



## Nutritional status of primary school children of rural and urban areas aged 7-9 years based on body mass index (BMI) of Bikaner District (Rajasthan)

Rita Mishra<sup>1</sup>, Vimla Dunkwal<sup>2</sup>

<sup>1</sup> Ph. D, Department of food and Nutrition, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India

<sup>2</sup> Dean, College of Home Science, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan, India

### Abstract

BMI, formerly called the quetelet index, is a measure for indicating nutritional status. It is defined as a person 'weight in kilograms divided by the square of the person's height in meters (kg/m<sup>2</sup>) Nutritional status of primary school children of rural and urban areas 827 school children aged 7-9 years of Bikaner district (Rajasthan) was studied by using Body mass index (BMI). It was showing that the overall percentage of mild under nourished were more 26.57 per cent were boys and 33.45 per cent were girls with mean BMI of 13.86&13.57. The percentage of severe under malnourished were 23.77 per cent in boys &13.60 per cent girls with mean BMI of 11.58 &11.19 and 19.85 per cent & 18.85 per cent were mild under nourished with mean BMI of 12.94 &12.50. Whereas, 24.01 & 29.49 per cent were normal in both the groups of rural and urban areas with mean BMI of 15.43 & 15.30. Only 4.41, 5.48 and 1.47 per cent were overweight and obese with mean BMI of 20.07 & 24.47 of boy and girl subjects. None of the subjects were found to be obese in girls groups. Findings present study indicates great scope of nutrition education programme for school going children and parents.

**Keywords:** body mass index, nutrition, severe under malnourished, moderate malnourished, mild malnourished

### Introduction

The school-age of a child is roughly equivalent to the period from kindergarten to junior high school; it begins after the pre-school period with a high risk of mortality and continues through most of the adolescent development and sexual maturity until adulthood [1]. Young children are extremely vulnerable to various infections due to poor quality and unhygienic food. For the sake of good health, children must be granted their right to education and nutritious food for comprehensive development. Children are descendants of the country. Appropriate engrossment must be reimbursed to their quality education and nutritious healthy food. The body needs a lot of nutrients during the teenage growth spurt that must be accumulating in the body throughout the childhood and whenever the body suffers from nutrient deficiency, this may lead to harmful health consequences such as delayed growth, academic retardation and reduced work capacity [2]. Children are the most vulnerable asset of any nation, walk on their tiny feet. School going children are the most important segment of a society who is vulnerable to retardation in growth, because of undernutrition. Certain specific biological, psychological and nutritional needs must be met to ensure the survival and healthy development at the school age.

Globally, malnutrition among school-age children is becoming a major public health problem. More than 200 million school-age children are stunted and underweight. If there is no action is taken, about 1 billion school children will grow up and their physical and mental development will be impaired by 2020 [3].

According to National Family Health Survey IV (2015-2016), 23 to 30 per cent of children (5-12 years) were found to be thin, and 11 to 24 percent of them were overweight, in rural and urban areas of Rajasthan.

According to UNICEF data, 90 per cent of developing world's undernourished children lives in Asia and Africa, while 40 per cent of the World's malnourished in India. The most recent estimates (1996-2005), in developing World, approximately 146 million children are underweight, out of these 57 million live in India. A contemporary investigation of children aged 6-18 years in India showed that a dual burden of underweight and overweight exists (Srihari, 2007). Undernutrition is a major public health problem worldwide, distinct in developing countries [4]. One-third of the children less than 5 years old world suffer from acute malnutrition. Under nutrition impedes the physical, mental and behavioral development of millions of children and is a major cause of child death [5, 6].

Over nutrition has emerged as a problem in children in developed countries and in rich urban sectors in developing countries in the past three decades. In developed countries, consumption of high-calorie foods and an increasingly stable lifestyle has been implicated as a major factor responsible for high rates of obesity. When a person is undernourished, their nutrition reserves are reduced, tissues become deficient in essential nutrients and cause medical illness, undernutrition or underweight is considered. The storage of proteins is exhausted as muscle tissue is used as a source of energy, Production of antibodies against bacterial and viral invasion is restricted. Lack of nutritional reserves may lead to more severe forms of malnutrition, such as a mixed condition of marasmus and kwashiorkor protein-energy malnutrition [7]. Looking for the paucity of available literature about nutritional status of primary school children of rural and urban areas of aged 7-9 years based on clinical assessment and body mass index (BMI). Present study had been planned and executed.

## Methodology

### Subject selection

The study was conducted on 7-9 years old primary school children studying in primary schools of Bikaner district (Rajasthan) including both urban and rural areas. First step of the study, taken by the investigator was to obtain the exhaustive list of all government primary schools of urban and rural areas of Bikaner District (Rajasthan). Thereafter, Fifty percent of those schools having at least hundred students population in primary section within 50 km distance from the College were selected. Thus, the study was conducted six government upper primary school in urban area situated at *Hanuman hatha, Rampura bas (Ialgarh), Bhutonka bas, Kyroinka Bas, Sadulgang and Subashpura*. The six-government upper primary schools in rural area situated at *Pemasar, Dholera no.1, Gigasar, Nagasarsugni, Khara and Ridmalsarpurothian*. After seeking prior permission and having discussion with respective school authorities, a list of all children (872) in number aging 7-9 years of both genders was prepared. These children were studying in class 1<sup>st</sup> to 5<sup>th</sup> standards. After explaining purpose of study and after taking consent from respective school authority and participant this study was conducted. Regularity in attending the school as well as willingness of the children to co-operate during the study was also taken care before selection of the subjects.

### Data collection

Pre tested questionnaire was used to record the information of school children. Age was recorded simply asking date of birth from each participant and was verified from school record book. All the subjects were clinically examined from head to toe by the researcher to assess the presence or absence of clinical signs as suggested by Jelliffe [8]. Clinical

signs were examined by checking superficially the organs like; face eyes, lips, teeth, tongue, nails, hair and skin. The BMI of each of the child was assessed based on their individual weight and height measurements. Data on BMI of the children so obtained were compared with the child growth standards are given by WHO to find out their nutritional status in terms of undernutrition, over nutrition and normal status [9].

Body mass index (kg/m<sup>2</sup>) = Weight (kg) /Height (m<sup>2</sup>)

### Statistical analysis of the data

Percentage mean and standard deviation of data were calculated during present study for statistical analysis of findings. The statistical analysis was carried out with the help of Microsoft excel 2007.

### Result and Discussion

In the present study total 827 children participated, out of that 542 primary school children (65.53%) belonged to rural areas and 285 of them (34.46%) were from urban areas. Age-wise view of the study groups clearly reveals that 33.73 per cent of them were age group of 7, 32.52 per cent of them were age group of 8 and 33.73 per cent of them were age group of 9 years urban subjects, respectively (Table 1). The percentage of girls 52.21 per cent was higher than the boys 47.78 per cent in rural areas. The percentage of boys 27.49 per cent is higher in urban areas than girls 25.09 per cent. Findings of greater number of girls were also reported by Khara while assessing the impact of a mid-day meal programme on the enrolment of children in primary schools of Rajasthan [10]. On the contrary, Shivprakash and Joseph found that boys constituted greater no (52.5%) as compared to their girl's counterpart (47.5%) in their study on 6 to 12 years old school going children at Karnataka [2].

**Table 1:** Distribution of subjects according to age and gender

Age (years)	Total subjects (N=827)	Rural subjects (n=542) (65.53%)			Urban subjects (n=285) (34.46%)		
		Boy (n=259) (47.78%)	Girl (n=283) (52.21%)	Total (n=542)	Boy (n=149) (27.49%)	Girl (n=136) (25.09%)	Total (285)
7	279(33.73)	86(33.20)	82 (28.97)	168(30.99)	63(42.28)	48(35.29)	111(38.94)
8	269(32.52)	81(31.27)	97(34.27)	178(32.84)	53(35.57)	38(27.94)	91(31.92)
9	279(33.73)	92(35.52)	104(36.74)	196(36.16)	33(22.14)	50(36.76)	83(29.12)
Total	N=827	259(100)	283(100)	542(100)	149(100)	136(100)	285(100)

Note: Values in parenthesis indicate the percentage of the subjects

Table 2 showed data regarding various grades of malnutrition among rural and urban boys aged 7-9 years based on their body mass index (BMI) for age. The table indicates that 18.53 & 32.88 percent boys aged from 7-9 years were severely under nourished whereas 21.62& 16.77 per cent were moderately under nourished, 26.64 & 26.17 per cent were mildly under nourished, 5.79 & 2.01 per cent were overweight and 2.31 per cent severely obese with

mean BMI values of 11.89,11.27,12.94, 12.94 13.81, 13.92, 21.2& 24.27, 18.95. In urban areas none of were found obese. Only 25.09& 22.14 per cent boys were normal with mean BMI value of 15.47& 15.39 of both the areas rural and urban respectively. It is concluded from the result that overall percentage of mild under nourished boys is more i.e. 26.47 per cent with mean BMI value of 13.86 as compared to normal as well as others grades of malnutrition.

**Table 2:** Distribution of rural and urban boy subjects according to BMI \* for age

Age (yrs)	WHO Standard	Subjects (n=408)	No. of boy subjects and mean BMI of rural area												
			-3SD severe under nourished		-2SD Moderate Under nourished		-1SD mild under nourished		+1SD normal		>+1SD over weight		>+2SD obesity		Over all mean BMI
7	15.5	R.B (n=86)	13 (15.11)	11.77	18 (20.93)	12.65	20 (23.25)	13.60	27 (31.39)	15.6	4 (4.65)	19.94	4 (4.65)	22.97	
		U B (n=63)	21 (33.33)	10.99	7 (11.11)	12.71	17 (26.98)	13.61	16 (25.39)	15.0	2 (3.17)	19.25	0 (0)	-	12.86
8	15.8	R B (n=81)	18	11.82	14	13.02	24	13.88	20	15.19	4	21.78	1	23.89	14.11

			(22.22)		(17.26)		(29.63)		(24.69)		(4.94)		(1.23)		
		U B (n=53)	18 (33.96)	11.23	9 (16.98)	12.86	15 (28.3)	13.95	10 (18.87)	15.63	1 (1.89)	18.65	0 (0)	-	13.25
9	16.3	R B (n=92)	17 (18.48)	12.09	24 (26.09)	13.14	25 (27.17)	14.16	18 (19.57)	15.63	7 (7.61)	21.88	1 (1.09)	26.57	14.52
		U B (n=33)	10 (30.3)	11.68	9 (27.27)	13.25	7 (21.21)	14.2	7 (21.21)	15.56	0 (0)	-	0 (0)	-	13.46
Total		R B (n=259)	48 (18.53)	11.89	56 (21.62)	12.94	69 (26.64)	13.81	65 (25.09)	15.47	15 (5.79)	21.2	6 (2.31)	24.47	14.33
		U B (n=149)	49 (32.88)	11.27	25 (16.77)	12.94	39 (26.17)	13.92	33 (22.14)	15.39	3 (2.01)	18.95	0 (0)	-	13.19
Overall total		(n=408)	97 (23.77)	11.58	81 (19.85)	12.94	108 (26.47)	13.86	98 (24.01)	15.43	18 (4.41)	20.07	1 (1.47)	24.47	13.76

Table 3: is showing data regarding various grades of malnutrition among rural and urban girls aged from 7-9 years based on their body mass index (BMI) for age. The table indicates that 10.95 & 19.11 per cent girls aged from 7-9 years were severely under nourished whereas, 18.02 & 20.58 per cent were moderately under nourished, 33.56 & 30.14 per cent were mildly under nourished, 7.42 & 1.47 per cent were overweight and 0.35 per cent were severely obese with mean BMI values of 11.26, 11.13, 12.47, 12.54, 13.57, 13.57, 21.18, 28.29 & 17.6. None were found to be

obese. Only 29.68 & 28.67 per cent girls were normal with mean BMI value of 15.26 & 15.35 of both areas rural and urban respectively. It is concluded from the results that overall percentage of mild under nourished girls is more i.e. 32.45 per cent with mean BMI value of 13.57 as compared to normal as well as other grades of malnutrition. Adhikari (2013) also reported that 81.74 per cent primary school children residing in Bangladesh were undernourished which coincides with present findings 70.32 to 85.92%.

**Table 3:** Distribution of rural and urban girls subjects according to BMI \* for age

Age (yrs)	WHO std	Subjects (n=285)	No. of urban subjects and mean BMI of urban areas.												
			-3SD Severe undernourished		-2SD moderate under nourished		-1SD mild under nourished		+1SD Normal		>+1SD Overweight		>+2SD Obesity	Overall mean BMI	
7	15.6	R G (n=82)	4 (4.87)	10.87	13 (15.85)	12.25	30 (36.58)	13.38	29 (35.36)	14.94	6 (7.3)	19.97	0 (0)	-	14.15
		U G (n=48)	8 (16.66)	10.79	6 (12.5)	12.53	15 (31.25)	13.34	17 (35.41)	15.10	2 (4.16)	17.6	0 (0)	-	13.3
8	15.9	R G (n=97)	15 (15.46)	11.30	17 (17.53)	12.35	26 (26.8)	13.47	32 (32.99)	15.24	7 (7.22)	21.66	0 (0)	-	14.11
		U G (n=38)	11 (28.95)	10.91	7 (18.42)	12.3	10 (26.32)	13.49	10 (26.32)	15.51	0 (0)	-	0 (0)	-	13.06
9	16.2	R G (n=104)	12 (11.54)	11.62	21 (20.19)	12.80	39 (37.5)	13.86	23 (22.12)	15.62	8 (7.69)	21.93	1 (0.96)	28.29	14.53
		U G (n=50)	7 (14)	11.7	15 (30)	12.81	16 (32)	13.88	12 (24)	15.45	0 (0)	-	0 (0)	-	13.63
Total		R G (n=283)	31 (10.95)	11.26	51 (18.02)	12.47	95 (33.56)	13.57	84 (29.68)	15.26	21 (7.42)	21.18	1 (0.35)	28.29	14.26
		U G (n=136)	26 (19.11)	11.13	28 (20.58)	12.54	41 (30.14)	13.57	39 (28.67)	15.35	2 (1.47)	17.6	0 (0)	-	13.33
Overall total		(n=419)	57 (13.60)	11.19	79 (18.85)	12.50	136 (32.45)	13.57	123 (29.49)	15.30	23 (5.48)	19.39	0	-	13.79

**Conclusion**

During present study total of 872 rural and urban primary school children comprising of 419 girls (283 rural, 136 urban) and 408 (259 rural, 149 urban) were boys. On the basis of body mass index (BMI) for age rural and urban subjects of both the groups' boys and girls were found to be higher percentage of mild undernourished as compared to normal as well as other grades of malnutrition category.

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