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Original Research Article

Evaluation of nutritional status of children aged 5-14 years in rural areas of Kanpur

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ABSTRACT

Background: Despite India's 50% increase in GDP since 1991, more than one third of the world's malnourished children live in India. The prevalence of underweight children in India is among the highest in the world. In this endeavor, we have under-taken empirical research to evaluate the nutritional status of children aged 5-14 years and to improve nutritional status of children living in rural areas of Kanpur.
Methods: This is a cross sectional study conducted amongst children aged 5-14 years in rural area of Kanpur. Children were examined clinically and height and weight were measured following standard procedures. MS Excel and Interactive statistics page were used for analysis of data.
Results: Mean age of subjects (in years) was 10.09±2.57 and 9.43±2.42 of males and females respectively. Prevalence of underweight was 39.4%; underweight female (41.1%) and males (38.1%). Prevalence of stunting was 27.8%; girls 36.8% and males 20.3%. Thinness (BMI for age/sex <-2SD) was found in 26.6% of children. The prevalence of pallor was found in 27.5% subjects with Thinness. This association was found statistically significant (X^2=6.250, p=0.001). Dental carries was found in 49 (13.61%) but in subjects with BMI < -2SD (thinness), 23 out of 92 had dental carries. This association was found statistically significant (X^2=13.632, p=0.001).
Conclusions: The problem of underweight is still high in rural areas. Total 27.8% children were stunted showing chronic malnutrition. This needs to be tackled through adequate nutrition and health education. Nearly 40 percent of the children were under-weight; an acute condition if not corrected at earlier stage may progress to severe form of malnutrition.

Keywords: Children of age group 5-14 years, Anthropometry, Underweight, Stunting, Thinness

INTRODUCTION

Despite India's 50% increase in GDP since 1991, more than one third of the world's malnourished children live in India.[1,2] The World Bank estimates that India is one of the highest ranking countries in the world for the number of children suffering from malnutrition. There were 795 million undernourished people in the world in 2014, a decrease of 216 million since 1990.[3] Apart from mid-day meal programme, which is run by the Government of India in government run schools, there are no other efforts for children in age group 5-14 years. A total of 925 million people are undernourished in 2010, an increase of 80 million since 1990. Nearly all of the undernourished are in developing countries.[4] Census 2011 has shown that this age 5-14 years group forms a very large proportion of the population. The prevalence of underweight children is 47% in India, is among the highest in the world and is nearly double that of Sub-Saharan Africa with direct consequences for morbidity, mortality, productivity and economic growth.[5,6]

Based on the age, body weight and height, a number of indices such as height-for-age and weight-for-height have

been suggested.[7] The children are classified using three categories: 'underweight' (low weight-for-age), 'stunting' (low height-for-age) or 'wasting' (low weight-for-height). Low anthropometric values are those more than 2 SD away from the CDC 2000 (centers for disease control and prevention) standards India has the highest number of children stunted because of malnutrition (48.2 million) equivalent to Colombia's population, according to Save the Children's 'Stolen Childhoods' report.[7-9] 31 million of children are part of India's workforce, the highest in the world. These two factors along with the lack of education and early marriage/parenthood pushed India to 116th place among 172 countries assessed for threats to childhood. In this endeavor, we have under-taken empirical research to evaluate the nutritional status of children aged 5-14 years and to improve nutritional status of children living in rural areas of Kanpur.

METHODS

This is an observational, cross sectional study conducted amongst children aged 5-14 years, in field area of RHTC (Rural health training centre, Shivrajpur) of RMCH&RC, Mandhana, Kanpur. Study was conducted for duration of 1 year (December 2017 to December 2018). Sample size has been calculated considering the prevalence obtained for underweight in the study Abid et al, which is 40%.[10]

$$N \geq \frac{Z^2_{1-\alpha/2} p \times (1-p)}{d^2}$$

$$N \geq \frac{1.96^2 \times 0.4 \times 0.6}{(0.06)^2}$$

Approximately 15% more than the minimum sample size required was taken for present study (n=360).

Out of the total 24 villages located within the covered area of RHTC, Shivrajpur, Kanpur, 5 villages (Bairi, Mahipalpur, Munderi, Khathi Niwada, Chakbaka) were selected randomly by using computer generated random number and applying simple randomization method. First house was selected then every third house was visited in sequence and children of age 5-14 years were interviewed till 360 children were achieved. The children/parents who were not willing to give consent or children who were hospitalized or not available at the time of visit were excluded from our study.

A pre-designed and pre-tested semi-structural questionnaire based proforma was set and data was collected. After taking ethical clearance from ethical committee of our institute & consent from parents, the children were examined clinically and by using the standard procedures of Anthropometry, height and weight were recorded.

For assessing the nutritional status, height for age, Weight for age and BMI for age was calculated using new WHO growth reference standards separate for boys and girls. To assess the dietary intake of the children, a 24 hour recall method of diet survey was adopted. The mother and the respective children were asked to give an account of the quantity of food items consumed. The data were analyzed by applying appropriate statistical tools.

RESULTS

Table 1 shows that maximum numbers of respondents (56/360) 15.6% were aged 9 years and minimum (6/360) 1.4% aged 5 years.

Table 1: Demographic profile of study subjects according to age.

Age (in years)	Number	Percentage (%)
5	6	1.4
6	28	7.8
7	62	14.4
8	32	8.9
9	56	15.6
10	51	14.2
11	23	6.2
12	46	12.8
13	33	9.2
14	34	9.4
Total	360	100

Table 2: Gender wise distribution of study subject.

Gender	Age in years (Mean±SD)	Number	Percentage (%)
Male	10.09±2.57	197	54.7
Female	9.43±2.42	163	45.3

Age and gender wise distribution of respondent's shows that 54.7% (197/360) were males and 45.3% (163/360) were females. There was no significant difference in mean age of subject. Mean age of subjects (in years) was 10.09±2.57 and 9.43±2.42 of males and females respectively (Table 2).

Table 3 shows 60.6% (218/360) subjects had normal weight for age remaining 39.4% (142/360) were underweight. Maximum 67.9% had normal weight for age and remaining 32.1% were underweight among 6 years age children and among 8 years children, minimum 46.9% subjects had normal weight and remaining 53.1%were found underweight.

Among total 142 underweight children, higher percentage of females was found to be under weight (41.1%), according to weight for age criteria than males (38.1%). But this difference is statistically not significant (p=0.7).

Weight for age was found normal in 218 (60.6%) with mean weight for age (29.4±10.6) and remaining 142 (39.4%) subjects with mean weight for age (19.2±4.9), were underweight for age, out of total 360 study subjects.

Table 3: Distribution of study subjects according to weight for age.

Age (in years)	Weight for age		Total N (%)
	Normal N (%)	Under weight N (%)	
5	3 (60.0)	2 (40.0)	5 (100.0)
6	19 (67.9)	9 (32.1)	28 (100.0)
7	29 (55.8)	23 (44.2)	52 (100.0)
8	15 (46.9)	17 (53.1)	32 (100.0)
9	36 (64.3)	20 (35.7)	56 (100.0)
10	32 (62.7)	19 (37.3)	51 (100.0)
11	13 (56.5)	10 (43.5)	23 (100.0)
12	30 (65.2)	16 (34.8)	46 (100.0)
13	19 (57.6)	14 (42.4)	33 (100.0)
14	22 (64.7)	12 (35.3)	34 (100.0)
Total	218 (60.6)	142 (39.4)	360 (100.0)

Table 4: Weight for age and genders among study subjects.

Weight for Age	Weight in Kg. (Mean±SD)	Gender		Total
		Male	Female	
		N (%)	N (%)	N (%)
Normal weight	29.4±10.6	122 (61.9)	96 (58.9)	218(60.6)
Under weight	19.2±4.9	75 (38.1)	67 (41.1)	142 (39.4)*
Total		197(100.0%)	163 (100.0)	360 (100.0)

*Z=0.37; p=0.7.

Table 5: Prevalence of stunting according to height for age among children aged (5-14 years).

Age (in years)	Height for age(cm)		Total
	Normal height (±2SD)	Stunting (<-2SD)	
	N (%)	N (%)	N (%)
5	4 (80.0)	1 (20.0)	5 (100.0)
6	15 (53.6)	13 (46.4)	28 (100.0)
7	27 (51.9)	25 (48.1)	52 (100.0)
8	15 (46.9)	17 (53.1)	32 (100.0)
9	33 (58.9)	23 (41.1)	56 (100.0)
10	40 (78.4)	11 (21.6)	51(100.0)
11	22 (95.7)	1 (4.3)	23 (100.0)
12	41 (89.1)	5 (10.9)	46 (100.0)
13	31 (93.9)	2 (6.1)	33 (100.0)
14	32 (94.1)	2 (5.9)	34 (100.0)
Total	260 (72.2)	100 (27.8)	360 (100.0)

*Height for age Boys/Girls (WHO 2007 reference)

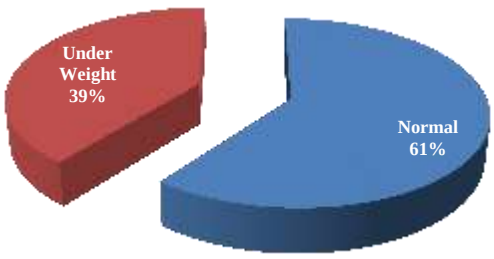

Figure 1: Prevalence of under weight.

Table 5 shows 72.2% (260/360) subjects had normal height for age remaining (100/360) 27.8% were stunted out of 360. Maximum 95.7% had normal height for age and remaining 4.3% were stunted among 23 children of 11 years age and among 32 subjects of 8 years, minimum 46.9% subjects had normal weight and remaining 53.1%were found stunted.

Height for age was found normal in 260 (72.2%) with mean height for age (131±18.04) and remaining 100 (27.8%) subjects with mean height for age (121.45±12.55) were stunted, out of total 360 study subjects. Among 100 subjects with stunted for age, 40 (20.3%) were boys and 60 (36.8%) were girls (Table 6).

Table 6: Height for Age and genders among study subjects mean.

Height for age*	Height in cm. Mean±SD	Gender	
		Male	Female
		N (%)	N (%)
Normal HT (±2SD)	131.00±18.041	157 (79.7)	103 (63.2)
Stunting (<-2SD)	121.45±12.552	40 (20.3)	60 (36.8)
Total		197 (100.0)	163 (100.0)

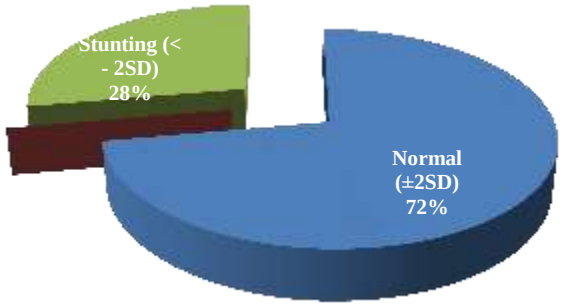

Figure 2: Prevalence of stunting.

Table 7: Body mass index (BMI) of children aged (5-14 years).

Age (in years)	Nutritional status (BMI* for age)	
	Normal±2SD	BMI (-2SD) (Thinness)
	N (%)	N (%)
5	3 (60.0)	2 (40.0)
6	21 (75.0)	7 (25.0)
7	35 (67.3)	17 (32.7)
8	17 (53.1)	15 (46.9)
9	39 (69.6)	17 (30.4)
10	35 (68.6)	16 (31.4)
11	16 (69.6)	7 (30.4)
12	37 (80.4)	9 (19.6)
13	31 (93.9)	2 (6.1)
14	34 (100.0)	0 (0.0)
Total	268 (74.4)	92 (25.6)

BMI* for age Boys/Girls (WHO 2007 reference).

Results shows that total 268 (74.4%) subjects had normal BMI for age/sex (±2SD) remaining 92 (26.6%) were found their BMI for age/sex <-2SD out of 360 subjects. Among 33 subjects of age 13 years, maximum 93.9% had normal BMI for age/sex (±2SD) and remaining 6.1% were of BMI<-2SD and among 32 subjects of age 8 years, minimum 46.9% subjects had normal weight and remaining 53.1% were found BMI <-2SD (Table 7).

BMI for age/sex with BMI <-2SD (thinness) (92 subjects), only 41 (20.8%) were boys and remaining 51 (31.3%) were girls.

Results shows that 268 subjects had mean BMI 16.49±2.06 with normal nutritional status and remaining 92 had mean BMI 12.76±.69 were showing thinness (Table 8).

Present study shows that overall prevalence of pallor was found 99 (27.5%) out of total 360 subjects with BMI ±2SD, 50 out of 260 had pallor and subjects with BMI <-2SD, 49 out of 92 subjects had pallor. This association between pallor among study subjects and their nutritional status was found statistically significant (X^2=6.250, p=0.000).

Table 9 shows that overall prevalence of dental carries was found 49 (13.61%) out of total 360, subjects with BMI±2SD 26 had dental carries and subjects with BMI <-2SD, 23 out of 92 subjects had dental carries. This association between dental carries among study subjects and their nutritional status was found statistically significant (X^2=13.632, p=0.000).

Present study depicts the overall prevalence of Ear discharge was 26 (7.22%) in total 360 subjects. 14 out of 268 subjects with BMI±2SD had Ear discharge and subjects with BMI <-2SD, 12 out of 92 had Ear discharge. This association between Ear discharge among study subjects and their nutritional status was found statistically significant (X^2=6.250, p=0.012).

Table 8: BMI for age and genders among study subjects.

BMI for age/sex	BMI Mean±SD	Gender		Total
		Male	Female	
		N (%)	N (%)	N (%)
Normal (±2SD)	16.49±2.06	156 (79.2)	112 (68.7)	268 (74.4)
BMI (<-2 SD) (Thinness)	12.76±.69	41 (20.8)	51 (31.3)	92 (25.6%)
Total		197(100.0%)	163 (100.0)	360 (100.0)

Table 9: Health problems and nutritional status of study subjects according to BMI forage/sex.

Health problems	BMI for Age		X^2	d.f	P value
	(±2SD)	(<-2 SD)			
	N (%)	N (%)			
Pallor					
Yes	50 (18.7)	49 (53.3)	41.134	1	0.000
No	218 (81.3)	43 (46.7)			
Total	268 (100)	92 (100)			
Teeth					
Normal	242 (90.3)	69 (75.0)	13.632	1	0.000
Dental carries	26 (9.7)	23 (25.0)			
Total	268 (100)	92(100)			
Ear discharge					
Yes	14 (5.220)	12 (13.04)	6.250	1	0.012
No	254 (94.78)	80 (86.96)			
Total	268 (100)	92 (100)			
Vitamin A deficiency					
Normal vision	258 (96.3)	83 (90.0)	5.017	1	0.025
Diminished vision	10 (3.7)	9 (9.8)			
Total	268 (100.)	92 (100)			

Above table shows that overall prevalence of Night blindness was found 19 (5.27%) out of total 360 subjects. 10 out of 268 BMI±2SD had diminished vision in night and 9 out of 92 subjects with BMI <-2SD had diminished vision in night. This association between diminished vision among study subjects and their nutritional status was found statistically significant (X^2=5.017, p=0.025).

DISCUSSION

Present study shows majority of study children 15.6% were aged 9 years and minimum 1.4% aged 5 years. Age and gender wise distribution of study subjects shows that 54.7% were males and 45.3% were females. Mean age of subjects was 10.09 yrs ±2.57 and 9.43 yrs ±2.42 of males and females respectively Sharma et al study in Rural Areas of Moradabad were also found similar results in their study 149 (50.50%) were boys and 146 (49.5%) were girl participants.[11] The mean height and weight of girls was found to be lower than boys (Table 1 and 2).

Prevalence of underweight was 39.4% out of 360 (100%). Higher percentages of females (41.1%) were found to be under weight than males (38.1%). But this difference is statistically not significant (p=0.7) (Table 3 and 4, Figure 1). Tiwari et al conducted a study on health profile of primary school children study from a rural health block of Kanpur were also found similar results.[12] Proportion of underweight was found higher in case of girls (33.3%) as compared to boys (26.2%).

Total 27.8% (100/360) subjects were found to be stunted in my study and out of this 40 (20.3%) were boys and only 60 (36.8%) were girls. (Table 5 and 6, Figure 2) Mondal et al conducted a study on Nutritional Status of Children in Rural Govt. Primary School, district Khammam, Andhra Pradesh, India.[13] Similar results were found among boys, stunting and severe stunting were 17.9% and 2% respectively. While among girls, stunting and severe stunting were 20.1% and 6% respectively. Girls (20.1%) were more stunted than boys (17.9%).

BMI for age/sex was found normal in 268 (74.4%) study subjects and remaining 92 (25.6%) subjects were showing thinness. Among 92 subjects with low Body Mass Index for age/sex, only 41 (20.8%) were boys and 51 (31.3%) were girls in the present study (Table 7 and 8). Best et al conducted a study on the nutritional status of school-aged children shows the prevalence of thinness (low BMI-for-age) in school-aged children was described in 62 of the reviewed studies.[14] All studies used BMI as an indicator for thinness, but the cutoff values that were applied to define thinness varied and were sometimes inaccurate according to the recommendations. The average prevalence of thinness was around 35% in both Africa and South- East Asia and was less than 15% in all other regions. The prevalence of thinness was lowest in Latin America. Especially high levels of thinness, between 35% and 50%, were reported in national studies from Sri Lanka, Vietnam, Madagascar, and Uganda. The most severe prevalence (77% to 90%) were observed in poor school-aged children from eastern India, Bangladesh, and rural South Africa. Above study of Best et al was comparable with our study as most of the global data for thinness was based on (BMI for age) which was also used as indicator of thinness in our study.[14] Pandit et al conducted a study on nutritional status of school age children (5-14 years) in a rural health block found that for the indicator thinness the prevalence was higher in females in lower age group and vice versa (p>0.05).[15] The results of study are comparable with our study; up to

5 years thinness was less among females but above 5 years as age thinness was observed more among females.

The overall prevalence of pallor was found 99 (27.5%) out of total 360 subjects, and with BMI±2SD 50 had pallor and subjects with BMI <-2SD, 49 subjects had pallor. This association between pallor among study subjects and their nutritional status was found statistically significant (X2=6.250, p=0.000). Almost similar results were found by Prakash et al in their study on nutritional status of rural school going children (6-12 years) of Mandya district, Karnataka.[16] Iron deficiency anemia is the most common nutritional deficiency which affects health, education, economy, and productivity of the entire nation. In their study, out of 484, pallor was noted in 123 (25.4%) children of this 59 were boys and 64 were girls.

Prevalence of dental carries was found in 49 (13.6%) out of total 360 subjects, and with BMI ±2SD, 26 had dental carries and with BMI <-2SD, 23 out of 92 subjects had dental carries. This association between dental carries among study subjects and their nutritional status was found statistically significant (X^2=13.632, p=0.000). Almost similar results were found by Tiwari et al conducted a study on health profile of primary school children: study from a rural health block of Kanpur found that overall 25.7% children were affected by dental caries.[12]

The prevalence of Ear discharge was found 26 (7.22%) out of total 360 subjects. 14 out of 268 subjects with BMI ±2SD had Ear discharge and subjects with BMI <-2SD, 12 out of 92 had Ear discharge. This association between Ear discharge among study subjects and their nutritional status was found statistically significant (X2=6.250, p=0.012). Almost similar results were found by Asghar et al.[10] Conducted a study on Health status of primary school children: study from a rural health block of Lucknow, found that ear discharge was noticed in 10% and was more common in girls (13.63%).

The prevalence of night blindness was found in 19 (5.27%) out of total 360 subjects. 10 out of 268 subjects with BMI±2SD, had diminished vision in night and 9 out of 92 subjects with BMI <-2SD, had diminished vision in night. This association between diminished vision among study subjects and their nutritional status was found statistically significant (X2=5.017, p=0.025) (Table 9). Almost similar results were found by Asghar et al conducted a study on health status of primary school children in a rural health block of Lucknow, found vitamin A deficiency in 4.70%; results are almost similar to our study.[10]

CONCLUSION

The children of age group 5-14 years period is nutritionally significant. Malnutrition has serious long term consequences for the child and adversely influences development of a nation. The problem of underweight is still high in rural areas of Kanpur, in spite of a robust mid-day meal scheme and regular school health services in the state. Results shows that total 27.8% children were stunted as they were suffering from chronic malnutrition. This needs to be tackled through adequate nutrition and health education. Nearly 40 percent of the children were under-weight; an acute condition if not corrected at earlier stage may progress to severe form of malnutrition.

Recommendations

Health and nutritional education should be given to the children and their parents and should be made as a part of school curriculum apart from regular education activities. Regular health and nutritional assessment of the children for early detection and treatment should be stressed at ground level. School based nutritional screening programmes should be implemented and regularly monitored. There is role of I E C (information education and communication) like role playing, mass media, poster, folk media etc. and community participation, involvement of NGOs and other sectors in improving health status of children. Regular monitoring of growth of children and health education session for the mothers is going to be effective in prevention of malnutrition among the children.

Limitations of the study

Even though, this study provided important information regarding the nutritional health status of the children aged 5-14 years of rural community. It is required to assess some of the factors that influence health extension service utilization among communities, social desirability and recall bias among study participants were the drawback of this study.

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REFERENCES

1. The Indian exception". The Economist. 2011.
2. UNICEF. The Children. Available at: http://www.unicef.org/india/children_2356.htm. Accessed on 2 October 2010.
3. Meeting the 2015 international hunger targets: taking stock of uneven progress Food and

Agriculture Organization of the United Nations, Economic and Social Development Department, 2015.
4. FAO. World Hunger and Poverty Facts and Statistics 2010. Available at: http://www.fao.org/publications/sofi/en. Accessed on 22 September 2010.
5. "World Bank Report". The World Bank. World Bank Report on Malnutrition in India, 2009.
6. Gragnolati M, Shekar M, Gupta MD, Bredenkamp C, Lee YK. India's Undernourished Children: A Call for Reform and Action: What are the dimensions of the undernutrition (Nutrition) problem in India? The World Bank; 2005: 6.
7. 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;55:489–98.
8. Kuczmarski 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.
9. 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; Available at: http://whqlibdoc.who.int/trs/WHO_TRS_854.pdf, Accessed on 20 May 2011.
10. Asghar SA, Gupta P, Srivastava MR, Srivastava JP, Zaidi ZH. Health status of primary school children: study from a rural health block of Lucknow. Int J Community Med Public Health. 2017;4(7):2498-501.
11. Sharma M, Watode B, Srivastava A. Nutritional Status of Primary School Children through Anthropometric Assessment in Rural Areas of Moradabad. Ann Int Med Dent Res. 2016;3(2):1-5.
12. Tiwari HC, Gahlot A, Mishra R. Health profile of Primary School Children: study from a rural health block of Kanpur. J Evol Med Dent Sci. 2013;2(36):6941-45.
13. Mondal R, Biswas T, Ravi Kumar BP, Arlappa N, Chatterjee C, Majumder A Nutritional Status of Rural Govt. Primary School Children in Khammam District, Andhra Pradesh, India. IJMDS. 2015;4(2):818-27.
14. Best C, Neufinger N, Gee L, Briel T, Osendarp S. The nutritional status of school-aged children: Why should we care? Food Nutr Bulletin. 2010;31(3):400-17.
15. Pandit IM, Ahmad SN, Khan S, Haq IU. Nutritional status of school age children (5-14 years) in a rural health block. Int J Current Res. 2015;7(2):12500-2.
16. Shivaprakash NC, Joseph RB. Nutritional Status of Rural School Going Children (6 12 Years) of Mandya District, Karnataka. Int J Sci Study. 2014;2(2):39-43.

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