

ANTHROPOMETRIC ANALYSIS OF MALNOURISHED SCHOOL CHILDREN FROM INDIA

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ABSTRACT

Background: Recently, India has made considerable progress in addressing some public health issues, but child malnutrition remains a challenging issue.

Objectives: The aim of this study was to conduct anthropometric analysis of malnourished children aged 6-12 years.

Methods: This cross-sectional study was conducted among children aged 6-12 years at Biliya Boys and Girls Government School in Patan District. Descriptive analysis was performed using Statistical Package for Social Sciences (SPSS) was used to complete the descriptive analysis.

Results: A total of 339 school children were eligible for evaluation in this study, where maximum (54%) of them being male. The average height, weight, and Body Mass Index (BMI) of male participants' 128.50 cm, 37.84 kg and 15.41kg/m², respectively. Most children were classified as underweight.

Conclusion: In this study, the anthropometric measurements including Weight, Height and BMI of the study participants were evaluated. The BMI was consistently noted to be of the underweight category reflecting that these participants were malnourished.

INTRODUCTION

Malnutrition means certain deficiency in nutrient intake, imbalance of essential nutrients or improper utilisation of nutrients. Despite several public health campaigns, malnutrition is still considered as one of the most serious public health issues, particularly in developing countries from South Asia and Sub-Africa. Higher Malnutrition rates are recorded among

children and women, forming a high-risk group.¹

India is among the worst hit from malnutrition, though some progress from Government is reported to have caused reduction in malnutrition. Despite progress, malnutrition continues to affect over growing high-risk population in India, especially among school-aged children.² The issue of malnutrition is multifaceted and complicated by socio-economic factors, food security and

healthcare accessible services.³ These factors have also profound impact on the childhood malnutrition in India. More precisely the school aged children are severely impacted by nutritional deficiencies.⁴

School age is a critical period for physical and mental health development in every child. Childhood malnutrition can impact child's motor, sensory, cognitive, behavioral, social and emotional development.⁵ Further, a malnourished child can suffer from absenteeism, unsatisfactory scholastic performance and is generally more prone to increased risk of developing disease, causing morbidity or even mortality cases.⁶

Government of India through its public health programme (Integrated Child Development, public Distribution system, Midday Meal scheme, Janani Shishu Suraksha Karyakram) promotes and aim to alleviate childhood malnutrition but the results are not satisfactory. Government of Gujarat's PURNA (Prevention of Under nutrition and Reduction in Nutritional Anaemia) and Mission Poshan 2.0 aims for providing holistic nutrition in children.⁶

Published literature have reported higher rates of childhood malnutrition in India. In addition, in spite of few studies conducted at the state level, the anthropometric analysis of school children from Gujarat is under reported.⁷

Therefore, this study aims to conduct anthropometric analysis of malnourished children aged 6-12 years in selected Biliya Government Boys and Girls School from Patan District, Gujarat, India.

MATERIALS AND METHODS

From January 2024 to April-2024, a cross-sectional study was conducted in Biliya

Government Boys and Girls School, Patan District, Gujarat, India using simple random sampling methodology. This sampling methodology provided equal and independent chance of being selected for the sample. All selected children of age 6-12 years, irrespective of caste, religion, socio-economic status who were available at the time of data collection were included in this study. The sample size was determined by using 95%CI and a proportion of 0.5, with an alpha of 5% and power of 80%, the sample size needed was 373. Participants with chronic infectious and non-infectious diseases, hereditary and congenital diseases, juvenile diabetes and all systemic disorders were not allowed to participate in the study.

A total of 34 participants were excluded due to missing or incomplete data. As a result, 339 (90.88% of those who were eligible) children took part in the study. Before the onset of data collection, the researcher briefly visited study area to meet school principal and to inform them regarding the study objectives and data collection process. Written informed consent was collected from the student's guardians. Parul Institute of Ayurved, Parul University Institutional Ethics Committee provided ethical approval and necessary permission prior to the conduct of this study. The current study was carried out in accordance with the principles of Helsinki Declaration. And the present study applied the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Participants' height was measured using a stadiometer (measuring rod) capable of measuring with an accuracy of 0.1 cm. In order to measure participants' weight, they were instructed to stand on the balance

with light clothing and without footwear and with feet apart and looking straight ahead. Weight was recorded to the nearest value. The BMI was calculated using the participants' height and weight measurement. The assessment of BMI was undertaken by the Weir and Jan's method.¹² The age of the participants was verified from their birth certificates.

The collected data was entered in Microsoft Excel. SPSS was used to complete the descriptive analysis.

RESULTS

A total of 339 school children were eligible for evaluation in this study, with 54% of them being male (**Figure 1**).

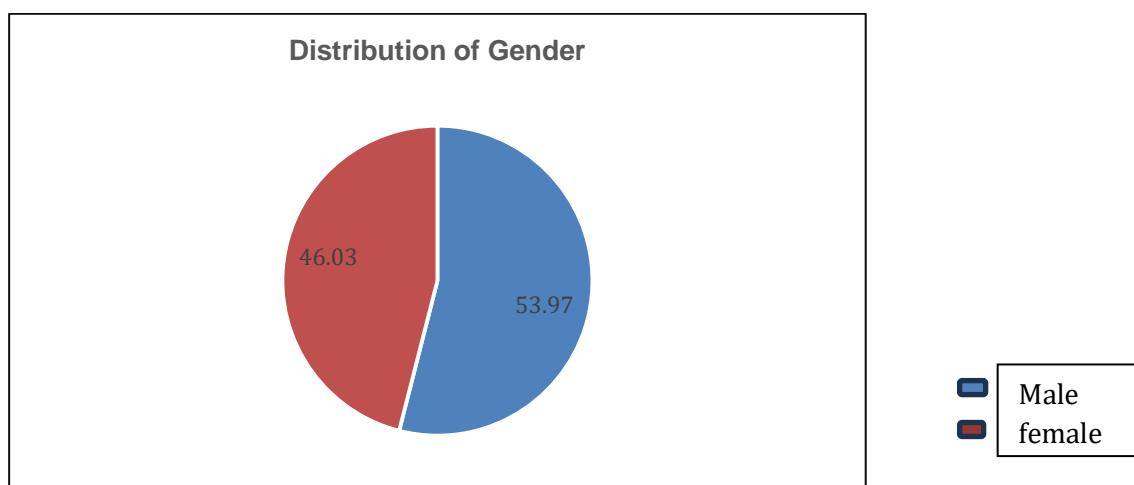


Figure 1: Distribution of Gender among study participants'

The overall boys study participants' average height, weight and BMI were 37.84kg, 128.50cm and 15.41kg/m², respectively. The overall girls study participants' average height, weight and

BMI were 32.85kg, 127.51cm and 15.42kg/m², respectively. The detailed summary of height, weight and BMI for all the study participants' is tabulated in below **Table 1**.

Gender	School Standard	Frequency	Weight		Height		BMI		Assessment
			Mean±SD	95% CI	Mean±SD	95% CI	Mean±SD	95% CI	
Boys	1	16	20.00±2.85	19.45-21.10	115.25±6.49	113.99-117.75	15.02±1.44	14.74-15.57	Underweight
	2	16	19.13±2.63	18.61-20.14	113.50±5.39	112.45-115.57	14.79±1.12	14.57-15.22	Underweight
	3	16	20.38±1.78	20.03-21.06	116.00±5.71	114.89-118.20	15.16±1.09	14.94-15.58	Underweight
	4	16	22.81±1.97	22.43-23.57	125.63±4.51	124.75-127.36	14.45±0.88	14.28-14.79	Underweight
	5	16	28.94±9.19	27.15-32.47	131.81±8.10	130.24-134.93	16.32±3.15	15.70-17.53	Underweight
	6	16	27.25±4.83	26.31-29.11	133.81±3.70	133.09-135.24	15.23±2.67	14.71-16.25	Underweight
	7	16	34.06±4.62	33.16-35.84	146.06±6.92	144.72-148.72	16.02±2.32	15.56-16.91	Underweight
	8	17	34.88±4.49	34.01-36.61	145.94±7.29	144.53-148.74	16.35±1.48	16.06-16.92	Underweight
Girls	1	14	20.14±2.31	19.69-21.03	114.79±6.49	113.52-117.28	15.30±1.39	15.03-15.84	Underweight
	2	14	20.36±2.73	19.83-21.41	116.29±7.48	114.83-119.16	15.03±1.07	14.82-15.44	Underweight
	3	14	20.79±2.60	20.28-21.79	116.93±7.94	115.39-119.98	15.18±0.96	14.99-15.55	Underweight
	4	14	22.79±1.80	22.44-23.48	124.50±5.22	123.48-126.51	14.69±0.57	14.58-14.91	Underweight
	5	14	25.21±3.26	24.58-26.47	124.43±5.40	123.38-126.51	16.30±1.87	15.93-17.02	Underweight
	6	14	26.14±3.97	25.37-27.67	133.64±3.93	132.88-135.16	14.65±2.23	14.22-15.51	Underweight
	7	14	34.07±5.52	33.00-36.20	144.93±6.91	143.59-147.59	16.23±2.36	15.77-17.13	Underweight
	8	12	33.42±5.03	32.44-35.35	144.58±6.96	143.23-147.26	15.95±1.80	15.60-16.64	Underweight

Table 1: Summary of Anthropometric Measurements of the Study Participants' (n=339)

DISCUSSION

Despite significant economic improvement over the last two to three decades and an overarching goal of addressing health needs through a variety of comprehensive programs, India's health outcomes have been suboptimal. The likelihood of a child being undernourished increased with age, according to one study.⁸ In terms of stunting and thinness, the age gap was significant. The increased frequency of parasite infection seen with increasing age may be linked to the higher prevalence of undernutrition among older children.⁸

Similarly, many studies in India and elsewhere have found that older children are more prone than younger children to become malnourished. In comparison with girls, boys had a greater chance of being malnourished.⁹ Boys were found to be more likely than girls to be undernourished, consistent with findings from the National Family Health Survey (NFHS-5) 2019-2021 conducted in Gujarat.¹⁰ The cause of the gender gap in undernutrition is unknown; however, some studies have found that boys are more influenced by environmental stress while playing, such as frequent illnesses and exposure to toxins and air pollution, than girls.

The literature on the causes of malnutrition is extensive. Low diet, poor socio-economic conditions, environmental, socio-demographic inequality, and ethnicity are the main causes of undernutrition in developing

countries. Socio-economic, cultural, and environmental factors that interfere with nutrient intake have a greater impact on malnutrition.¹¹

Limitation: Low sample size in this study means its findings cannot be generalized to the entire population of children between 6-12 years old age.

CONCLUSION

In this study, the anthropometric measurements including Weight, Height and BMI of the study participants were evaluated. BMI measurements indicated consistent 'underweight' category among participants. This study recommends an improved implementation of Mid-Day Meal Scheme (also known as Pradhan Mantri Poshan Shakti Nirman/PM POSHAN) in children between 6–12-year age within the study area. Access to clean drinking water as well as sanitation and hygiene standards should be prioritized by the policy makers.

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Author Contributions

Dr. Nikita Parmar conceptualized the study, designed the intervention, collected and analyzed the data, and

prepared the manuscript. The entire work, including literature review, statistical analysis, and final drafting, was carried out by the author as part of her Ph.D. research under academic supervision.

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Declaration on the Use of Artificial Intelligence (AI)

AI tools (specifically ChatGPT by OpenAI) were utilized only to assist in language refinement, grammar correction, and formatting of the manuscript. All scientific content, data interpretation, and conclusions were independently developed and verified by the author.

Conflict of Interest

The author declares no conflict of interest related to this study or the publication of this manuscript.

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