Available online at **www.ijmrhs.com**

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2021, 10(10): 130-138

Nutritional Status of School Going Children in India: A Review

Brij Pal Singh and Mahak Sharma*

Department of Nutrition and Dietetics, Faculty of Allied Health Sciences, Manav Rachna International Institute of Research and Studies, Haryana, India

Corresponding e-mail: mahak.fas@mriu.edu.in

ABSTRACT

Good nutrition means a stronger immune system, low illness, better health, and a productive society. In India, most school-age children are malnourished, mainly undernourished. This review has been done to know the prevalence of wasting, stunting, overweight, and obesity among children in rural as well as urban areas of different areas in India. For this purpose, thirty studies were reviewed by using different sources such as Research Gate, PubMed, Google Scholar, American Journal of Clinical Nutrition, and surveys of different agencies such as websites of the Ministry of Women and Child Development Government of India and different state governments. Dietary recalls structured interviews and anthropometric measurements were used in all the studies for data collection. Results from the various studies show that the underweight children range from 6.6% to 83%. Prevalence of stunting ranges from 13.8% to 56.1%, prevalence of wasting ranges from 6.7% to 75%, and prevalence of underweight ranges from 6.6% to 83%. It was concluded that malnutrition is a major problem in children and a lot of attention is needed to combat the problem.

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

INTRODUCTION

School-going age is very significant because this is the main period of life to make the body store nutrients. These stores help in the rapid growth of children. Good nutrition means a stronger immune system, low illness, better health, and a productive society [1]. More than 200 million school-age children are malnourished, mainly undernourished and about one billion school children will be impaired with physical and mental development by 2020. School-going children are the main contributors to the manpower of the coming time and will help in improving the socio-economic condition of developing countries like India. So, the mental and physical well-being of these children is the most concern that can be achieved by adequate nutrition [2]. The children who do not get an adequate quantity of required macro and micronutrients, including carbohydrates, proteins, fats, vitamins, and minerals (iron, calcium, potassium, magnesium, phosphorus, iodine, etc.) may not be in a position to perform to their full potential in their academics [3]. It is usually seen that the quality and quantity of food in children usually change with time from childhood to adolescence. A healthy diet is not their priority during childhood and poor dietary practices may lead to several health problems.

Since the beginning of the 21st century dieticians, nutritionists, scientists, health practitioners, and policymakers have been finding tools to measure the diet quality, so that dietary assessments can be made for required food quality to the population which is mainly classified diets in two basic categories that are good quality which is rich in fruits and vegetable content and bad and unhealthy foods which is diet contains high fats and processed foods. But it is considered it is difficult to assess the quality of diet in terms of consumption of particular food items, developing a single indicator for the measurement of overall diet quality is a more complex task [4,5]. But there is evidence supporting the positive impact of individual food items, such as fruit and vegetables, on long-term health and well-being, it is increasingly acknowledged that it is the combination of foods that groups of individuals eat which comprise the overall diet, rather than the presence or absence of specific food items, that is ultimate of importance to nutritional health status [6]. As such, McNaughton, SA; Ball, K; Crawford, D, and Mishra, GD argue that analyses of children's diets should examine not only individual food items or nutrients but also the types of food that make up their whole

diet [7]. Researchers have conceptualized the measurement of overall diet quality in two broad ways. The first is food patterns and the second is Diet Quality Indexes.

Food patterns are concerned with which foods are eaten in combination and Diet Quality Indexes involve considering the nutritional value of different foods relative to guidelines. There is a growing interest in nutritional epidemiology for measuring diet quality by dietary patterns in place of a single food item or nutrient [8]. The dietary pattern analysis approach implements the fact that foods are consumed in complex combinations and that the balance of the various aspects of the diet is crucial.

Malnutrition is the main global health problem of children which affects large numbers of children in developing countries [9]. Globally, malnutrition is the cause of at least half of all childhood deaths and one-third of child deaths are due to undernutrition only [10]. It accounts for 11% of the global burden of disease. It is more prevalent in countries with low and lower-middle economic populations [11]. Malnutrition among school-age children is a major public health problem [12]. As of 2005, pediatric malnutrition is a risk factor for 16% at the global level and 22.4% of India's burden of disease. 47% of India's children are underweight which is the highest in the world and is almost double that of Sub-Saharan African countries [13]. As today's children are the citizens of tomorrow's world, their survival, protection, and development are the prerequisites for the future development of humanity [14].

Good nutrition during school age is important to overcome the deficiencies occurred during childhood. Adequate food availability in terms of quantity as well as quality, ability to digestion, absorption, and utilization of food, and the discriminations against girls can greatly affect the adequate nutrition of children [15]. The health of children and youth is of fundamental importance. Over one-fifth of our population comprises children aged 5-14 years that is, the group covering primary and secondary education. Without ensuring optimal child growth and development, efforts to accelerate economic development significantly will be unsuccessful.

Malnutrition implies both extremes, under-nutrition on one side and over-nutrition on the other, causes a great deal of physical and emotional suffering and it is a violation of a child's human rights. They both increase the vulnerability of a child to a variety of diseases in later life. The health of children is of great importance as rapid growth occurs during this period. Good nutrition is a basic requirement for good health and a living organism is a product of nutrition [16]. There is a growing concern over the health of children all over the world with social changes and rapid economic growth. Nutritional status in childhood is one of the main determinants of the health status of an adult.

PEM (Protein Energy Malnutrition) is the most common nutritional problem in third world countries affecting children of under-five age category globally. 20%-80% of primary school children are suffering from nutritional deficiencies. Improvement in the overall health of the children population is very essential that can be achieved only by nutritional assessment of children [17]. The term malnutrition refers to both undernutrition and overnutrition. Good nutrition gives a stronger immune system, good health, and more productivity. Various forms of malnutrition including both macro and micronutrient deficiencies affect a large segment of the population in India [1].

LITERATURE SOURCES

All the studies for this review paper were obtained from various sources such as Research Gate, PubMed, Google Scholar, American Journal of Clinical Nutrition, and a book "Nutritive Value of Indian Foods", NIN (ICMR) for review of the literature. In all the reviewed studies various methods were used for data collection like the structured interview to know dietary habits, dietary recalls, anthropometric measurements, and biochemical assessment. The results were reviewed concerning various factors responsible for the nutritional status of the children. The researches were selected from the medium of advanced research, and the articles were open access distributed under the creative commons attribution license, which permits unrestricted use, distribution, and reproduction in any medium provided the original work properly cited.

RESULTS

Good nutrition during school age is important to overcome the deficiencies occurred during childhood. Adequate food availability in terms of quantity as well as quality, ability to digestion, absorption, and utilization of food, and the discriminations against girls can greatly affect the adequate nutrition of children [15].

Sati V and Dahiya S studied 200 rural school-going children of 7-9 years in Hisar district, Haryana. Data collection

was done by anthropometric measurement and 24-hour dietary recall method for three consecutive days. Results showed that food and nutrient intake was inadequate and anthropometric measurements were significantly lower than the reference value ($p<0.05$). Moreover, 55.5% of children were underweight and 54.11% of the children were stunted [1].

A similar study was conducted by Murugkar DA, et al., which assessed the nutritional status of 200 school-going children (6-9 years) in the Bhopal district of Madhya Pradesh. Interviews consisting of food frequency questions and 24-hours dietary recall of children and anthropometric measurements including weight and height were used for data collection. The height, weight, and BMI of all children were significantly lower than the reference value ($p \leq 0.05$). Results also showed that 55% of the children were wasted and 47% were severely malnourished and the diet they consume lacks all the major and minor nutrients required for the growth of children except fat. The study concluded that nutritional inadequacies, poverty, lack of infrastructure, and poor education of mothers resulted in severe malnutrition in school-going children [2].

A descriptive cross-sectional study was conducted by Amruth M, et al., on 424 primary school children to find out their nutritional status and dietary risk factors for malnutrition in Sullia, Karnataka. Probability proportional to size sampling method and anthropometric measurement was used and statistical analysis of data was done. The results showed the prevalence of underweight; stunting and thinness are 26.5%, 19.2%, and 26.5% respectively. It was also observed that private school children had better nutritional status than government school children and the prevalence of malnutrition was higher in boys than girls and children belonging to joint families [4].

Another study conducted by Hasan I, et al., from Bangalore conducted a nutritional assessment cross-sectional study among 500 children in three Government Urdu higher primary schools of Azad Nagar and its surrounding area. The overall prevalence of malnutrition in school children was found to be 52% (260). The prevalence of malnutrition among boys was 53.85% (161) and among girls was 49.25% (99). The prevalence of stunting was more in boys that is 41.47% as compared to girls that are 38.81%. It was also found that nutritional status was highly related to personal hygiene and socio-economic status [16].

A study conducted by Fazili A, et al., also assessed the nutritional status of school-age children of 5-14 years in a rural health block of North India (Kashmir) using the WHO Z-Score System. Study results showed that the overall prevalence of underweight is 11.1%, stunting is 9.25% and wasting is 12.3% [17].

A study was done by Nigudgi SR, et al., from Gulbarga, Karnataka among 935 students in higher primary schools of Gulbarga city assessed the nutritional status, to find out the burden of specific deficiency disorders and to assess the status of personal hygiene among them showed that 50.05% children were below the average weight for age, 22.35% children had specific deficiency diseases in which bitot's spot in 48.80% children and anemia in 10.05%. 91.44% of schoolchildren had good personal hygiene [18].

150 school-going children from Allahabad belonging to age group 7-10 years were studied by Ruchika H, et al. Data collection was done by 3 days dietary recall method. Heights, weights, and mid-upper arm circumference were measured and heamoglobin levels of children were estimated by cyanmethaemoglobin method. Clinical status assessing anemia was also recorded and results from a state that means height and weight in these children were significantly less than the national standards ($p<0.05\%$). 65.33% had hemoglobin levels below the normal values, indicating anemia, out of which 53.33% were mild anemic and 12% were moderately anemic [19].

A study was done by Navaneethan P, et al., among 806 school-going students of Vellore, Tamil Nadu belonging to age group 11 18 years, showed that 83% of students were underweight for their age as per WHO's international standards. Only 16% of the students were in the normal range (BMI 18.5-24.9), and of the rest, 0.39% and 0.06% were in the BMI range of 25-29.9 (overweight) and 30-35.9 (obese) respectively. This regression model showed that age, sex, and father's occupation significantly affect their BMI. The study concluded that malnutrition among school children can be eliminated by providing additional healthy foods and by improving the Socio-Economic Background (SEB) [20].

In another study, Jain M, et al., assessed the nutritional status and observe the diet quality and their association in 7-9 years old 120 randomly selected from 3 schools of Bilaspur town of Rampur district of Uttar Pradesh, India. Data collection was done by using a self-designed questionnaire, socioeconomic status was assessed using Kuppuswamy's socioeconomic status scale. Anthropometric measurements, the twenty-four-hour dietary recall was used to collect

information regarding diet and nutrient intake; nutrient adequacy ratio and mean adequacy ratio was calculated. According to weight for age Z-score, 5.8% of children were underweight and 0.83% were severely underweight. Nutrient adequacy was inadequate for energy and iron and was 75% higher than normal for fat. Diet quality was not associated with anthropometric measurements of the subjects. A weak positive correlation was observed in nutrient intake and diet quality score, and no significant association was found between nutritional status and diet quality ($p>0.05$) and socio-economic status and diet quality ($p>0.0.5$) of children [21].

In a cross-sectional study Inkhiya S, et al. assess the prevalence of malnutrition in 300 school children of 6-12 years of age of Bikaner, Rajasthan. Data collection was done by pretested questionnaire on stratified random sampled children. The results showed that the prevalence of underweight, overweight, and obesity based on BMI for age was 30.0%, 18.33%, and 1.33% respectively and the overall prevalence of malnutrition was found to be 49.66% [22].

Another cross-sectional study was done by NC Ashok, et al. to assess the nutritional status of 1566 government and private primary school children aged 6-12 years of Mysore city. Data were collected on demographic details, dietary habits and physical activity of the child, education status, occupation, and monthly income of their parents. The results showed that 385 children (24.5%) were underweight, 132 (8.4%) were overweight, and 65 (4.1%) were obese. The majority of underweight children 226 (32.5%) were found in the government school. Socioeconomic status, dietary habits, and physical activity of the child were found to be the determinants of their nutritional status in the study [23].

A cross-sectional study was carried out by Mukherjee R, et al. to determine the nutritional status of 760 school children in Army School, Pune. Data collected and associations of nutritional status with socio-economic status, education status of parents, mothers working status, and family size were determined. The results showed that the prevalence of stunting was 13.81%, wasting 6.71%, and undernutrition 9.87%. The study also concludes that the mother's educational level, wasting, socio-economic status, and family size were significantly associated with the nutritional status of the child [24].

To assess the nutritional status of 484 rural school-going children of 6-12 years old of Mandya district, Karnataka Shivaprakash NC and Joseph RB had done an observational cross-sectional study. The children were assessed for nutritional status by clinical examination and anthropometric assessment. The results showed that the overall prevalence of underweight was 30.3% (147) and stunting was 27.9% (135) [25].

Another cross-sectional study done by Shashank KJ and Chethan TK to assess the nutritional status of 284 school-going children between the age group of 6-12 years of Bijapur district of Karnataka showed that 97 children (34.15%) were underweight and 25% were stunted. On applying the Chi-square test socio-demographic variables like gender and parents' education association with the underweight of the children were found to be statistically insignificant in the study [26].

A cross-sectional study done by Srivastava A, et al. on 512 schoolchildren of 5 to 15 years age group to assess the nutritional status in school-age slum children and to analyze factors associated with malnutrition with the help of a pre-designed and pre-tested questionnaire, anthropometric measurements, and clinical examination in urban slums of Bareilly, Uttar Pradesh (UP), India. The mean height and weight of boys and girls in the study group was lower than the CDC 2000 (Centers for Disease Control and Prevention) standards in all age groups. The study showed that 46.8% of children were normal, 38.4% were underweight, 33.3% were wasted and 19.9% were stunted. The prevalence of stunting and underweight was highest in the age group 11 years to 13 years whereas the prevalence of wasting was highest in the age group 5 years to 7 years [27].

A descriptive cross-sectional study among 820 children was conducted by Shaikh MK, et al. of age group 6 to11 years from selected government primary schools (Urban and Rural) of Karimnagar city, Telangana, India. Data collection with a standardized questionnaire and anthropometric measurement were done. The results showed that 29.3% of rural children and 22.2% of urban children were underweight respectively. Similarly, 21.5% of children were stunted in rural areas and 16% from urban areas [28].

Manjula AA and Aravindan KP assessed the nutritional status of 862 children in different types of schools by using anthropometric parameters in children of Kozhikode district. The results showed that the prevalence of stunting is 12.9%, Underweight 46.3%, and 65.5% respectively in ordinary and backward area schools. Overweight affects 10.6% of students and the prevalence of severe malnutrition is very low [29].

A multistage cross-sectional study was done by Debottam Pal, et al. using stratified cluster random sampling method on 24,108 primary and upper-primary students from the whole state of West Bengal. Descriptive and regression analyses were conducted using SAS-9.4. The results showed that the prevalence of under-nutrition was about 22.8% and 54% were at risk of developing undernutrition. Only 17% of the students had adequate nutritional status [30].

Secondary data analysis was done by Madhur Verma, et al. and evaluated the nutritional status of children and adolescents in the 5-18 years, age group, under the 'Rashtriya Bal Swasthya Karyakram' in the District Fatehgarh Sahib of Punjab. A total of 897 children's data were included in the study. Out of 352 children in the 5-9 years, age group 58.8% were severely underweight, 37.4% were stunted and 31.8% of the children were thin. In the age group of 10-18 years, 19.4% were severely stunted and 26.9% were severely thin [31].

The nutritional status of 100 school-going children of 7-9 years of Lucknow district was assessed by Sweta Saxena and Sunita Mishra in their study. These students were selected from five different schools. Results revealed that 25% of students were mildly stunted, 22% students were moderately stunted and 15% students were severely stunted. In the same way, 30% were mild, 24% were moderately and 3% of students were severely wasted [32].

Another descriptive cross-sectional study by Cynthia Subhaprada S was done on 6 to 10 years old 101 government primary school children in an urban slum of Kurnool, Andhra Pradesh. The students were selected by systematic random sampling. Results showed that 38% of children had normal weight for age and 63% were undernourished [33].

In a study done by Mondal T, et al. on 3564 primary school children of age 8 to 9 years from 183 government-aided schools of West Bengal showed that prevalence of thinness was 65.4% in boys and 65.3% in girls, and prevalence of underweight in boys was 39.7% and in girls was 36.5%. Moreover, 26.1% of boys and 22.9% of girls were stunted [34].

A cross-sectional survey was conducted by Singh H, et al. on 350 tribal pre-school children of age group 3 to 5 years in Kinnaur, Himachal Pradesh. The results showed that the prevalence of underweight children was 21.4%, prevalence of stunting was 27.4% and prevalence of wasting was 11.1% [35].

In another cross-sectional study conducted by Patel N, et al., among 5-13 years old school children in the urban area of Ahmedabad. A sample size of 28,256 children was selected, out of which boys were 15,087 and girls were 13,169. The results showed that 29.44% (8,319) children were underweight and 0.78% (221) children were overweight/obese [36].

Another study conducted by Osei, et al., on 499 children of 6 to 10 years old in a hilly agrarian community in Tehri Garhwal District, Uttarakhand showed that underweight, stunting, and wasting were present in 60.9%, 56.1%, and 12.2% of children respectively [37].

A cross-sectional study was conducted by Sethy G, et al. in an urban slum area of Berhampur city of Odisha on 300 children. The study results revealed that 69% of children belonged to undernutrition in which underweight was 55.3%, wasted were 75% and stunted were 42%. The study also supports the role of maternal education, faulty feeding, and hygienic practice in malnutrition of children [38].

A descriptive study done by Kashyap R and Kaur S, in Chandigarh on 3,793 school children showed that children found to be underweight were 73.3%, overweight was 2.3% and obese was 1.5%. The study also suggests that the prevalence of overnutrition is high in children belonging to high socio-economic status in India [39].

In another study conducted by Cherian AT, et al., among 6-15 years old 1634 school children in Kochi, Kerala revealed that obesity was 3.0% for boys and 5.3% for girls. Moreover, this study also suggests that obesity (7.5%) and overweight (21.9%) were highest in high economic status and lowest (1.5% and 2.5% respectively) in low economic status [40].

A community-based cross-sectional study in ITDA areas in nine states of India including Andhra Pradesh, Gujarat, Kerala, Karnataka, Maharashtra, Madhya Pradesh, Odisha, Tamil Nadu, and West Bengal was done by Meshram II, et al., on 14,587 children aged 0-5 years and results revealed that the prevalence of underweight was 49%, stunting was 51% and wasting was 22%. This study also supports that maternal literacy, morbidities pattern and socio-economic status was also a contributing factor for under-nutrition in children [41].

Another cross-sectional study was conducted by Ghosh J, et al. among the Santal-Munda tribal community from Amdanga block of North 24 Parganas district, West Bengal. The study results showed that the prevalence of underweight, stunting and wasting was 38.65%, 21%, and 32.7% respectively. The severe form of underweight children was 8.40%, stunted was 4.20%, and waste was 9.20%. Moreover, this study also showed that preschool children were more malnourished than school-going children [42].

As per the latest annual report of 2020-21 Ministry of women and child development government of India 35.7% of children less than 5 years of age are underweight and 38.4% are stunted. Despite these improvements, the status of maternal and child undernutrition and anemia in the country is worrisome that requires utmost attention [43].

DISCUSSION

School-going age is the foundation of human life. If the foundation is strong, future life will also be strong. But despite many efforts by different agencies of government and NGOs malnutrition is still a big challenge that restricts the proper growth and health of children leading to various morbidities and poor academic performance. Malnutrition has a long life effect on children in the later stages of life. It is the responsibility of all that is the parents, teachers, social workers, government, researchers, and all dieticians, and caregivers should give regular and continuous attention to the health and children's nutritional status. Today's children are responsible citizens of tomorrow, which will play an important and more significant role in the growth and development of society. However, there is an upward trend in the children's nutritional status has been seen, but still, many children are undernourished in developing and underdeveloped countries. From the review of various studies, it was found that the nutritional status of children is strongly related to gender, education, SES (Socio-Economic Status), demographic conditions, and agricultural diversity. The children whose mothers were having higher education were found to have better nutritional status because educated caregivers/mothers know the importance of a balanced diet, so emphasis should be given on girls' education because they will become future mothers.

It was also found that children from rural areas were more malnourished than their counterparts from urban areas. So, efforts should be made to improve the family's economic status, diversification of agriculture, better infrastructure, and amenities in rural areas. The curriculum of schools and other institutions should include nutrition and health topics so that the nutritional status of children can be improved.

CONCLUSION

After reviewing of literature and available data for this paper it is concluded that most of the children are still malnourished even after taking various measures to reduce malnutrition in children so more efforts are needed on the ground level to help the beneficiaries. This can be done by improving Socio-Economic Status (SES) of the families, education level, gender equality, properly implementing government schemes, diversification of food, and active participation of government agencies as well as NGOs. It is recommended that policymakers, parents, and caregivers pay regular attention to the children's diet. The Anganwadi (pre-schools), mid-day-meal in schools, and other feeding programs should be regularly evaluated from time to time and required changes should be made. They should be restructured as per the availability of seasonal food items so the requirement of each food group and Dietary Diversity Score (DDS) and food items from every group (FVS) can be met in children. School health services can play an important role in the development of every child by providing comprehensive care of the health and wellbeing of children during the school years. As health and education are intimately related, the advantages of health education can be attained best in the school. Health education should give more emphasis to preventing health problems rather than providing a cure.

DECLARATIONS

Conflicts of Interest

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

Funding

No funding was provided by the organization to do this review.

REFERENCES

[1] Sati, Vandana, and Saroj Dahiya. "Nutritional assessment of rural school-going children (7-9 years) of hisar district, Haryana." *Open Access Scientific Reports,* Vol. 1, No. 7, 2012, pp. 1-4.

[2] Murugkar, Dipika Agrahar, Paridhi Gulati, and Chetan Gupta. "Nutritional status of school going children (6-9 years) in rural area of Bhopal district (Madhya Pradesh), India." *International Journal of Food and Nutritional Sciences,* Vol. 2, No. 4, 2013, pp. 61-67.

[3] Nabarro, David, Purnima Menon, and Marie Ruel. "Sun: A global movement to accelerate progress in reducing maternal and child undernutrition." *International Food Policy Research Institute*, 2012.

[4] Amruth, M. "A study on nutritional status and risk factors for malnutrition among primary school children in sullia, Karnataka." *MD Rajiv Gandhi University of Health Science,* 2012.

[5] Dubois, Lise, Manon Girard, and Nathalie Bergeron. "The choice of a diet quality indicator to evaluate the nutritional health of populations." *Public Health Nutrition,* Vol. 3, No. 3, 2000, pp. 357-65.

[6] Pryer, Jane A., Adrian Cook, and Prakash Shetty. "Identification of groups who report similar patterns of diet among a representative national sample of British adults aged 65 years of age or more." *Public Health Nutrition,* Vol. 4, No. 3, 2001, pp. 787-95.

[7] McNaughton, Sarah A., et al. "An index of diet and eating patterns is a valid measure of diet quality in an Australian population." *The Journal of Nutrition,* Vol. 138, No. 1, 2008, pp. 86-93.

[8] Nair, Madhavan K. "Little Flower Augustine, and Archana Konapur. 2015." Food-based interventions to modify diet quality and diversity to address multiple micronutrient deficiency." *Frontiers in Public Health,* Vol. 3, p. 277.

[9] Ergin, Filiz, et al. "Nutritional status and risk factors of chronic malnutrition in children under five years of age in Aydin, a western city of Turkey." *Turkish Journal of Pediatrics,* Vol. 49, No. 3, 2007, pp. 283-89.

[10] Black, Robert E., et al. "Maternal and child undernutrition: Global and regional exposures and health consequences." *The Lancet,* Vol. 371, No. 9608, 2008, pp. 243-60.

[11] UNICEF. "The State of the World's Children 2008." 2007. https://www.unicef.org/reports/state-worlds-children-2008

[12] UNICEF. "Levels and trends of child mortality: 2011 report." *Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation. New York: UNICEF, WHO, World Bank, United Nations Population Division,* 2011.

[13] Gragnolati, M., et al. "India's undernourished children: A call for reform and action. Washington, DC: Health." *Nutrition and Population Division, World Bank,* 2005.

[14] World Health Organization, and WHO Global School Health Initiative. "Research to improve implementation and effectiveness of school health programmes." No. WHO/HPR/HEP/96.3. World Health Organization, 1996.

[15] World Health Organization. "Comparative quantification of health risks: Childhood and maternal under nutrition." 2016. http://www.who.int/publications/cra/en/.

[16] Hasan, Izharul, Mohd Zulkifle, and Abdul Haseeb Ansari. "An assessment of nutritional status of the children of government Urdu higher primary schools of Azad Nagar and its surrounding areas of Bangalore." *Archives of Applied Science Research,* Vol. 3, No. 3, 2011, pp. 167-76.

[17] Fazili, Anjum, et al. "Nutritional status of school age children (5-14 years) in a rural health block of North India (Kashmir) using WHO Z-score system." *Online Journal of Health and Allied Sciences,* Vol. 11, No. 2, 2012, pp. 1-3.

[18] Nigudgi, S. R., et al. "Assessment of nutritional status of school children in Gulbarga city." *Journal of Pharmaceutical and Biomedical Sciences,* Vol. 21, No. 21, 2012, pp. 2230-7885.

[19] Handa, Ruchika, et al. "Assessment of nutritional status of 7-10 years school going children of Allahabad district:

A review." *Middle-East Journal of Scientific Research,* Vol. 3, No. 3, 2008, pp. 109-15.

[20] Navaneethan, Palanisamy, et al. "Nutritional status of children in rural India: A case study from Tamil Nadu, first in the world to initiate the mid-day meal scheme." *Health,* Vol. 3, No. 10, 2011, pp. 647-55.

[21] Jain, Monika, et al. "Nutritional status and diet quality in 7-10 years old school going children." *International Journal for Environmental Rehabilitation and Conservation,* Vol. 9, No. 1, 2018, pp. 45-53.

[22] Inkhiya, Suman, et al. "A cross-sectional study to assess prevalence of malnutrition in school children 6-12 years of age of Bikaner, Rajasthan." *International Journal of Advanced Research,* Vol. 2, No. 5, 2016, pp. 867-70.

[23] Ashok, N., H. Kavitha, and Praveen Kulkarni. "A comparative study of nutritional status between government and private primary school children of Mysore city." *International Journal of Health & Allied Sciences,* Vol. 3, No. 3, 2014, pp. 164-64.

[24] Mukherjee, R., S. Chaturvedi, and R. Bhalwar. "Determinants of nutritional status of school children." *Medical Journal Armed Forces India,* Vol. 64, No. 3, 2008, pp. 227-31.

[25] Shivaprakash, N. C., and Ranjit Baby Joseph. "Nutritional status of rural school-going children (6-12 Years) of Mandya District, Karnataka." *International Journal of Scientific Study,* Vol. 2, No. 2, 2014, pp. 39-43.

[26] Shashank, K. J., and T. K. Chetan. "Nutritional status of school going children between the age group of 6-12 yrs in rural area of Bijapur district." *National Journal of Community Medicine,* Vol. 7, No. 5, 2016, pp. 409-12.

[27] Srivastava, Anurag, et al. "Nutritional status of school-age children-A scenario of urban slums in India." *Archives of Public Health,* Vol. 70, No. 1, 2012, pp. 1-8.

[28] Shaikh, M., et al. "Assessment of nutritional status among school children of Karimnagar, Telangana, India." *International Journal of Research in Medical Sciences,* Vol. 4, No. 10, 2016, pp. 4611-17.

[29] Manjula, Anupama A., and K. P. Aravindan. "Nutritional status of children in different types of schools." *Calicut: Government Medical College,* 2004.

[30] Pal, D., et al. "Malnutrition scenario among school children in Eastern-India-An epidemiological study." *Epidemiology: Open Access,* Vol. 6, No. 1, 2016, pp. 1-9.

[31] Verma, Madhur, et al. "Nutrition status of school children in Punjab, India: Findings from school health surveys." *Journal of Tropical Pediatrics,* Vol. 67, No. 1, 2021.

[32] Saxena, Sweta, and Sunita Mishra. "Malnutrition among school children of Lucknow." *International Journal of Science and Research,* Vol. 6, No. 3, 2014, pp. 1726-30.

[33] Cynthia Subhaprada, S. "Nutritional status of government primary school children in an urban slum, Kurnool, Andhra Pradesh." *International Journal of Current Medical and Applied Sciences,* Vol. 6, No. 3, 2015, pp. 167-70.

[34] Mondal, Tirtha, Samiran Mondal, and Malabika Biswas. "An assessment of nutritional status of children of government aided primary school of West Bengal." *International Journal of Elementary Education,* Vol. 4, No. 3, 2015, pp. 41-45.

[35] Singh, Harshvardhan, et al. "Nutritional status of 1-5 Years children in a hilly tribal District of North India." *International Journal of Contemporary Medical Research,* Vol. 3, No. 11, 2016, pp. 3286-88.

[36] Patel, Nehal, et al. "Nutrition and health status of school children in urban area of Ahmedabad, India: Comparison with Indian Council of Medical Research and body mass index standards." *Journal of Natural Science, Biology, and Medicine,* Vol. 6, No. 2, 2015, pp. 372-77.

[37] Osei, Akoto, et al. "Nutritional status of primary schoolchildren in Garhwali Himalayan villages of India." *Food and Nutrition Bulletin,* Vol. 31, No. 2, 2010, pp. 221-33.

[38] Sethy, S. G., et al. "Prevalence of malnutrition among under five children of urban slums of Berhampur, Odisha, India: A community a community based cross-sectional study." *International Journal of Contemporary*

Pediatrics, Vol. 4, No. 6, 2017, pp. 2180-86.

[39] Kashyap, Rashmi, and Surinder Kaur. "Nutritional status and morbidity profile among school children, northern India." *Malaysian Journal of Paediatrics and Child Health,* Vol. 21, 2015, pp. 51-59.

[40] Cherian, Alice T., Sarah S. Cherian, and Sobhana Subbiah. "Prevalence of obesity and overweight in urban school children in Kerala, India." *Indian Pediatrics,* Vol. 49, No. 6, 2012, pp. 475-77.

[41] Meshram, Indrapal Ishwarji, et al. "Trends in the prevalence of undernutrition, nutrient and food intake and predictors of undernutrition among under five year tribal children in India." *Asia Pacific Journal of Clinical Nutrition,* Vol. 21, No. 4, 2012, pp. 568-76.

[42] Ghosh, Joyeta, and Rama Ranjan Pati. "Assessment of nutritional status among Santal-Munda tribal children in rural area of Amdanga block, North 24th Parganas District of West Bengal, India." *International Journal of Current Microbiology and Applied Sciences,* Vol. 4, No. 7, 2015, pp. 810-14.

[43] Annual report 2020-2021, Ministry of Women and Child Development, Government of India. https://wcd.nic.in/sites/default/files/WCD_AR_English%20final_.pdf