## Original Research Article

# Nutritional status determined by anthropometric measurement among rural school children aged between (6-18 years) using WHO Z-score in our field practice area 

Seema P. ${ }^{1 *}$, Damayanthi M. N. ${ }^{2}$

Department of Community Medicine, ${ }^{1}$ ESI Medical College and Hospital, Rajajinagar, Bangalore, ${ }^{2}$ Chamarajanagara Institute of Medical College, Chamarajanagara, Karnataka, India

Received: 06 October 2017
Revised: 02 January 2018
Accepted: 12 February 2018

## *Correspondence:

Dr. Seema P.,
E-mail: seema_97in@yahoo.co.in
Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.


#### Abstract

Background: In India, children under 15 years of age constitute about $40 \%$ of the population. Nutrition among this age group is of vital importance as ill health leads to imbalance both in physical and mental growth. Hence this study was taken up to assess the nutritional status of school going children. Methods: Study design: cross-sectional study. Study period: one year. Sample technique: purposive sampling. Data collection: by interview method. Anthropometric measurements were recorded. New WHO growth chart standards were considered in assessing stunting, underweight, thinness and obesity among these children. Data analysis: SPSS software version 19. Results: A total of 932 children from 7 government schools were enrolled. 324 children were in the age group of 6-10 years. Among them 156 ( $48.14 \%$ ) were underweight for their age and gender. In these $156,89(57 \%)$ were boys of whom $60 \%$ of them were 10 years of age. 67 ( $52.4 \%$ ) were girls, among whom we found 27 ( $62.2 \%$ ) were 10 years. There were 594 children who were stunted for their age. 274 ( $46.12 \%$ ) were boys and 320 ( $53.87 \%$ ) girls. Thinness was observed, which around $44.6 \%$ was, 175 children were severely thin for their age and gender. Overweight was $6.76 \%$ and 10 children were obese for their age and gender. Conclusions: Malnutrition among children is a major public health problem in India. Stunting was seen in 274 boys and 320 girls, among them $148(54 \%)$ and $184(57.5 \%)$ girls were in the age of $11-15$ years. Thinness was seen in 416 $(44.6 \%)$ of children, among them $175(18.8 \%)$ were severely thin for their age and gender. The present study will be useful for the policy makers to formulate various strategies and health care programmes of the population concern to combat the issue.


Keywords: Nutritional status, Height, Weight, WHO-Z score

## INTRODUCTION

Malnutrition continues to be a primary cause of ill health and mortality among children in developing countries. It is a major public health problem and accounts for about half of all child death's worldwide. ${ }^{1}$ School children constitutes a large pool of this age group, It is widely
accepted that, for the practical purposes, anthropometry is the most useful tool for assessing the nutritional status of children. ${ }^{2}$ Nutritional deprivation is rampant in children of school age particularly primary school children of school age. Primary school children ranging in magnitude from $20-80 \%$ of the population. Since deficient physical growth is naturally reflected in their sub-optimal
achievement, assessment of nutritional status of this segment of population is essential for making progress towards improving overall health of the school age children. ${ }^{3}$ Anthropometric parameters are frequently used by physician and health workers as a valuable instrument to define nutritional status, and assess the growth and development of children. Decision for policy making and planning in public health nutrition must be based on accurate anthropometric information on the population for which it is intended to used. ${ }^{6}$ The present study was taken up to assess the nutritional status among school going children measuring their height and weight, calculating BMI using WHO Z- score system.

## METHODS

A cross-sectional study was conducted in the field practice area attached to the Department of Community Medicine, RRMC, Bangalore. Institutional Ethical Clearance was obtained from Ethical Committee to conduct the study. Study period was for one year duration (January 2014 to January 2015). Purposive sampling technique was adopted and seven government schools were identified for the study. Data was collected by trained investigators and medical officer. Prior permission from parents and from respective head masters of all seven government school was taken. Age
was recorded based on their school records The data was collected by interviewing and examining the children with the help of class teacher. Absent student data was collected in the subsequent visit.

Weight and height of children were measured in situ at the time of interview using standardized techniques. New WHO growth chart standards were considered in assessing stunting, underweight, thinness and obesity among children. If the child's height weight and BMI was less than 2SD for the corresponding age and gender, then the child was considered as stunted, underweight or thin respectively. If the child's BMI was more than 2 SD then it was considered as obese, if it fell between one and 2SD then the child was considered as overweight. The collected data was reviewed and entered into Excel sheets for analysis for computing using SPSS software version 19.

## RESULTS

In our study, among 932 children who were included, 324 ( $34.7 \%$ ) were in the age group of 6-10 years, among them $155(47.8 \%)$ were girls and 169 ( $52.2 \%$ ) were boys. 608 ( $65.2 \%$ ) were between 11-18 years, 318 ( $52.3 \%$ ) were girls and 290 ( $47.7 \%$ ) were boys (Table 1).

Table 1: Age and sex wise distribution of the children.

| Age (in years) | Females (\%) | Males (\%) | Total |
| :--- | :--- | :--- | :--- |
| $\mathbf{6 - 1 0}$ | $155(47.8)$ | $169(52.2)$ | $324(34.7)$ |
| $\mathbf{1 1 - 1 8}$ | $318(52.3)$ | $290(47.7)$ | $608(65.2)$ |
| Total | 473 | 459 | $932(99.9)$ |

Table 2: Showing the weight for age.

| Weight for age | Normal |  | Moderate |  | Severe |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Age | N | $\%$ | N | $\%$ | N | $\%$ |
| $\mathbf{6}$ | 20 | 11.9 | 11 | 12.1 | 4 | 6.2 |
| $\mathbf{7}$ | 37 | 22.0 | 15 | 16.5 | 8 | 12.3 |
| $\mathbf{8}$ | 41 | 24.4 | 19 | 20.9 | 10 | 15.4 |
| $\mathbf{9}$ | 38 | 22.6 | 21 | 23.1 | 18 | 27.7 |
| $\mathbf{1 0}$ | 32 | 19.0 | 25 | 27.5 | 25 | 38.5 |
| Total | 168 | 100.0 | 91 | 100.0 | 65 | 100.0 |

Table 3: Showing stunting among school children.

|  | All (N=932) | Boys (N=461) | Girls (N=471) |
| :--- | :--- | :--- | :--- |
| Prevalence of moderate stunting | $276(29.6 \%)$ | $140(30.4 \%)$ | $136(28.9 \%)$ |
|  | (CI: 26.8-32.6) | (CI: 26.4-34.7) | (CI: 25.0-33.1) |
|  | (CI: 31.2 318$)$ | $134(29.1 \%)$ | $184(39.1 \%)$ |
| Prevalence of total stunting | $594(63.7 \%)$ | (CI: 25.1-33.4) | (CI: 34.8-43.5) |
|  | (CI: 60.6-66.8) | $274(59.4 \%)$ | $320(67.9 \%)$ |
|  |  | (CI: 54.9-63.8) | (CI: 63.6-72.0) |

In our study, we found 324 ( $34.7 \%$ ) of children belonged to 6-10 years of age. Among these 324 children, 91
children were moderately underweight for their age and gender, among them 25 children were 10 years old. Severe underweight was seen in 65 children, among them

25 children belonged to 10 years of age (Table 2, Figure 1).

A total of 594 ( $63.7 \%$ ) among 932 children were stunted for their age and gender. Whereas prevalence of severe
stunting was seen in 318 (34.1\%), among them 134 ( $29.1 \%$ ) were boys and 184 (39.1\%) girls. Moderate stunting was seen in $276(29.6 \%)$ children among them 140 (30.4\%) boys and 136 ( $28.9 \%$ ) girls (Table 3).

Table 4: Showing thinness among school children.

|  | All ( $\mathrm{N}=932$ ) | Boys ( $\mathrm{N}=461$ ) | Girls ( $\mathrm{N}=471$ ) |
| :---: | :---: | :---: | :---: |
| Prevalence of moderate thinness | $\begin{aligned} & 241 \text { (25.8\%) } \\ & \text { (CI: 23.2-28.8) } \end{aligned}$ | $\begin{aligned} & 89 \text { (19.3\%) } \\ & \text { (CI: 16.0-23.2) } \end{aligned}$ | $\begin{aligned} & 152(32.3 \%) \\ & \text { (CI: } 28.2-36.6) \end{aligned}$ |
| Prevalence of severe thinness | $\begin{aligned} & 175(18.8 \%) \\ & \text { (CI: } 16.4-21.4) \end{aligned}$ | $\begin{aligned} & 98(21.3 \%) \\ & \text { (CI: 17.8-25.2) } \end{aligned}$ | $\begin{aligned} & 77(16.3 \%) \\ & \text { (CI: 13.3-20.0) } \end{aligned}$ |
| Prevalence of total thinness | $\begin{aligned} & 416(44.6 \%) \\ & \text { (CI: 41.5-47.8) } \end{aligned}$ | $\begin{aligned} & 187(40.6 \%) \\ & \text { (CI: 36.2-35.1) } \end{aligned}$ | $\begin{aligned} & 229(48.6 \%) \\ & \text { (CI: 44.1-53.1) } \end{aligned}$ |

Table 5: Showing prevalence of overweight and obesity among school children.

|  | All $(\mathrm{N}=932)$ | Boys (N=461) | Girls (N=471) |
| :--- | :--- | :--- | :--- |
| Prevalence of overweight | $63(6.76 \%)$ | $31(6.72 \%)$ | $32(6.79 \%)$ |
|  | $(\mathrm{CI}: 5.32-8.56 \%)$ | $(\mathrm{CI}: 4.78-9.39)$ | $($ CI: $4.85-9.43)$ |
| Prevalence of obese | $10(1.07 \%)$ | $5(1.08 \%)$ | $5(1.06 \%)$ |
|  | (CI: $0.58-1.96)$ | (CI: $0.46-2.51)$ | (CI: $0.45-2.46)$ |
| obese | $73.83 \%)$ | $36(7.8 \%)$ | $37(7.86 \%)$ |
|  | $(\mathrm{CI}: 6.28-9.74)$ | $(\mathrm{CI}: 5.69-10.62)$ | (CI: $5.75-10.46)$ |



Figure 1: Showing underweight among school children.

In our study among 932 children, a total of 416 ( $44.6 \%$ ) children were thin for their age and gender. Severe thinness was seen in 175 ( $18.8 \%$ ) children, among these 98 (21.3\%) were boys and 77 ( $16.3 \%$ ) girls. In 241(25.8\%) were moderately thin, we found 89 (19.3\%) were boys and 152 ( $32.3 \%$ ) girls (Table 4).

Among 932 children who were recruited for the study, we found overall prevalence of overweight was seen in 63 ( $6.76 \%$ ) children and $10(1.07 \%)$ were obese for their age and gender (Table 5).

## DISCUSSION

In our study among 932 children, 324 children were in the age group of 6-10 years. Among them 89 (43.5\%) boys and $67(52.4 \%)$ girls were underweight for their age
and gender whereas Joshi et al in their study found that among 786 students, $26 \%$ of the students were found to be undernourished and $13 \%$ were stunned, $12 \%$ wasted and $1 \%$ included both stunted and wasted. ${ }^{1}$ In our study we found 594 ( $63.7 \%$ ) among 932 children were stunted for their age and gender. Whereas prevalence of severe stunting was seen in 318 ( $34.1 \%$ ) among them 134 $(29.1 \%)$ were boys and $184(39.1 \%)$ girls. Moderate stunting was seen in 276 (29.6\%) children among them 140 (30.4\%) boys and 136 (28.9\%) girls. Whereas Hasan et al found that overall prevalence of malnutrition in the school children was found to be $52 \%$ (260). ${ }^{2}$ Prevalence of malnutrition among boys was $53.85 \%$ and girls was $49.25 \%$, stunning was more in boys as compared to girls ( $41.47 \%$ vs. $38.81 \%$ ).

In our study overall prevalence of underweight was $48.14 \%$ and underweight was highest seen in age group of 10 years which was around $15.43 \%$, stunting was seen in 594 children among them 274 boys and 320 girls, among them 332 ( $55.89 \%$ ) were between 11-15 years of age, thinness was seen in 341 children and boys in age between 16-18 years were around $25.7 \%$ and girls 6-10 years were around $36.4 \%$ whereas Fazili in their study showed that overall prevalence of underweight of $19.2 \%$ highest seen in 6 year old males was $21.5 \%$ and stunting 12 year males highest of $28.5 \%$ prevalence, prevalence of thinness was lowest in 13 year old females of $14.2 \%$ and highest in 13 year old males of $47.1 \%$. ${ }^{3}$ In our study we found among these 324 children, 91 children were moderately underweight for their age and gender, among them 25 children were 10 years old. Severe underweight was seen in 65 children, among them 25 children
belonged to 10 years of age. Dolla found that $59.8 \%$ of the children weight for age were under weight (<median2SD) and $26.2 \%$ children had very low body weight which were $<-3$ SD of the standard. ${ }^{4}$

From our study we saw prevalence of thinness among boys ( $43.3 \%$ ) which is significantly high than that of girls (29.9\%) (chi square $=18.16, \mathrm{p}=0.00002$ ). whereas Study conducted by Marwaha et al found that height of boys and girls was consistently higher at all ages when compared with earlier India data, but the final height was $2-4 \mathrm{~cm}$ lower than that reported in the WHO multicentre study of $2007 .{ }^{5}$ In our study we found overall prevalence of overweight was seen in 63 ( $6.76 \%$ ) children and 10 $(1.07 \%)$ were obese for their age and gender. Whereas Dhingra, Jain and Raj in their study found boys fall in the overweight with shorter height ( $\mathrm{SD}>1<2$ ) in all age groups except at age group 8 where the boys are significantly taller than the reference values. ${ }^{6}$ Girls were overweight in all the age group ( $\mathrm{SD}>1<2$ ) except at age 6. In our study we found overall prevalence of stunting among girls ( $67.8 \%$ ) which is significantly high compared to that of boys (54.6\%) (Chi square-6.8, $\mathrm{p}=0.0089$ ) whereas Goon et al in their study found that boys were more underweight ( $48.8 \%$ ) than girls (38.5\%) and the difference was statistically significant ( $\mathrm{p}=0.024$; $\mathrm{p}<0.05$ ) and girls tend to be more stunted (56.8\%) compared to boys $(48.4 \%)(p=0.004 ; \mathrm{p}<0.05))^{7}$

## CONCLUSION

Malnutrition among children is a major public health problem in India. From our study it is seen that undernourishment among girls in the age group of 10 years was around $62.2 \%$ where as in boys was around $60 \%$. Whereas stunning which is a key indicator of chronic malnourishment was seen in 274 boys and 320 girls, among them 148 (54\%) and 184 (57.5\%) girls were in the age group of 11-15 years. Stunning among adolescent is of concern, especially girl children, hence providing community health education would reverse the problem. We also found thinness in our study group, 416 ( $44.6 \%$ ) children thin for their age and gender, among them 175 were severely thin. Around 63 ( $6.76 \%$ ) were overweight and $10(1.07 \%)$ obese for their age and gender in our study population.

The present study shows the magnitude of stunning and thinness which is still a nutritional problem. The result of present study will be useful for the policy makers in their endeavor to formulate various developmental strategies
and health care programmes for the population concern to combat the issue.

## ACKNOWLEDGEMENTS

We thank the team which helped us in conducting the study, We thank the school authorities for giving us permission to conduct the study and heartfelt thanks to children and their parents who helped us to conduct the study smoothly and also our colleagues and college authorities for their valuable guidance and support.

## Funding: No funding sources

Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

## REFERENCES

1. Joshi HS. Determinants of Nutritional status of school children- A cross sectional study in the Western region of Nepal. Natl J Integr Res Med. 2011;2(1):10-5.
2. Hasan I, Zulkifle M, Ansari AH. An Assessment of nutritional status of the children of government Urdu higher primary schools of Azadnagar and its surroundings areas of Bangalore. Arch Applied Sci Res. 2011;3(3):167-76.
3. Fazili A. Nutritional status of School Age Children (5-14years) in a rural health block of North India (Kashmir) using WHO Z-Score system. Online J Health Allied Sci. 2012;11(2):1-3.
4. Dolla CK. Nutritional status of Kodaku Pre-school children in Central India. J Hum Ecol. 2005;17(3):229-31.
5. Marwaha RK. Nationwide reference data for height, weight and body mass index of Indian School children. National Med J India. 2011;24(5):269-77.
6. Dhingra M, Jain R, Raj Y. Comparison of height, weight and BMI of Indian school children (614years of age) with WHO New Growth Standards. Br J Sports Med. 2010;44:37.
7. Goon DT. Anthropometrically determined nutritional status of urban primary schoolchildren in Makurdi, Nigeria. BMC Public Health. 2011;1:769.

Cite this article as: Seema P, Damayanthi MN.
Nutritional status determined by anthropometric measurement among rural school children aged between (6-18 years) using WHO Z-score in our field practice area. Int J Community Med Public Health 2018;5: 1424-7.

