI-for-age Z-scores, which permits standardized assessment and comparison of nutritional status across populations[4].

Despite sustained national nutrition programmes, undernutrition continues to be a major public health concern in India. According to the Census of India 2011, 68.8% of the country's population resides in rural areas, where poverty, food insecurity, inadequate sanitation, limited maternal education and restricted access to healthcare continue to influence child nutrition[5]. The National Family Health Survey-5 (NFHS-5, 2019–21) reported that in Telangana, 33.1% of children under five years were stunted and 31.8% were underweight[6]. Similarly, the Comprehensive National Nutrition Survey (CNNS) demonstrated that nutritional deficiencies persist beyond the preschool years and remain common among school-age children and adolescents, highlighting the importance of nutritional assessment beyond the under-five age group[7].

Community-based studies from different parts of India have consistently reported a substantial burden of undernutrition among school-going children, although the prevalence varies according to geographical region, socioeconomic status and assessment methods. Studies from Karnataka and Punjab have documented a high prevalence of undernutrition among school-going children, particularly in rural and socioeconomically disadvantaged populations[8, 9]. Similar observations have also been reported among school children in Hyderabad, Telangana[10, 11]. However, published community-based data on the nutritional status of school-going children in rural Telangana remain limited, and few studies have directly compared children attending government and private schools within the same rural community. Such comparisons are important because school type often reflects differences in household socioeconomic status, nutritional environment and access to health services, thereby providing useful information for planning targeted school health interventions.

The present study was therefore undertaken to assess and compare the nutritional and health status of school-going children aged 6–10 years attending government and private schools in Aliabad village, Medchal District, Telangana.

MATERIALS AND METHODS

Study design and setting: This community-based cross-sectional study was conducted between July 2005 and January 2006 in Aliabad village, Medchal District, Telangana, by investigators from the Departments of Community Medicine and Paediatrics, Mediciti Institute of Medical Sciences, Hyderabad.

Study population: The study included school-going children aged 6–10 years attending three government and three private elementary schools in Aliabad village. Children who were permanent residents of the village and whose parents or legal guardians provided written informed consent were eligible for participation. Children with chronic illnesses known to affect growth (such as congenital heart disease, chronic kidney disease or tuberculosis), physical deformities precluding anthropometric measurements, acute illness at the time of examination, or incomplete demographic or anthropometric records were excluded.

Sampling method: As the study was conducted in a single village with a defined and limited population, a census approach was adopted. Complete enumeration of all eligible children attending government and private elementary schools during the study period was undertaken, and no formal sample size calculation was performed. Total 409 children were enrolled, including 312 from government schools and 97 from private schools.

Ethical approval: The study was approved by the Institutional Ethics Committee of Mediciti Institute of Medical Sciences, Hyderabad (Reference No. MIMS/IEC/2005/3). Written informed consent was obtained from the parent or legal guardian of every participating child before enrolment. Verbal assent was also obtained from children aged 7 years or older who were able to provide assent.

Data collection: Data were collected using a pre-designed and structured proforma developed for the study. Information recorded included demographic characteristics (age, sex, school name and school type), residential status, anthropometric measurements and findings of clinical examination covering skin, ear, eye and dental conditions, skeletal abnormalities and other systemic illnesses. Age was verified from school admission registers and, wherever available, birth certificates.

Body weight was measured to the nearest 0.1 kg using a calibrated weighing scale, and height was measured to the nearest 0.1 cm using a portable stadiometer. Each measurement was obtained twice by the same trained examiner using a standardized measurement protocol, and the average value was used for analysis. Every child underwent a general physical and systemic examination under the supervision of a paediatrician. Data were

checked for completeness and consistency before statistical analysis.

Assessment of nutritional status: Nutritional status was assessed using the WHO 2007 Growth Reference. Weight-for-age (up to 10 years), height-for-age and BMI-for-age Z-scores were calculated using WHO AnthroPlus software[4, 12, 13]. The cut-off criteria for both anthropometric indicators were normal nutritional status (Z-score ≥−2 SD), moderate undernutrition (Z-score −2 to >−3 SD) and severe undernutrition (Z-score ≤−3). Overall nutritional status was determined using a composite classification based on weight-for-age and BMI-for-age, with each child assigned to the more severe nutritional category identified by either indicator. Height-for-age was evaluated separately to assess stunting.

Statistical analysis: Data were analysed using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) and compared using the independent samples Student's *t*-test. Categorical variables were expressed as frequencies and percentages and compared using the Chi-square test or Fisher's exact test, as appropriate. All statistical tests were two-sided, and a *p*-value <0.05 was considered statistically significant.

RESULTS

Overall, 409 school-going children aged 6–10 years were studied including 312 (76.3%) from government schools and 97 (23.7%) from private schools. There were 206 (50.4%) boys and 203 (49.6%) girls. The mean age was 7.6±1.4 years among government-school children and 7.7±1.3 years among private-school children.

Overall nutritional status

Government-school children had lower mean height and weight than private-school children (117.2±12.1 cm vs. 121.9±9.0 cm and 18.2±4.5 kg vs. 20.6±4.4 kg, respectively).

Based on the composite nutritional assessment derived from weight-for-age and BMI-for-age, 191 (46.7%) children had normal nutritional status, 116 (28.4%) had moderate undernutrition and 102 (24.9%) had severe undernutrition. Combined together, undernutrition (moderate or severe) was observed in 218 (53.3%) children.

Government-school children had a significantly higher prevalence of undernutrition than private-school children. Overall undernutrition was observed in 61.5% of government-school children compared with 26.8% of private-school children (p<0.001) [Table. 1].

Comparison of nutritional status according to sex

The distribution of nutritional status differed significantly between government- and private-school boys (p=0.003), with a higher prevalence of moderate and severe undernutrition among government-school boys. A similar pattern was observed among girls, with government-school girls showing significantly higher levels of moderate and severe undernutrition than private-school girls (p<0.001) [Table. 2].

Nutritional status	Government school (n=312)	Private school (n=97)	Total (N=409)
Normal nutritional status	120 (38.46)	71 (73.20)	191 (46.70)
Moderate undernutrition	97 (31.09)	19 (19.59)	116 (28.36)
Severe undernutrition	95 (30.45)	7 (7.22)	102 (24.94)

Table 1: Comparison of nutritional status between government and private school children

$\chi^2_{(2)}$ =38.58, p<0.001.

Nutritional status	Govt-School boys (n=143)	Pvt-School boys (n=63)	Govt-School girls (n=169)	Pvt-School girls (n=34)
Normal status	67 (46.85)	45 (71.43)	53 (31.36)	26 (76.47)
Moderate undernutrition	41 (28.67)	12 (19.05)	56 (33.14)	7 (20.59)
Severe undernutrition	35 (24.48)	6 (9.52)	60 (35.50)	1 (2.94)
Total	143	63	169	34

Table 2: Comparison of nutritional status between government and private school children according to sex

Government boys vs. Private boys: $\chi^2_{(2)}$ =11.34, p=0.003. Government girls vs. Private girls: $\chi^2_{(2)}$ =26.22, p<0.001

Nutritional status	Govt-School 6–7 years (n=152)	Pvt-School 6–7 years (n=46)	Govt-School 8–10 years (n=160)	Pvt-School 8–10 years (n=51)
Normal status	42 (27.63)	35 (76.09)	70 (43.75)	36 (70.59)
Moderate undernutrition	53 (34.87)	7 (15.22)	42 (26.25)	12 (23.53)
Severe undernutrition	57 (37.50)	4 (8.69)	48 (30.00)	3 (5.88)
Total	152	46	160	51

Table 3: Comparison of nutritional status between government and private school children according to age group

Government vs. Private (6–7 years): $\chi^2_{(2)}$ =35.33, p<0.001. Government vs. Private (8–10 years): $\chi^2_{(2)}$ =14.96, p<0.001.

Comparison according to age group

Government-school children aged 6–7 years had a significantly higher prevalence of undernutrition than private-school children of the same age group (p<0.001). A similar pattern was observed among children aged 8–10 years, with undernutrition remaining significantly more common in government-school children (p<0.001) [Table. 3].

Clinical examination identified ear ailments as the most common morbidity (28.6%), followed by systemic conditions (29.8%), dental problems (12.0%), skin ailments (10.0%), eye ailments (5.4%) and skeletal abnormalities (2.9%). Most morbidities were more frequently observed among government-school children than private-school children [Table. 4].

Presence of co-morbidities	Government school (n=312)	Private school (n=97)	Total (N=409)
Skin ailments (eczema, fungal infections, dermatitis)	34 (10.9%)	7 (7.2%)	41 (10.0%)
Ear ailments (acute otitis media, chronic suppurative otitis media, impacted wax)	103 (33.0%)	14 (14.4%)	117 (28.6%)
Eye ailments (refractive errors, conjunctivitis, Bitot's spots)	18 (5.8%)	4 (4.1%)	22 (5.4%)
Dental problems (caries, gingivitis, malocclusion)	35 (11.2%)	14 (14.4%)	49 (12.0%)
Skeletal problems (limb deformities, scoliosis, rickets)	11 (3.5%)	1 (1.0%)	12 (2.9%)
Other clinical findings*	96 (30.8%)	26 (26.8%)	122 (29.8%)

Table 4: Clinical co-morbidities among school children

*Includes asthma, abdominal pain, lymphadenopathy and pallor.

DISCUSSION

Overall, 53.3% of the children included in this study were undernourished, with a significantly higher prevalence among government-school children than private-school children. This difference was consistently observed across both sexes and age groups. Government-school children also had lower mean height and weight, while ear ailments were the most common clinical co-morbidity identified.

The overall prevalence of undernutrition confirms that nutritional deficiency continues to be a major public health problem among rural school-going children. Similar observations have been reported across South Asia[12] and from Karnataka and Punjab[8, 9], whereas studies from Bengaluru, Meghalaya and Pune have documented comparatively lower prevalences[14-16]. These differences probably reflect variations in socioeconomic conditions, dietary practices, healthcare access and methods used for nutritional assessment. The relatively higher prevalence observed in this study may also be partly attributable to the composite classification based on weight-for-age and BMI-for-age, which categorised children according to the more severe anthropometric deficit.

Undernutrition was more than twice as common among government-school children as among private-school children. Similar differences according to school type have been reported from Andhra Pradesh and Karnataka[13, 17], while studies from Burkina Faso have also demonstrated poorer nutritional status among children attending public schools[20]. Government schools mainly have children from socioeconomically disadvantaged families; therefore, school type probably reflects underlying socioeconomic circumstances, including lower household income, poorer parental education, food insecurity and reduced access to healthcare, rather than acting as an independent determinant of undernutrition[2, 7].

Girls had a higher prevalence of undernutrition than boys in government schools, whereas no appreciable sex difference was observed among private-school children. Similar findings have been reported from Punjab[9]. However, studies from Burkina Faso have reported no significant sex difference, indicating that the influence of sex on nutritional status is likely to vary according to the social and cultural context of the study population[18-20].

Undernutrition was more frequent among children aged 6–7 years than those aged 8–10 years irrespective of school type. Comparable observations have been reported among school children in Afghanistan[21]. This pattern probably reflects persistence of nutritional deficits acquired during early childhood before adequate catch-up growth occurs.

Clinical co-morbidities were frequently observed, with ear ailments being the commonest organ-specific finding. Similar school-based studies from Karnataka and Kolkata have reported a substantial burden of clinical morbidities among school children, although the predominant conditions differed across populations[17-19]. These observations emphasise the need to integrate regular health screening with nutritional assessment as part of school health services.

The strengths of this study include its community-based design, inclusion of both government and private schools from the same rural community, complete enumeration of eligible children, and nutritional assessment using the WHO 2007 Growth Reference through WHO AnthroPlus software. Clinical examination of all participants under paediatric supervision further strengthened the study. However, the cross-sectional design precludes causal inference. Information on socioeconomic status, dietary

intake, parental education and household characteristics was unavailable, limiting evaluation of determinants of undernutrition. Height-for-age categories could not be presented separately because the original WHO AnthroPlus outputs were unavailable during manuscript preparation. The study was also confined to a single rural village, which may limit the generalisability of the findings.

The high burden of undernutrition observed among rural school-going children, particularly those attending government schools, highlights the need to strengthen school health services. Periodic growth monitoring, nutritional assessment, health education, early identification of undernutrition and timely referral should be integrated into existing school health programmes. Such measures may contribute to improved nutritional status, better educational performance and healthier adulthood.

CONCLUSION

More than half (53.3%) of school-going children aged 6–10 years were undernourished, with a significantly higher prevalence among government-school children (61.5%) than private-school children (26.8%). Government-school girls and younger children were particularly affected. These findings indicate that undernutrition remains an important public health problem among rural school-going children in Telangana.

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