NUTRITIONAL STATUS OF SCHOOL GOING CHILDREN IN INDIA

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ABSTRACT

Stronger immunity, fewer illnesses, improved health, and a productive society are all results of good eating. The majority of school-age children in India are undernourished or malnourished. This review was conducted to determine the prevalence of childhood obesity, overweight, and stunting in rural and urban locations throughout India. The American Journal of Clinical Nutrition, Research Gate, PubMed, Google Scholar, and surveys of various organizations, such as the websites of the Ministry of Women and Child Development of the Government of India and various state governments, were used to review thirty studies for this purpose. All of the research used dietary recalls, structured interviews, and anthropometric measurements for data collection. The findings of many studies reveal that the underweight kids

Keywords: Malnutrition, Under-nutrition, Stunting, Wasting, Underweight

INTRODUCTION

The age at which a person starts school is crucial since this is when the body stores the majority of its nutrients. These shops aid in children's quick development. Stronger immunity, fewer illnesses, improved health, and a productive society are all benefits of good diet [1]. One billion school-aged children will have physical and mental development problems by 2020, and more than 200 million school-age children are hungry, primarily undernourished. Children who attend school are the main source of the future labor force and will contribute to the improvement of the socioeconomic situation in developing nations like India. Therefore, the most important goal that can be accomplished by sufficient diet for these kids is their mental and physical health [2]. Children who do not receive enough of the essential macro- and micronutrients, such as carbohydrates, proteins, lipids, vitamins, and minerals (iron, calcium, potassium, magnesium, phosphorus, iodine, etc.), may not be able to achieve their academic potential [3]. The quantity and quality of food consumed by children typically alter as they go from childhood to adolescent. They do not prioritize eating well while they are young, and this can result in a number of health issues.

Dieticians, nutritionists, scientists, healthcare professionals, and policymakers have been searching for tools to measure diet quality since the dawn of the twenty-first century so that dietary assessments can be made for the

population's required food quality. Diets are primarily divided into two basic categories: good quality, which is diet is rich in fruits and vegetables content, and bad and unhealthy foods, which is diet contains high fats and processed foods. However, it is thought to be challenging to evaluate the quality of diet in terms of consumption of specific food items; instead, it is more difficult to create a single signal for the evaluation of diet quality overall [4,5]. The combination of foods that groups of people eat, which comprise the overall diet, rather than the presence or absence of specific food items, is increasingly recognized as being of ultimate importance to nutritional health status [6]. Although there is evidence to support the positive impact of individual food items, such as fruit and vegetables, on long-term health and well-being. As a result, McNaughton, SA; Ball, K; Crawford, D; and Mishra, GD propose that assessments of children's diets should look at both the sorts of foods that make up their entire diet as well as specific food items or nutrients.diet [7]. There are two main methods that researchers have imagined measuring the overall quality of a diet. Food patterns and Diet Quality Indexes are the first two.

Food patterns are concerned with the combinations of foods eaten, while Diet Quality Indexes take into account the nutritional content of various foods in relation to recommendations. The measurement of diet quality by dietary patterns rather than a specific food or nutrient is becoming a rising area of study in nutritional epidemiology [8]. The balance of the various dietary components is essential, and the dietary pattern analysis method takes into account the fact that meals are frequently taken in complicated combinations.

The primary pediatric health issue affecting a sizable portion of children in poor nations is malnutrition [9]. At least half of all juvenile fatalities worldwide are attributable to malnutrition, and solely undernutrition is to blame for one-third of all child fatalities [10]. It is responsible for 11% of the worldwide illness burden. It is more common in nations with lower- and middle-class populations [11]. A significant public health issue is childhood malnutrition [12]. In 2005, pediatric malnutrition was a risk factor for 16.% of diseases worldwide and 22.4% of diseases in India. The percentage of underweight children in India is 47%, the highest in the world and nearly twice the rate in Sub-Saharan Africa [13]. Future human growth is dependent on the survival, protection, and development of today's children because they are the world's citizens of tomorrow [14].

To recover from the inadequacies experienced in childhood, good nutrition is crucial during the school years. Children's ability to digest, absorb, and utilize food, as well as gender-based discrimination, can all have a significant impact on their ability to receive a sufficient diet [15]. Children's and young people's health is critically important. Children between the ages of 5 and 14 make up more than one-fifth of our population, or the age range for primary and secondary schooling. It will be impossible to considerably increase economic development without guaranteeing appropriate kid growth and development.

Malnutrition, which includes both extremes of under- and over-nutrition, leads to significant physical and mental suffering in children and is against their basic human rights. Both of them make a youngster more susceptible to

developing a number of disorders as they age. Given that children are growing rapidly at this time, their health is very important. A living organism is a byproduct of nourishment, which is a fundamental condition for optimum health [16]. A growing concern for children's health is being expressed globally due to social changes and rapid economic expansion. One of the key factors influencing an adult's health state is their nutritional status as a youngster.

The most prevalent nutritional issue affecting children under the age of five worldwide is PEM (Protein Energy Malnutrition). Between 20% and 80% of elementary school students have dietary deficits. It is crucial to improve the general health of the kid population, and nutritional evaluation of children is the only way to do this [17]. Both undernutrition and overnutrition are referred to as malnutrition. A healthy diet results in a stronger immune system, better health, and increased productivity. A sizable portion of the population in India suffers from various types of malnutrition, including deficiencies in macro- and micronutrients [1].

LITERATURE SOURCES

Research Gate, PubMed, Google Scholar, the American Journal of Clinical Nutrition, and the book "Nutritive Value of Indian Foods", NIN (ICMR), were all used to gather all the studies for this review paper. All of the studies under consideration used a variety of approaches to collect data, including structured interviews to learn about eating habits, meal recalls, anthropometric measures, and biochemical analysis. The findings pertaining to several elements affecting the children's nutritional status were examined. The publications were open access and distributed under the creative commons attribution license, which allows for unrestricted use, distribution, and reproduction in any form so long as the original work is properly attributed. The studies were chosen from the category of advanced research.

RESULTS

To recover from the inadequacies experienced in childhood, good nutrition is crucial during the school years. Children's ability to digest, absorb, and utilize food, as well as gender-based discrimination, can all have a significant impact on their ability to receive a sufficient diet [15].

In the Hisar area of Haryana, Sati V and Dahiya S studied 200 rural school-going children between the ages of 7-9. data gathering was completed over the course of three days using anthropometric measurements and the 24-hour dietary recall method. The findings demonstrated insufficient food and nutrient intake, and anthropometric parameters were significantly below the reference value (p 0.05). In addition, 55.5 percent of kids were underweight and 54.1 percent were stunted [1].

Similar research was done by Murugkar DA, et al., who evaluated the nutritional condition of 200 school-age children (ages 6 to 9) in the Madhya Pradesh district of Bhopal. Data collection methods included kid interviews with food frequency questions, 24-hour dietary recall, and anthropometric measurements such as height and weight. All of the

children's weight, height, and BMI were noticeably lower than the reference value (p 0.05). Results also revealed that, aside from fat, the children's diet lacked all the major and minor nutrients necessary for their growth, leaving 55% of them wasted and 47% seriously undernourished. The study came to the conclusion that severe malnutrition in school-age children was caused by dietary deficiencies, poverty, a lack of infrastructure, and poorly educated moms [2].

Amruth M. et al. carried out a descriptive cross-sectional study on 424 primary school students in Sullia, Karnataka, to determine their nutritional status and dietary risk factors for malnutrition. Anthropometric measurements and a probability proportional to size sample technique were used, and results were statistically analyzed. The findings demonstrated the prevalence of underweight; stunting and thinness are respectively at 26.5%, 19.2%, and 26.5%. Additionally, it was shown that children attending private schools had better nutritional status than those attending public schools, and that malnutrition was more common in boys than in girls and in children living in joint households [4].

500 children in three Government Urdu higher primary schools in Azad Nagar and its surroundings participated in a cross-sectional study on nutritional evaluation conducted by Hasan I, et al., from Bangalore. Malnutrition was observed to affect 52% of school-aged children overall (260). Male malnutrition prevalence was 53.85% (161) while female malnutrition prevalence was 49.25% (99). Boys were more likely than females to experience stunting (41.47% versus 38.81%). Additionally, it was discovered that socioeconomic position and personal hygiene were strongly correlated with nutritional status [16].

The nutritional condition of school-age children between the ages of 5 and 14 in a rural health block of North India (Kashmir) was also evaluated in a study by Fazili A, et al. using the WHO Z-Score System. The rate of underweight overall is 11.1%, stunting is 9.25%, and wasting is 12.3%, according to study findings [17].

In a study conducted by Nigudgi SR, et al. in Gulbarga, Karnataka, 935 students in higher primary schools were evaluated for their nutritional status, the prevalence of specific deficiency disorders, and their level of personal hygiene. The results revealed that 50.05% of the students were underweight for their age, 22.35% had specific deficiency diseases, including bitot's spot in 48.80% of the students and anemia in 10.05%. Schoolchildren had good personal hygiene in 91.44% of cases [18].

Ruchika H. et al. investigated 150 school-going children from Allahabad in the 7–10 age range. Data were gathered using the three-day dietary recall approach. Children's heights, weights, and mid-upper arm circumference were recorded, along with estimates of their hemoglobin levels using the cyanmethaemoglobin technique. Results from a clinical assessment of anemia were also collected, and they showed that these kids' weight and height were significantly below the national averages (p 0.05%). Anemia was present in 65.33% of the population, with mild anemia accounting for 53.33% of those cases and significant anemia for 12% [19].

According to a study by Navaneethan P, et al., 83% of students in Vellore, Tamil Nadu, who were enrolled in school

and were between the ages of 11 and 18 were underweight for their age. Only 16% of the students had a BMI between 18.5-24.9, which is considered normal. The remaining kids had BMIs between 25 and 29.9, which is considered overweight, and 30-35.9, which is considered obese. According to this regression model, a person's BMI is highly influenced by their age, sex, and father's profession. According to the study's findings, it is possible to eradicate malnutrition in schoolchildren by increasing access to wholesome foods and enhancing their socioeconomic environment (SEB) [20].

In a different study, Jain M. et al. evaluated the nutritional status, observed the quality of the diet, and their association in 120 children aged 7-9 from three schools in the town of Bilaspur in the Rampur district of Uttar Pradesh, India. The socioeconomic status was measured using the Kuppuswamy socioeconomic status scale, and data was collected using a self-designed questionnaire. The 24-hour dietary recall and anthropometric measures were utilized to collect Nutrient adequacy ratio and mean adequacy ratio were derived using data on food and nutrient intake. 5.8% of kids were underweight and 0.83% were extremely underweight, according the weight for age Z-score. For calories and iron, nutrient adequacy was insufficient, while for fat, it was 75% over average. Diet quality has no relation to the respondents' anthropometric measures. Nutrient intake and diet quality score showed a slight positive link, and there was no statistically significant relationship between children's socioeconomic position and diet quality (p>0.0.5) or their nutritional status (p>0.05) [21].

among a cross-sectional study, Inkhiya S. and colleagues evaluate the prevalence of malnutrition among 300 schoolchildren in Bikaner, Rajasthan, aged 6 to 12. On a stratified random sample of youngsters, pretested questionnaires were used to collect the data. According to the findings, malnutrition was shown to be present in 49.66% of cases of underweight, overweight, and obesity based on BMI for age, correspondingly [22].

NC Ashok, et al. conducted a second cross-sectional study to evaluate the nutritional status of 1566 public and private primary school students in Mysore city between the ages of 6 and 12. Demographic information, the child's eating habits and physical activity, the parents' employment status, occupation, and monthly income were all obtained. The findings revealed that 65 children (4.1%) were fat, 132 children (8.4%) were overweight, and 385 children (24.5%) were underweight. 226 (32.5%) of the underweight kids were detected at the government school. The study indicated that the child's socioeconomic level, eating habits, and physical activity were the main drivers of their nutritional status [23].

Mukherjee R, et al. conducted a cross-sectional study to ascertain the nutritional status of 760 schoolchildren in Army School, Pune. Data were gathered, and relationships between nutritional status and socioeconomic status, parental education levels, mothers' employment status, and family size were found. The findings revealed that stunting was common (13.81%), wasting was common (6.71%), and undernutrition was common (9.87%). The study also found a strong relationship between the child's nutritional condition and the mother's education level, weight, socioeconomic

status, and family size [24].

Karnataka Shivaprakash NC and Joseph RB conducted an observational cross-sectional study on 484 rural school-aged children (6–12 years old) in the Mandya district to evaluate their nutritional status. An anthropometric evaluation and a clinical examination were used to gauge the children's nutritional condition. The findings revealed that stunting affected 13.5% (135) and underweight affected 30.3% (147) of the population overall [25].

Another cross-sectional study conducted by Shashank KJ and Chethan TK to evaluate 284 school-going children between the ages of 6 and 12 in the Bijapur district of Karnataka revealed that 97 children (34.15%) were underweight and 25% were stunted. Applying the Chi-square test revealed that the study's link between sociodemographic factors such gender and parents' educational attainment and children's underweight was statistically insignificant [26].

An anthropometric measurement, a clinical examination, and a pre-designed and pre-tested questionnaire were used in a cross-sectional study by Srivastava A, et al. on 512 schoolchildren in the age range of 5 to 15 years to evaluate the nutritional status of school-age slum children and to analyze factors linked to malnutrition in urban slums of Bareilly, Uttar Pradesh (UP), India. In all age categories, the boys' and girls' mean height and weight in the study group were lower than the CDC 2000 (Centers for Disease Control and Prevention) criteria. 46.8% of children were normal, 38.4% were underweight, 33.3% were wasting, and 19.9% were stunted, according to the study. While the frequency of wasting was highest in the age group of 5 to 7 years, the prevalence of stunting and underweight was highest in the age group of 11 to 13 years [27].

Shaikh MK, et al. did a descriptive cross-sectional study with 820 children aged 6 to 11 from chosen government primary schools (Urban and Rural) in Karimnagar city, Telangana, India. An anthropometric measurement and standard questionnaire were used to obtain the data. The findings indicated that, correspondingly, 29.3% of children in rural areas and 22.2% of children in urban areas were underweight. Similar to this, 16% of children from urban areas and 21.5% of children in rural areas [28] were stunted.

Using anthropometric data on children in the Kozhikode district, Manjula AA and Aravindan KP evaluated the nutritional status of 862 students in various types of schools. The findings indicated that in schools in both affluent and impoverished areas, the frequency of stunting is 12.9%, that of underweight 46.3%, and that of overweight 65.5%. 10.6% of pupils are overweight, while severe malnutrition is quite uncommon [29].

Debottam Pal, et al. conducted a multistage cross-sectional study on 24,108 primary and upper-primary pupils from the entire state of West Bengal using the stratified cluster random sampling method. Using SAS-9.4, descriptive and regression analyses were performed. According to the findings, there were around 22.8% of people who were undernourished, and 54% of them were at danger of becoming undernourished. Just 17% of the students had an acceptable level of nutrition [30].

Madhur Verma, et al. analyzed the nutritional condition of kids and teens in the 5–18 age range as part of the Punjabi

district of Fatehgarh Sahib's "Rashtriya Bal Swasthya Karyakram" using secondary data analysis. The study collected data on 897 youngsters in total. 352 kids between the ages of 5 and 9 made up this age group, and 58.8% of them were severely underweight, 37.4% were stunted, and 31.8% were thin. 19.4% of children aged 10 to 18 had severe stunting, and 26.9% had severe underweight [31].

Sweta Saxena and Sunita Mishra evaluated the nutritional status of 100 school-going youngsters in the Lucknow district between the ages of 7-9. Five different schools were used to pick these individuals. According to the findings, 15% of students had severe stunting, 22% had moderate stunting, and 25% had mild stunting. Similar to this, 30% of pupils were barely spent, 24% were barely wasted, and 3% were severely wasted [32].

Cynthia Subhaprada S conducted a second descriptive cross-sectional study on 101 government elementary school students aged 6 to 10 in a Kurnool, Andhra Pradesh, urban slum. The students were chosen by a methodical random sample. According to the findings, 38% of kids were at a healthy weight for their age and 63% were undernourished [33].

According to a study by Mondal T. et al., the prevalence of thinness was 65.4% in boys and 65.3% in girls among 8 to 9-year-old primary school students from 183 government-aided schools in West Bengal. The prevalence of underweight was 39.7% in boys and 36.5% in girls. Additionally, 22.9% of girls and 26.1% of boys had stunted growth [34].

In Kinnaur, Himachal Pradesh, Singh H. et al. conducted a cross-sectional survey on 350 indigenous preschoolers between the ages of three and five. According to the findings, stunting was 27.4%, wasting was 11.1%, and there were 21.4% more underweight children than average [35].

In a different cross-sectional study, schoolchildren aged 5 to 13 in Ahmedabad's urban area were studied. Boys made up 15,087 of the 28,256 youngsters in the sample, while girls made up 13,169. The findings revealed that 0.78% (221) of children were overweight or obese and 29.44% (8,319) of children were underweight [36].

Another study by Osei et al. on 499 children aged 6 to 10 in a highland agrarian community in Tehri Garhwal District, Uttarakhand, revealed that 60.9%, 56.1%, and 12.2% of the children had stunting, wasting, and underweight, respectively [37].

Sethy G., et al. examined 300 kids in a cross-sectional research in an urban slum region of Berhampur, Odisha. According to the study's findings, 69% of children had undernutrition, including 55.3% who were underweight, 75% who were wasting, and 42% who were stunted. The study backs up the notion that improper feeding, hygiene practices, and maternal education all contribute to child malnutrition [38].

In a descriptive research conducted in Chandigarh by Kashyap R and Kaur S on 3,793 schoolchildren, it was discovered that 1.5% of the students were fat, 2.3% were overweight, and 73.3% were underweight. The study

contends that children in India with high socioeconomic level frequently exhibit overnutrition [39].

Another study by Cherian AT, et al. found that 3.0% of boys and 5.3% of girls in 1634 school children aged 6 to 15 in Kochi, Kerala were obese. Additionally, according to this study, obesity (7.5%) and overweight (21.9%) were most prevalent in high socioeconomic rank and least prevalent (1.5% and 2.5%, respectively) in low socioeconomic status [40].

Meshram II, et al. conducted a community-based cross-sectional study on 14,587 children aged 0 to 5 years in ITDA areas of nine Indian states, including Andhra Pradesh, Gujarat, Kerala, Karnataka, Maharashtra, Madhya Pradesh, Odisha, Tamil Nadu, and West Bengal. The findings showed that the prevalence of underweight was 49%, stunting was 51%, and wasting was 22%. This study also provides evidence that maternal literacy, morbidity patterns, and socioeconomic status all play a role in children's undernutrition [41].

Ghosh J, et al. carried out a second cross-sectional study on the Santal-Munda tribal group in West Bengal's North 24 Parganas district's Amdanga area. According to the study's findings, stunting, wasting, and underweight prevalence rates were correspondingly 38.65%, 21%, and 32.7%. Children who were severely underweight (8.40%), stunted (4.20%), and waste (9.20%). Additionally, this study revealed that preschoolers had greater malnutrition than children who attended school [42].

According to India's Ministry of Women and Child Development's most recent annual report for the years 2020–21, 38.4% of children under the age of five are stunted, while 35.7% of children under the age of five are underweight. Despite these advancements, the country's anemia and undernutrition rates for mothers and children are alarming and demand immediate attention [43].

DISCUSSION

The beginning of human life is when a person enters school. Future life will be robust if the foundation is firm. But despite numerous initiatives by governmental and non-governmental organizations, malnutrition remains a significant issue that hinders children's healthy development and growth, which causes a variety of morbidities and subpar academic performance. Children who are malnourished experience long-term effects in their later years. It is everyone's duty to pay regular and ongoing attention to children's health and nutritional status, including parents, teachers, social workers, the government, researchers, and all dieticians. Children of today will grow up to be responsible adults who contribute significantly to society's expansion and advancement. Although there has been a rise in children's nutritional status, there are still many undernourished children in developing and impoverished nations. The nutritional health of children is significantly influenced by gender, education, SES (Socio-Economic health), demographic factors, and agricultural diversification, according to a study of numerous studies. Because educated caregivers/mothers understand the value of a balanced diet, it was shown that the children of moms with greater levels of education had better nutritional status. As a result,

emphasis should be placed on girls' education because they will eventually become mothers.

Additionally, it was discovered that children from rural areas suffered from higher malnutrition than their urban counterparts. Therefore, efforts should be undertaken to raise family incomes, diversify agriculture, enhance infrastructure, and provide amenities in rural areas. To improve the nutritional status of children, nutrition and health subjects should be taught in schools and other institutions.

CONCLUSION

After studying the literature and the statistics that are accessible for this article, it has been determined that even after implementing various methods to minimize child malnutrition, the majority of the beneficiaries still require assistance. Therefore, additional efforts must be made locally to assist the beneficiaries. This can be accomplished through raising the socio-economic status (SES) of the families, the level of education, promoting gender equality, appropriately administering government programs, diversifying the food supply, and enlisting the help of governmental and non-governmental organizations (NGOs). It is advised that parents, guardians, and other caretakers regularly monitor the diets of youngsters. The mid-day meal in schools, other feeding programs, and Anganwadi (pre-schools) should all be periodically examined to determine whether any adjustments are necessary. They should be reorganized in accordance with the seasonal food items that are readily available so that children's needs for each food category, food items from each group, and Dietary Diversity Score (DDS) can be satisfied. By providing comprehensive care for children's health and wellbeing during the school years, school health services may play a significant role in the development of every child. Since education and health are closely intertwined, schools are the best place to benefit from health education. Instead of focusing on a treatment, health education should place more of an emphasis on health problem prevention.

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