

Prevalence of malnutrition among adolescents (11-16 years): A comparative study between Government and Private Schools in Allahabad

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ABSTRACT

Malnutrition is an indicator of poor nutrition, having a major consequence on human health as well as social and economic development of a population. The purpose of the present study was to assess and compare the burden of malnutrition among adolescents studying in government and private schools of Allahabad. A cross sectional study was carried out in four government schools (Government Inter college, Mary Wanamaker Girls' Inter College, Jamuna Christian Inter College, Allahabad Inter College) and two private schools (Tagore Public School and Maharshi Patanjali Vidya Mandir) of Allahabad city. Total 2436 adolescents in the aged between 11-16 years were participated in the study. Out of them, 1146 (47.0%) students were from private schools and 1290 (53.0%) were from government schools. Weight and height of the students were measured and body mass index (BMI) was calculated. Indian standards for BMI for age and gender were used as a reference. Students with BMI above 95 percentile were considered as obese, those between 85 and 95 percentile as overweight and those below the 05 percentile were considered as underweight. The prevalence of underweight, overweight and obesity was found 3.9%, 12.1% and 5.4% respectively. Overall 21.4% adolescents in the age group 11 to 16 years were found malnourished in Allahabad. The prevalence of malnutrition was found to be significantly ($p=0.000$) higher among boys (25.0%) than girls (18.0%). Students studying in private school (31.1%) had significantly ($p=0.000$) higher rate of malnutrition than those from government schools (12.9%). The prevalence of overweight and obesity was observed significantly higher among students studying in private school (19.5% and 10.4%) compared to those studying in government school (5.6% and 1.0%) while underweight prevalence was higher in students studying in government schools (6.3%) compared to private schools (1.1%). According to type of school and gender, more number of boys (34.9%) were found malnourished compared to girls (25.9%) in private school and difference was highly significant ($p=0.001$) whereas no such difference was found between boys (13.1%) and girls (12.7%) in government school.

Key Words : Adolescents, Malnutrition, Overweight, Obesity, Underweight

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INTRODUCTION

Adolescents *i.e.* individuals aged 10-19 years constitute 243 million *i.e.* about one fifth of India's population (Godbole *et al.*, 2013). Adolescence is a period of transition from childhood to adulthood; an important phase in the life span of human being characterized by rapid growth. During this period appropriate nutrition remains one of the primary needs for optimal mental and physical growth (Godbole *et al.*, 2013). Inadequate nutrition leads to poor health status.

Malnutrition denotes impairment of health arising either from deficiency or excess or imbalance of nutrients in the body (Thedki *et al.*, 2011). It is an indicator of poor nutrition, having a major consequence on human health as well as social and economic development of a population (Black *et al.*, 2003). The health consequences of a prolonged state of malnutrition among children and adolescents include delayed physical growth, impaired motor and cognitive development, diminished cognitive performance, lower intellectual quotient, poor social skills, greater behavioural problems and vulnerability to contracting diseases (Mengistu *et al.*, 2013 and Park, 2005). In addition, malnutrition also leads to important consequences in adult life in terms of physical growth, work capacity, reproductive performances and risk of chronic diseases (Singh *et al.*, 2013).

Due to the negative health outcomes associated with malnutrition, it becomes important to find out its prevalence in adolescents as they are the most nutritionally vulnerable section of the population. In Allahabad, little information is available on the prevalence of malnutrition in adolescents. Therefore, the present study was carried out to assess the burden of malnutrition among adolescents studying in government and private schools of Allahabad. The purpose of the study was to compare the prevalence of malnutrition among government and private school students.

METHODOLOGY

A cross sectional study was carried out in four government schools (Government Inter college, Mary Wanamaker Girls' Inter College, Jamuna Christian Inter College, Allahabad Inter College) and two private schools (Tagore Public School and Maharshi Patanjali Vidya Mandir) of Allahabad city. Students from sixth to eleventh standard aged between 11 to 16 years were included in the city. Probability proportionate to size of the population (PPS) technique was used to decide the number of students to be studied from each school and then subsequently from each class and section. It was assumed that at least 50 children would be studied from each class. The required number of children from each section was selected by random sampling.

Consent of school authorities was taken before the initiation of the study. Weight and height of students were measured and body mass index (BMI) was obtained by calculation. Indian standards for BMI for age and gender were used as a reference. Children with BMI above 95 percentile were considered as obese, those between 85 and 95 percentile as overweight and those below the 05 percentile were considered as underweight (Agarwal *et al.*, 2001). Prevalence of overweight, obesity and underweight is presented as percentages. Chi square test was done to analyze the results statistically. $p < 0.05$ was considered as

statistically significant.

RESULTS AND DISCUSSION

Total number of 2436 adolescents in the aged between 11-16 years participated in the study. Out of them, 1146 (47.0%) students were from private schools and 1290 (53.0%) were from government schools. In the private school, 657(57.3%) were boys and 489(42.7%) were girls while in government school, 543(42.1%) were boys and 747(57.9%) were girls. Overall, 522 (21.4%) adolescents in the age group 11 to 16 years were found malnourished in Allahabad.

Table 1 depicts that when about 17.5% adolescents were above normal weight only 3.9% were below normal weight this shows that overweight/obesity is replacing undernutrition (Park *et al.*, 2009). Similarly, Wang *et al.* (2009) also reported a clear transition of children from being underweight to becoming overweight and obese. The prevalence of overweight and obesity was significantly higher among students studying in private school (19.5% and 10.4%) compared to those studying in government school (5.6% and 1.0%) and underweight prevalence was higher in students belonging to government schools (6.3%) compared to private schools (1.1%). Bhardwaj *et al.* (2008) reported that the prevalence of overweight/obesity among adolescents children was 29.0% in private school and 11.3% in government school consistent with findings of the present study. Another study conducted by Thekdi *et al.* (2011) also observed that BMI was more in private school as compared to the government school. Similarly, Premnath *et al.* (2010) found that prevalence of underweight was more in children from government school (24%) as compared to children from private schools (15.9%).

Table 1 : Overall prevalence of underweight, overweight and obesity in government and private school students			
Nutritional status	Government school	Private school	Total
Normal weight	1124(87.1)	790(61.0)	1915(78.6)
Underweight	81(6.3)	14(1.1)	95(3.9)
Overweight	72(5.6)	223(19.5)	295(12.1)
Obesity	13((1.0)	119(10.4)	132(5.4)
Total	1290 (53.0)	1146(47.0)	2436(100)

$X^2=260$; d.f.=3; $p=0.000^*$

A total of 1146 private school students in the age group 11-16 years were studied. Out of them, 356 (31.1%) students were found malnourished. Large number of students were overweight and obese (29.9%) compared to underweight (1.2%) in private school. The prevalence of underweight, overweight as well as obesity was found higher among boys (2.0%, 20.7% and 12.2%) than girls (0.2%, 17.8% and 8.0%) respectively. On total, higher number of boys (34.9%) were found malnourished than girls (25.9%) and statistically the difference was significant ($p=0.001$). According to age group, malnutrition was found significantly ($p=0.05$) higher in 11-13 years (33.6%) compared to 14-16 years (28.6%) (Table 2).

A total of 1290 government school students in the age group 11-16 years were studied.

Age	Boys					Girls				
	Total	Under weight	Normal weight	Over weight	Obese	Total	Under weight	Normal weight	Over weight	Obese
11	53	-	31(58.4)	11(20.8)	11 (20.8)	59	-	43(72.9)	11(18.6)	5(8.5)
12	131	02 (1.5)	86(65.7)	25(19.1)	18(13.7)	93	01(1.1)	62(66.7)	23(24.7)	7 (7.5)
13	137	03 (2.2)	86(62.8)	32(23.3)	16(11.7)	82	-	60(73.2)	16(19.5)	6(7.3)
14	129	01 (0.8)	85(65.9)	20(15.5)	23(17.8)	85	-	65(76.5)	15(17.6)	5(5.9)
15	88	01 (1.1)	64(72.7)	16(18.2)	07(8.0)	86	-	70(81.4)	11(12.8)	5(5.8)
16	119	06 (5.0)	76(63.9)	32(26.9)	05(4.2)	84	-	62(73.8)	11(13.1)	11(13.1)
Total	657	13 (2.0)	428(65.1)	136(20.7)	80(12.2)	489	01(0.2)	362(74)	87(17.8)	39(8.0)

Out of them, 166 (12.9%) students were malnourished. Higher proportion of students were found underweight (6.3%) compare to overweight (5.6%) and obesity (1.0%) in government school. Gender wise, the prevalence of underweight, overweight and obesity was (6.3%, 5.9% and 0.9%) and (6.3%, 5.4% and 1.0%) among boys and girls respectively and the difference was not found significant ($p=0.85$). According to age group, prevalence of malnutrition was higher in the age group 11-13 years (14.0%) compared to 14-16 years (11.7%) but was not found significant statistically ($p=0.21$) (Table 3).

Age	Boys					Girls				
	Total	Under weight	Normal weight	Over weight	Obese	Total	Under weight	Normal weight	Over weight	Obese
11	66	08 (12.1)	57 (86.4)	1(1.5)	-	79	08(10.1)	66(83.5)	4(5.1)	1(1.3)
12	87	08 (9.1)	72 (82.8)	6(6.9)	1(1.2)	125	09(7.2)	108(86.4)	6(4.8)	2(1.6)
13	128	10 (7.8)	112 (87.5)	6(4.7)	-	156	11(7.0)	136(87.2)	9(5.8)	
14	113	06 (5.3)	95 (84.1)	9(7.9)	3(2.7)	130	08(6.2)	119(91.5)	3(2.3)	
15	84	01 (1.2)	76 (90.5)	6 (7.1)	1(1.2)	124	08(6.5)	108(87.0)	7(5.7)	1(0.8)
16	65	01 (1.5)	60 (92.3)	4(6.2)	-	133	03(2.2)	115(86.5)	11(8.3)	4(3.0)
Total	543	34 (6.3)	472 (86.9)	32(5.9)	5(0.9)	747	47(6.3)	652(87.3)	40(5.4)	8(1.0)

In the current study a clear socio economic difference was observed in the prevalence of underweight, overweight and obesity with the type of school. The prevalence of underweight was found higher among students studying in government schools than private school (6.3% vs 1.1%) whereas overweight and obesity prevalence was recorded higher among those studying in private schools than government school (29.9% vs 6.6%). Similar observation were noted by Ashok *et al.* (2014). This clearly reveal that overweight and obesity is associated with high socio economic class whereas underweight with lower socio economic class. The assumption that type of school attended reflects the socio economic status has been used

and validated previously by Mukherjee *et al.* (1999) and Gupta *et al.* (2011). Private school students are financially well so indulge in a life style involving less of physical activity and more sedentary activities therefore are more prone to overweight and obesity.

Conclusion :

A high number of adolescents (21.5%) in the age group 11 to 16 years were found malnourished in Allahabad. Occurrence of overweight and obesity was more in students from private school while underweight in government school. Adolescents should be encouraged to adopt healthy dietary practices and life style in order to maintain healthy normal weight.

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