

Spectrum of Nutritional Status: A Cross Sectional Study

Bhavana Tiwari*, V.K. Tandon**, Gaurav Arya**, Chitra Rani Chauhan**, Rohit Agarwal***, Mukesh Mishra***

*Associate Professor **Assistant Professor ***Senior Resident, Rama Medical College, Kanpur – 208017, Uttar Pradesh, India.

Abstract

Background: Pediatric malnutrition is a major cause of morbidity and mortality in developing countries including India. This malnutrition can be prevented by proper dietary advice to parents along with early diagnosis and management of malnutrition. The aim of this study was to find out the present nutritional status and its comorbid abnormalities in children attending primary school in rural Kanpur. *Objective:* To assess the prevalence of underweight, stunting, wasting and comorbid abnormalities of malnutrition in 5 to 10 years age group of school going children. *Methods:* This study was across sectional study conducted in rural primary schools of Mandhana Kanpur between December 2016 to May 2017 to know the nutritional status of school age children with coexisting morbidities with the help of anthropometric measurement and clinical examination. *Results:* A total of 400 children were studied belonging to the age group 5 to 10 years including 226 (56.5%) boys and 174 (43.5%) girls. Approximately 54% boys and 50% girls have their weight and height within normal limits. Prevalence of wasting and stunting was highest in 5 to 6 years age group in both sexes. On clinical examination highest number of children were found to be clinically anemic in both sexes but more in girls followed by presence of pharyngitis. *Conclusion:* In our study we found presence of all types of nutritional deficiency starting from under nutrition to stunting, wasting and associated abnormalities like anemia and pharyngitis. Need of the hour is more steps to be taken to overcome the nutrition gap and abolish the problem of malnutrition.

Keywords: Underweight; Stunting; Wasting; Anemia.

Introduction

Pediatric age group is the period of rapid growth, and this period is highly vulnerable period as well. In pediatrics the school age is the active growing phase of childhood [1]. Multiple factors work together to affect the growth and development of children.

Health and nutritional condition in children is best assessed by anthropometric examination which includes physical measurements like body weight, height, mid arm circumference and triceps skin fold thickness. Based on the age, sex, body weight and height, certain indices such as weight for age, height-for-age and weight-for-height have been suggested

[2]. Then children are classified using anthropometric measurement in three categories: 'underweight' (less than 2 SD weight-for-age), 'stunting' (less than 2SD height-for-age) or 'wasting' (less than 2SD weight-for-height). Less than 2 SD away from the CDC 2000 (Centers for Disease Control and Prevention) standards [2,3,4].

"End all forms of malnutrition by 2030." That was the challenge world leaders laid down to all of us at the end of 2015 when they adopted the Sustainable Development Goals (SDGs) [1]. At least 12 of the 17 sustainable development goals contains indicators that are highly relevant for nutrition, reflecting nutrition's central role in sustainable development [5].

Corresponding Author: Vishnu Kumar Tandon, Assistant Professor, Rama Medical College, Kanpur – 208017, Uttar Pradesh, India.

E-mail: vishnutandon.vt@gmail.com

Received on 22.08.2017, Accepted on 14.09.2017

The socioeconomic status of the family and social wellbeing of the community is reflected in the nutritional status of the pediatric population. The present study in rural primary school of Kanpur, Uttar-Pradesh (UP), India, was undertaken to evaluate the overall prevalence of undernutrition and, sex wise difference if any in undernutrition, and to find out any associated comorbid abnormalities of undernutrition.

Methods

This study was across sectional study conducted by department of Pediatrics Rama Medical College Mandhana Kanpur between December 2016 to May 2017. Study group comprised of 400 children from age group 5 to 10 years studying in a primary school of Mandhana. To calculate the sample size with 52% prevalence of malnutrition at 95% confidence interval and relative precision of 10%, 400 number of children needed to be included in the study.

Ethical approval was obtained from ethical committee, Rama Medical College Mandhana Kanpur. All parents / guardian of children who were enrolled in the study were informed and written consent in their local language obtained from them prior to inclusion into the study.

The age of the child was determined using school records.

Measurement of weight and height of each and every child was done, using standardized technique recommended by Jelliffe in metric system [6]. Weight was measured by digital weighing machine having accuracy of 100 grs, with children standing straight, having light clothes without heavy woollens and without footwear. Height of the children was measured using stadiometer with child standing without footwear with feet parallel and head in frankfurt plane having firm contact with the head plate, both hands hanging by the sides of child, and occiput, shoulder, buttocks, and heel touching the rod. Weight for age (underweight), height for age (stunted), weight for height (wasted) were calculated for each and every child and compared with the CDC 2000 [2,3]. Those who had values between ± 2 SD of cutoff were considered normal [4].

All the children who were included in the study were clinically examined by the pediatric resident doctors for anemia, Vitamin A deficiency by the presence of corneal xerosis, Bitot's spots and conjunctival xerosis, hair changes like depigmentation, lustreless, easily pluckable and flag sign was looked

for, skin changes like dry rough skin and crazy pavement or flaky paint dermatosis was searched. Teeth were examined for caries and cavities, and ENT examination was done for pharyngitis and tympanic membrane perforation. All the children were given dewormin tablets, and those who were found anemic were given iron tablets, vitamin A was offered to those children who were having manifestations of xerophthalmia. All other children who were diagnosed to be having comorbid skin and dental findings were referred to appropriate departments for further management.

Results

A total of 400 children were studied belonging to the age group 5 to 10 years (Table 1). Out of the 400 students, 226 (56.5%) were boys and 174 (43.5%) were girls.

Statistical Analysis

Statistical software namely SPSS 21.0 version was used for the analysis of the data and microsoft word and excel have been used to generate tables. There is significant statistical association & proportion was found between the graphs ($p < 0.001$) at 0.1% level of significance with appropriate degrees of freedom.

Undernutrition, wasting, stunting was seen in variable number of children in study group. All the data was analysed using spss software and p value with chi square analysis and no significant association was observed.

We examined the study group for coexisting deficiency disorders in which anemia and xerophthalmia was found highly significant statistically. Hair changes, skin changes, and chronic suppurative otitis media was also found to be statistically significant in study group. Dental changes and pharyngitis was present in variable number of children but it was not statistically significant. In our study it was also observed that all findings were present more in girls than in boys.

Discussion

School age is the time when children undergo physical growth, and mental, emotional and social development is also significant during this period. According to (UNESCO) 6 to 11 years age is considered as primary school age. School age is the

Table 1: Table showing spectrum of nutritional status in school age children

Age group	Normal	Under weight	Wasted	Stunted
5-6 yrs				
Boys (39)	21(53.84%)	13(33.33%)	11(28.20%)	10(25.64%)
Girls (44)	23(52.27%)	14(31.81%)	13(29.54%)	11(25%)
6-7 yrs				
Boys (41)	21(51.21%)	10(24.39%)	9(21.95%)	7(17.07%)
Girls (41)	20(48.78%)	11(26.83%)	10(24.39%)	9(21.95%)
7-8 yrs				
Boys (44)	24(54.54%)	10(22.73%)	10(22.73%)	9(20.45%)
Girls (36)	19(52.78%)	9(25%)	9(25%)	7(19.44%)
8-9 yrs				
Boys (49)	24(48.98%)	11(22.45%)	10(20.41%)	9(18.37%)
Girls (29)	14(48.28%)	9(31.03%)	7(24.14%)	6(20.69%)
9-10 yrs				
Boys (53)	29(54.72%)	13(24.53%)	10(18.87%)	9(16.98%)
Girls (24)	13(54.16%)	7(29.17%)	6(25%)	4(16.67%)

Table 2: Prevalence of Nutritional Deficiency Spectrum

Nutritional Status	Boys (N=226)		Girls (N=226)		P-value
	No.	%	No.	%	
Normal	119	52.7	89	51.1	Z=0.397
95% Confidence interval of Normal Patients	45.5 to 58.5		43.6 to 58.4		p>0.69 NS
Underweight	57	25.2	50	28.1	Z=0.67
95% Confidence interval of Normal Patients	19.4 to 30.6		21.3 to 34.7		p>0.49 NS
Wasted	50	22.1	45	25.8	Z=0.93
95% Confidence interval of Normal Patients	15.7 to 26.3		18.6 to 31.4		p>0.35 NS
Stunted	44	19.5	37	21.3	Z=0.49
95% Confidence interval of Normal Patients	13.9 to 24.1		14.9 to 27.1		p>0.62 NS

	Normal	Underweight		Normal	Stunted
Boys	119	57		119	44
Girls	89	50		89	37

X² = 0.445 p > 0.504 statistically not significant

	Normal	Wasted		Normal	Underweight+Wasted+Stunted
Boys	119	50		119	151
Girls	89	45		89	132

X² = 0.72 p > 0.39 statistically not significant

Table 3: Prevalence of comorbid abnormalities in study group

Age group	Anemia	Xerophthalmia	Hair Changes	Skin Changes	Teeth Changes	Csom	Pharyngitis
5-6 yrs	14 (35.90%)	4 (10.26%)	4 (10.26%)	3 (7.69%)	7 (17.95%)	10 (25.64%)	11 (28.20%)
Boys (39)	24 (54.55%)	7 (15.91%)	10	8 (18.18%)	8 (18.18%)	10 (22.73%)	11 (25%)
Girls (44)			(22.73%)				
6-7 yrs	15 (36.59%)	3 (7.31%)	4 (9.76%)	3 (7.31%)	13 (31.71%)	7 (17.07%)	8 (19.51%)
Boys (41)	20 (48.78%)	5 (12.20%)	8 (19.51%)	4 (9.76%)	7 (17.07%)	8 (19.51%)	5 (12.20%)
Girls (41)							
7-8 yrs							
Boys (44)	13 (29.55%)	0	3 (6.81%)	0	10 (22.73%)	4 (9.09%)	6 (13.64%)
Girls (36)	17 (47.22%)	5 (13.89%)	4 (11.11%)	5 (13.89%)	8 (22.22%)	4 (11.11%)	7 (19.44%)
8-9 yrs							
Boys (49)	17 (34.69%)	0	4 (8.16%)	0	7 (14.29%)	0	0
Girls (29)	15 (51.72%)	0	4 (13.79%)	2 (6.90%)	4 (13.79%)	4 (13.79%)	6 (20.69%)
9-10 yrs							
Boys (53)	20 (37.74%)	0	3 (5.66%)	0	6 (11.32%)	0	0
Girls (24)	13 (54.17%)	0	0	0	4 (16.67%)	4 (16.67%)	4 (16.67%)

Table 4: Prevalence of Nutritional Deficiency Spectrum in Boys & Girls

Nutritional Disorder	Boys (N=226)		Girls (N=226)		P-value
	No.	%	No.	%	
Anemia	79	34.9	89	51.1	Z=3.21P<0.0013
95% Confidence interval of Normal Patients	28.8 to 41.1		43.6 to 58.4		Highly significant
Xerophthalmia	7	3.09	17	9.77	Z=2.58P<0.0097
95% Confidence interval of Normal Patients	0.8 to 5.2		5.3 to 14.17		Highly significant
Hair Changes	18	7.96	26	14.94	Z=1.96 P<0.05
95% Confidence interval of Normal Patients	4.4 to 11.4		8.8 to 19.2		Significant
Skin Changes	6	2.65	19	10.9	Z=3.40P<0.001
95% Confidence interval of Normal Patients	0.06 to 4.8		5.5 to 14.5		Significant
Teeth Changes	43	19.2	31	17.8	Z=0.51p>0.61
95% Confidence interval of Normal Patients	13.9 to 24.1		11.4 to 22.6		Not significant
CSOM	21	9.29	30	17.24	Z=2.33P<0.01
95% Confidence interval of Normal Patients	5.4 to 12.8		11.4 to 22.6		Significant
Pharyngitis	25	11.06	26	14.94	Z=0.90p>0.365
95% Confidence interval of Normal Patients	6.9 to 15.1		8.8 to 19.2		Not significant

period of very rapid growth and development, and this is the time for attainment of physical, mental, social and emotional changes. As our country is a growing country population consisting of this age group is approximately one fifth. So in this light present study was conducted to assess the nutritional status of primary school age children and associated morbidities.

Although there is vast difference in the prevalence of under nutrition and wasting in different regions but in almost whole of developing world children fail to grow in length/height and weight in similar age specific pattern [7]. In our study we observed that the growth of the children was very much less than the expected reference standards by CDC 2000. Similar results were observed by other workers as well from India [8,9]. In contrast to this in children of Latin America the prevalence of underweight and thinness is found below 10% [10].

Overall under nutrition observed in study group was 25.3% in boys and 28.6% in girls whereas in a study conducted by in Karnataka among 6 to 12 years age group observed the prevalence of under nutrition in boys 32.3% and in girls 28.3% this study showed more under nutrition among boys than our study while among girls prevalence of under nutrition was almost same as in our study [11]. Another study done by from Bangalore among 5-14 years old students stunting was seen in 58.2% children, whereas in a study from Allahabad found under nutrition in 7- 10 year age group to the tune of 25% [12, 13]. In contrast to our study another study from Kashmir conducted on 5-14 years old children reported under nutrition to the tune of only 11.1%. One more study from Assam conducted by in 6-8 year old children reported under nutrition in 47.4% of children [14,15]. One more study from Navinagar Mumbai reported prevalence for stunting 16.8% and underweight 42.3% [16].

Underweight 90.0% and stunting 47.5% was reported by from Chhattisgarh [17]. Similarly from Puriliya West Bengal also reported figures of underweight 33.7% and stunting 17.0% [18].

In our study the children were found less nourished than the children from Delhi by but in other hand our study group children were better nourished than school children from Punjab [19,20]. Another study conducted by department of Community Medicine of Rama Medical College Mandhana by also showed the prevalence of under nutrition to the tune of 28% which correlated well with our results of under nutrition in boys 25% and 28% in girls [21].

In our study we found that many children were having more than one ailment. Clinically anemia was detected in 37% in boys and 50% in girls in the present study, which was more than in the children of rural school children in Punjab (22.5%) [22]. Anemia was almost same in prevalence in our study as found in a study in Bareilly [23].

In our study we found presence of dental caries also in about 20 % of boys and 22% in girls. Our results were same as also reported by similar study from rural Kanpur(21), where 25.7% children were found affected by dental caries. Another study from Pokhra including students of Government primary school found dental caries in 41.5% children [24]. On the other hand one more study reported 17.4% children suffering from dental caries [25]. Similar study from Punjab reported lower prevalence of dental caries in rural school children 11.5% [26]. Another study from Tirupati showed almost same findings as our study where dental caries was seen in 20.9% school age children [27].

In our study chronic suppurative otitis media and pharyngitis was seen in variable no of children of different age groups, more of both problems were seen

in more girls than boys and range was from 10% to 22%. Another study from Bhaktapur found csom in 22.3% [28] and study from rural kanpur found csom in 21.5% children [21].

Hair changes and skin changes in the form of lusterless, de pigmented and sparsh hair was found in 5 to 22% children and both were present more in girls. Similar findings were seen in another study in Karnataka where all these findings were seen but much less in frequency [11]. Another study which was also from Karnataka, Mysore district included jenukuruba tribal children found hair changes in more than 90% children [29]. Vit A deficiency disorders also called as Xerophthalmia is a very common finding in school age children and in our study we looked for it in form of night-blindness, bitot's spot, congetivalxerosis and corneal xerosis. All these manifestations could be detected in variable number of children in our study ranging from 6 - 11%. In a study from Karnataka all these manifestations range between 2-20% [11]. Another study from collar district of Karnataka found that Vitamin A deficiency was the commonest ocular morbidity (33.8%) which manifested as bitot spots and conjunctival xerosis [30].

Study Strength and Limitations

This study may help in treating the morbidities related to nutritional status in school going children in rural area. As this study involved only school going children it may not be representative of children in general population

Funding

Nil

Competing Interests

The authors declare that they have no competing interests.

Conclusion

This study shows that in spite of all the efforts done by government of India ,we are not able to completely eradicate the under nutrition, wasting, stunting, and various associated deficiency disorders in school age children , though the frequency of these are decreasing but still prevalent and needs to be looked for further. We should educate the society more about the nutritional needs of children and proper dietary advice should be given to children and parents.

Contribution

VKT conceived the idea of study and supervised it, BT reviewed the literature and made the design of study, GA, RA and MM participated in data collection, CT statistically analyzed the data. All authors have read and finalized the manuscript.

References

1. Nutrition for the school-aged child. NebGuide Series No.G92-1086-A. 2002.p.1.
2. Waterlow IC, Buzina R, Keller W, Lane IM, Nichaman MZ, Tanner IM. The presentation and use of height and weight data for comparing the nutritional status of groups of children under the age of 10 years. Bull World Health Organ. 1977;55:489-498.
3. Kuczumarski RJ, Ogden CL, Guo SS, Grummer-Strawn LM, Flegal KM, Mei Z. et al. 2000 CDC Growth Charts for the United States: methods and development. Vital Health Stat. 2002;11(246):1-190.
4. WHO Expert Committee on Physical Status. Physical status: the use and interpretation of anthropometry, report of a WHO expert committee. Geneva, World Health Organization. 1995. (WHO Technical Report Series, No. 854;
5. International Food Policy Research Institute. 2016. Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030. Washington, DC.
6. Jelliffe DB. The assessment of the nutritional status of the community. WHO Monog Series No. 1966;53: 1-271.
7. International Institute of Population Sciences (IIPS) National Family Health Survey (NFHS-3), Fact sheets for 29 States. Mumbai: International Institute for Population Sciences India, Mumbai. 2007.
8. Panda P, Benjamin AI, Singh S, Zachariah P. Health status of school children in Ludhiana city. Indian J Community Med. 2000;25(4):150-155.
9. Banerjee A. Height and weight patterns as indicators of growth among school children in an Air Force Station: A cross sectional study. Med J Armed Forces India. 2001;57(1):8-11. doi: 10.1016/S0377-1237(01) 80080-0.
10. Best C, Neufingerl N, Van Geel L, Van den Briel T, Osendarp S. The nutritional status of school-aged children: why should we care? Food Nutr Bull. 2010; 31(3):400-417.
11. N C Shivaprakash, Ranjit Baby Joseph. "Nutritional Status of Rural School-Going Children (6-12 Years) of Mandya District, Karnataka". Int J Sci Stud. 2014;2(2):39-43.
12. Hasan I, Zulkifle M, Haseeb A. 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. 2011;3(3):167-176.
13. Ruchika H, Faizan A, Kesari K, Prasad R. Assessment of Nutritional Status of 7-10 Years School Going Children of Allahabad District: A Review. Middle East J. Sci. Res. 2008;3(3):109-115.
 14. Fazili A, Mir A, Pandit IM 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. 2012;11(2).
 15. Mendhi GK, Barua A, Mahanta J. Growth and Nutritional Status of School age Children in Tea garden workers of Assam. J human Ecol. 2006;19(2): 83-85.
 16. Bandopadhyay D. A Nutrition Survey of school children, Navi Nagar Mumbai. Medical Journal and Forum India. 1988;44(1):31-34.
 17. Mitra M, Kumar PV, Chakraborty S, Bharati P. Nutritional Status of Kamar Tribal Children, Chhattisgarh. Indian J of Pediatrics. 2007;74(4):381-384.
 18. Chaudhary SD, Chakraborty T, Ghosh T. Prevalence of under nutrition in Santal Children of Puriliya district West Bengal. Indian Pediatrics. 2008;45(1): 43-46.
 19. Dhingra DC, Anand NK, Gupta S. Health status of school children of various socio-economic groups. Indian Pediatric. 1977;14(3):243-246.
 20. Panda P, Benjamin AI, Zachariah P. Growth and morbidity patterns among rural school children in Ludhiana, Punjab. Health Popul Perspect Issues. 1997; 20(1):20-28.
 21. Harish Chandra Tiwari, Anju Gahlot, Richa Mishra. "Health profile of primary school children: study from a rural health block of Kanpur". Journal of Evolution of Medical and Dental Sciences 2013 Sep 9;2(36):6941-6945.
 22. Panda P, Benjamin AI, Zachariah P. Growth and morbidity patterns among rural school children in Ludhiana, Punjab. Health Popul Perspect Issues. 1997; 20(1):20-28.
 23. Anurag Srivastava, Syed E Mahmood, Payal M Srivastava, Ved P Shrotriya, Bhushan Kumar. Nutritional status of school-age children - A scenario of urban slums in India Arch Public Health. 2012;70(1): 8. Published online 2012 Apr 17. Doi: 10.1186/0778-7367-70-8.
 24. L. Shrestha, J. Khatri. Health status of school children of Pokhara valley, Nepal. J. of Nepal Med Asso 2003; 42(147):128-32.
 25. S R Nigudi, Shrinivasan Reddy, Raj Shekhar Kaptey. Morbidity pattern of school children of Gulbarga City. Media Innovatica. December 2012;1(2):20-24.
 26. Panda P, Benjamin AI, Zachariah P. Growth and morbidity patterns among rural school children in Ludhiana, Punjab. Health Popul Perspect Issues. 1997; 20(1):20-28.
 27. Indirabai K. Ratna Malika DPNM: school health service programmer, a comprehensive study of school children of Tirupati city, Andhra Pradesh. Indian Pediatric. 1976;13(10):751-758.
 28. S.R. Shakya, S. Bhandary, P.K. Pokharel. Nutritional status and morbidity pattern among governmental primary school children in the eastern Nepal. Kathmandu University Med. J. 2004;2(4)8:307-14.
 29. Prabhakar SC, Gangadhar MR. Nutritional Status of Jenukuruba Tribal Children in Mysore District, Karnataka. Anthropologist. 2009;11(2):83-88.
 30. Kamath P, Guru Prasad BS, Deepthi R, Muninrayana C. Prevalence of ocular morbidity among school going children (6-15 years) in rural area of Karnataka, South India. Int J Pharm Biomed Res. 2012;3(4) :209-212.
-