

# An anthropometric study on the primary school in a rural area of district Bareilly

Dharmendra Kumar Gupta, Sonam Maheshwari\*, Shyam Bihari Gupta,  
Ved Prakash Shrotia, Aasheesh Kumar, Ratnesh

Department of Community Medicine, SRMS-IMS, Bareilly, India-243202  
\*Corresponding author E-mail: [maheshwarisonam2@gmail.com](mailto:maheshwarisonam2@gmail.com)

## Abstract

Now a day underweight as well as overweight has become serious problem among children and adolescents in developed and developing countries. Careful assessment, monitoring and follow up of these children and adolescent were of great importance for the health state of society. The aim of the present study was to determine the prevalence of obesity, overweight and underweight among primary school children in a rural area of district Bareilly. This cross-sectional study was performed on school-age children 4 to 14 years old, took place between December 2014 and March 2015. A total of 340 children (229 boys and 111 girls) were interviewed and examined. A pre-designed and pre-tested questionnaire was used to interview the study participants to elicit information on family characteristics like residence, religion, education and occupation of parents; and information on individual characteristics like age, sex. Anthropometric measurements were taken and noted by trained field workers. The prevalence of obesity, overweight was higher in boys than girls. There was significant relationship between BMI with gender and with age. Conclusion: Based on the results, although underweight was still relatively common in 4-14 year old children. Establishing interventional measures in order to prevent risky behaviors leading to Underweight and overweight seems to be highly necessary.

**Keywords:** Body mass index; Primary school children; ANOVA

## 1. Introduction

Children constitute the most important segment of any community. The Children's health of any community is a sensitive and important indicator of wealth of that community. Children's Underweight and overweight remain major public health problem throughout India. The country is still stressed with this major problem. The national family health survey (NFHS) data show that 53% of children in rural areas are underweight and this varies across states. The percentage of underweight children in the country was 53.4 in 1992; it decreased to 45.8 in 1998 and rose again to 47 in 2006 (Must 1996). More than half of the world's undernourished populations live in India. And more than half of Indian children are undernourished. Although the growing prevalence of overweight and obesity has received attention in many states (Maheshwari et al. 2015).

Underweight, the condition resulting from faulty nutrition, weakens the immune system and causes significant growth and cognitive delay. Growth assessment is the measurement that best defines the health and nutritional status of children, while also providing an indirect measurement of well-being for the entire population (Dietz 1981). Obesity related morbidities are rare in children and are generally restricted to the severely obese. Such morbidities include the Pick Wickian syndrome, orthopedic disorders such as genu valgum and genu varum, respiratory disorders such as upper airway obstruction (Srivastava et al 2012). The most prevalent immediate consequences for obese children are social isolation and peer problems (Dietz 1998).

School age is the active growing phase of childhood. Especially during primary school age is a dynamic period of physical growth as well as of mental development of the child. Research indicates that health problems due to miserable nutritional status in primary school-age children are among the most common causes of low school enrolment, high absenteeism, early dropout and unsatisfactory classroom performance (Maheshwari et al. 2015). Many social scientists reported a high prevalence of overweight among school children in India; along with it some studies reported a high prevalence of underweight among children. Excess weight in this age is the leading cause of pediatric hypertension, and overweight children are at a high risk for developing long-term chronic conditions, including adult onset diabetes mellitus, coronary heart disease, orthopedic disorders and respiratory diseases (Dietz 1981, Aristimuno et al. 1984). Therefore, it was proposed to carry out a study to assess and identify the prevalence of Underweight, overweight and obesity among rural school going children. The nutritional status of children does not only directly reflect the socioeconomic status of the family and social wellbeing of the community, but also the efficiency of the health care system, and the influence of the surrounding environment. The present study in selected rural area Bhojipura of Bareilly City in the state of Uttar-Pradesh (UP), India, aimed to evaluate the overall prevalence of underweight, overweight and obesity. Also to assess age-sex trends in the level of unhealthy weight, for correction of the nutritional deficit of the vulnerable population group and to provide baseline data for future research.

## 2. Methods

This cross-sectional study, in which we explored nutritional status in school-age children 4 to 14 years old, took place between December, 2014 and March, 2015 in Bhojpura Block of Bareilly (UP), India. A total of 340 children (229 boys and 111 girls) were interviewed and examined. A pre-designed and pre-tested questionnaire was used to interview the study participants to elicit information on family characteristics like residence, religion, education and occupation of parents; and information on individual characteristics like age, sex. Anthropometric measurements were taken and noted by trained field workers.

Ethical approval was obtained from Shri Ram Murti Smarak (SRMS) Institute of Medical Sciences, Bareilly (UP) Institution Review Board. The study was carried out in four private schools in Bhojpura block of Bareilly district in Uttar Pradesh, India. The schools include Ram Sahay Kundallal Junior High School Chakdha, Cambridge Academy Imam Naga Gautiya, ZSNC Public school and Cambridge Academy. For participation of the study subjects Principal of respective school was informed about the study objectives and gave informed written consent prior to inclusion into the study.

Each child's height and weight were measured in the metric system, using standardized technique recommended by Jelliffe (Jelliffe 1966). A stadiometer (measuring rod) capable of measuring to an accuracy of 0.1 cm was used to assess height of the subjects. The subject was made to stand without footwear with the feet parallel and with heels, buttocks, shoulders, and occiput touching the measuring rod, hands hanging by the sides. The head was held comfortably upright with the top of the head making firm contact with the horizontal head piece. A portable balance with an accuracy of 100 g was used to record the weight of the subjects. Children were instructed to stand on the balance with light clothing and without footwear and with feet apart and looking straight. Weight was recorded to the nearest value.

## 3. Result and discussion

Table 1 shows information regarding height, body weight and BMI measures that characterized the study sample. Height values

were higher in boys in age 4 and 5. Afterwards it was similar from 6 up to 13. At age 14, girl's height is more than boys. Weight values present that in initial age; almost boys were heavier than girls but in age 13 and 14 it became opposite. As for BMI, values showed that boys BMI is greater than girls. In total we can conclude Height weight and BMI growing increase with progressing age.

Table 2 shows the prevalence of low body weight/thinness, overweight and obesity stratified by gender and age. Girls had a higher prevalence of low body weight/thinness ( $p=0.028$ ) and a significantly higher prevalence of overweight and obesity than boys ( $p<0.001$  and  $p<0.031$ ). For all ages, 13.6 % of girls and 14.1 % of boys had low body weight/thinness. As for overweight, 3.7 % of girls and 6.5 % of boys were overweight, along with 2.0 and 2.2%, respectively, who were obese. As for age groups, a significant increase in the prevalence of low body weight/thinness was observed with age in both genders ( $p=0.022$ ). As for the prevalence of overweight and obesity, estimates indicated significant lower proportions with advancing age ( $p<0.001$  and  $p=0.001$ ). It shows proportion of overweight boys is increasing with increasing age while it was similar in case of girls.

Children in the age group of 5-14 years are often considered as school-age. Since 1972, the United Nations Educational Scientific and Cultural Organization (UNESCO) considers 6-11 years as primary school age and 12-17 years as secondary school age for statistical purposes (Srivastava et al 2012). According to census 2011, it is recorded that, in India, about 20 percent population consists of children between 5 and 14 years. During this period physical, mental, emotional social changes occur so this age is considered as a vibrant. In other words, the foundations of good health and sound mind are laid during the school age period (Srivastava et al 2012). Hence the present study was formulated with the objective, to assess and find the major socio-economic correlates of nutritional status in school-age children.

The differences observed in the prevalence underweight and overweight between boys and girls may possibly be explained by sexual specificities related to biological sensitivity to environmental aggressions, mainly those of nutritional nature. Although, justifications and the mechanisms of this phenomenon are not well defined.

**Table 1:** Mean, Standard Deviation and "F" Statistics Corresponding to Height, Body Weight and Body Mass Index Measures of Children Involved in the Study

Age (yrs)	Height(cm)			Body weight(Kg)			BMI(Kg/m <sup>2</sup> )		
	Girls	Boys	Total	Girls	Boys	Total	Girls	Boys	Total
4	68.00±10.14	103.00±6.06	95.8±5.76	12±1.96	14±3.04	13.5±1.3	13.5±3.0	15.9±1.8	15.6±1.2
5	105.00±11.31	124.33±12.10	116.8±8.2	16±2.83	19.67±5.69	14.6±3.3	12.6±3.3	14.6±3.3	13.6±1.1
6	118.94±5.36	118.88±5.01	118.2±1.9	19.33±3.3	18.88±2.46	19.4±0.6	13.3±5	15.6±1.8	14.8±1.5
7	121.33±5.43	127.50±6.48	125.8±2.4	20.72±2.63	22.72±3.13	22.2±6.1	14.6±4.6	16.3±1.5	15.4±1.7
8	131.27±3.91	130.33±7.08	130.5±2.6	25±4.61	24.48±3.69	24.6±4.0	15.3±1.9	17.3±2.1	16.5±1.6
9	132.14±6.46	136.21±6.60	134.7±2.7	27.24±5.24	27.47±3.61	27.4±4.3	15.9±2.6	18.6±1.7	17.2±2.4
10	139.06±4.48	138.27±7.05	138.6±2.86	29.71±4.83	27.73±8.02	28.5±3.5	17.6±3.1	20.6±2.0	18.3±2.3
11	141.83±3.53	140.13±6.98	140.4±3.4	34.17±6.56	29.71±6.74	30.4±1.6	16.4±1.4	19.2±5.0	18.0±3.9
12	144.00±4.24	146.93±8.38	146.6±3.3	32.5±3.54	33.07±7.78	33±1.1	18.4±1.4	22.5±1.0	20.7±3.5
13	153.20±3.03	152.67±6.44	152.9±3.6	43.2±3.56	36.50±4.59	39.5±5	18.6±6.0	23.9±2.0	22.4±4.9
14	159.00±1.4	150.50±0.70	153.3±4.3	48±2.64	40.50±12.02	43±2.2	19.5±2.0	24.6±1.6	22.6±2.6
F <sub>age</sub>	p<0.001			p<0.001			p<0.001		
F <sub>sex</sub>	p<0.001			p=0.008			p<0.001		
F <sub>int</sub>	p=0.081**			p<0.001			p=0.066**		

**Table 2:** Prevalence And 95% Confidence Interval of Low Body Weight/Thinness, Overweight and Obesity According to Sex and Age Group

Age- Group(Years)	Underweight		Overweight		Obesity	
	Girls	Boys	Girls	Boys	Girls	Boys
4-6	12.7(10.5-15.8)	9.2(8.6-12.9)	3.1(1.2-4.5)	4.2(3.2-4.9)	1.2(0.8-2.1)	1.8(1.4-2.7)
7-9	13.8(12.1-14.4)	12.6(10.3-13.2)	4.2(3.4-5.6)	6.8(5.4-7.9)	1.5(0.9-1.9)	1.5(0.8-2.2)
10-12	14.2(12.9-15.1)	11.8(10.9-12.9)	3.3(2.1-4.4)	7.0(5.4-7.6)	1.8(1.3-2.4)	2.0(1.4-2.8)
13-14	14.4(13.2-14.9)	13.1(12.4-13.9)	3.4(1.3-4.5)	7.6(5.5-8.8)	1.1(0.9-1.8)	2.4(1.5-3.2)
Total	13.6(12.4-14.3)	14.1(13.0-14.8)	3.7(1.8-5.0)	6.5(4.2-7.2)	2.0(1.6-2.4)	2.2(1.7-3.9)
χ <sup>2</sup> Sex	p=0.031	p=0.001	p=0.001	p=0.003	p=0.002	p=0.145
X <sup>2</sup> Age Group	p=0.022	p=0.002	p=0.210	p=0.007	p=0.415	p=0.023

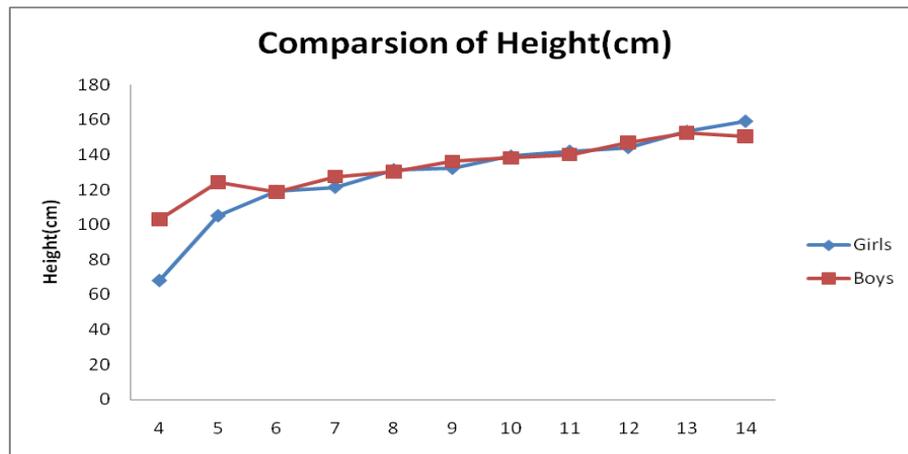


Fig. 1: Comparison of Height (cm)

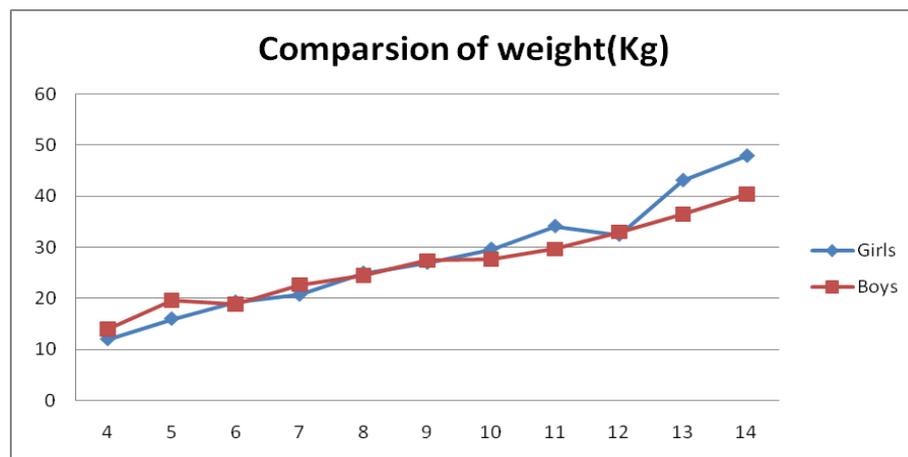


Fig. 2: Comparison of weight (kg)

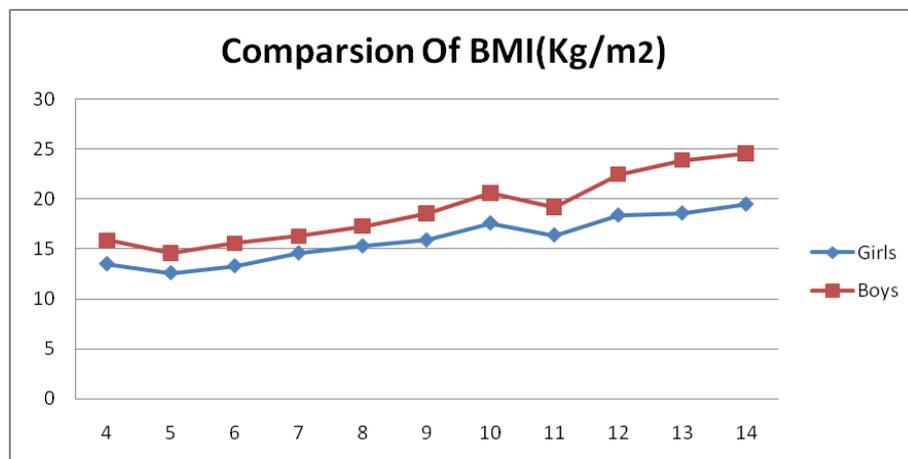


Fig. 3: Comparison of BMI (kg/m<sup>2</sup>)

## 4. Conclusion

It is clear that the problem of underweight and overweight in India is of alarming magnitude, but also of great intricacy. Considering that both low body weight/thinness and overweight and obesity are severe short and long-term health repercussions, with regard to the prevalence found in both nutritional indicators, it is worth necessary the importance of maintaining actions to control malnourishment in the population particularly in this age group. In this situation, it is suggested that the access of the population to food should be accompanied by a specific education process focused on adequate consumption, nutritional needs and the regular practice of physical effort specific to increase energy expenditure.

## References

- [1] Aristimuno GG, Foster TA, Voors AW, Srinivasan SR, & Berenson GS (1984) "Influence of persistent obesity in children on cardiovascular risk factors: the Bogalusa Heart Study", *Circulation*, 69: 895- 904. <http://dx.doi.org/10.1161/01.CIR.69.5.895>.
- [2] Dietz WH (1998) "Health consequences of obesity in youth: childhood predictors of adult disease." *Pediatrics*, 101(suppl): 518-25.
- [3] Dietz WHJ (1981) "Obesity in infants, children, and ado-lescents in the United States. Identification, natural history, and after effects." *Nutr Res*, 1: 117-137. [http://dx.doi.org/10.1016/S0271-5317\(81\)80014-0](http://dx.doi.org/10.1016/S0271-5317(81)80014-0).
- [4] International Institute of Population Sciences (IIPS) National Family Health Survey (NFHS-3) (2007), Fact sheets for 29 States. Mumbai: International Institute for Population Sciences India, Mumbai.

- [5] Jelliffe DB (1966) "The assessment of the nutritional status of the community". WHO Monog Series No, 53:1-271.
- [6] Maheshwari S, Singh Brijesh P, Singh Om P., Gupta P. K.(2015) "Variation in body mass index and their determinants among married women in Uttar Pradesh" *International Journal of Health*, 3 (2) 52-55. <http://dx.doi.org/10.14419/ijh.v3i2.5233>.
- [7] Must A. (1996) "Morbidity and mortality associated with elevated body weight in children and adolescents." *Am J Clin-Nutr*, 63 (suppl): 518-25.
- [8] Srivastava et al (2012) "Nutritional status of school-age children - A scenario of urban slums in India." *Archives of Public Health* 70:8. <http://dx.doi.org/10.1186/0778-7367-70-8>.