Original Article

A Cross-Sectional Study to Find out Nutritional Status and Academic Achievement of School Adolescents Availing Mid-Day Meal in Government Schools of Chandigarh, India

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Abstract

Background: Nutrition is one of the most important determinants of educational outcomes. *Objective:* To find relation between nutritional status and academic achievement of school adolescents availing Mid-Day Meal Schemein Chandigarh, India. *Material and Methods:* A school-based survey consisting 1274 participants from randomly selected 12 government schools of Chandigarh was conducted. Seven schools, three schools and two schools from urban, rural and slums were selected respectively. Thereafter, the school adolescents of 6th, 7th and 8th standard from each school were selected. WHO Anthroplus software was used to find out nutritional status of adolescents. *Results:* Prevalence of stunting and severe stunting among adolescents was found 313 (25.47%) and 91 (7.40%) respectively. Prevalence of thinness and severe thinness were 279 (22.70%) and 89 (7.24%), respectively. Highest prevalence of stunting was found in lower socio-economic group adolescents i.e. 161 (28.14%) and it decreased with better socioeconomic status. *Conclusion:* Malnutrition affects educational performance as revealed by poor academic scores, who consumed no Mid-Day Meal or less Mid-Day Meal. Malnutrition is mostly affecting the school adolescents of lower socio-economic group, there is a need to strengthen the Mid-Day Meal Scheme in Chandigarh particular and country in general

Keywords: Malnutrition; BMI; Stunting; Mid-Day Meal; Chandigarh; Academic Achievement.

Introduction

Notwithstanding India ranked first position in milk production in the world and second in fruit and vegetable according to Economic Survey of India 2014-15 even than malnutrition is severely affecting schoolchildren of India [1,2]. Malnourished children are usually enrolled in school at a later age and attend fewer years of schooling [3-5]. Irregular school attendance of malnourished and unhealthy children is one of the key factors in poor academic performance [6-9].

Evidence suggests that school feeding programs improve cognitive function related to memory, test grades, and school attendance [10-12]. Studies shown school feeding programs also show the potential to increase children's body size with psychosocial development and academic achievement [13-14].

There is a lack of research comparing nutritional effect of Mid-Day Meal Scheme (MDMS) on schoolchildren's academic achievement. Keeping above backdrop in view, the present investigation was carried out with the objective to find out nutritional status of school adolescents.

Materials and Methods

Study Design, Setting and Sampling

A cross-sectional study was carried out between January and May 2012 in Chandigarh, India. There were 185 recognized schools in Chandigarh including 106 Government schools [18]. The schools were stratified according to their location to get proportionate representation from urban, rural and slum areas. Therefore, total 12 schools, including 07 schools from urban area, 03 schools from rural area and 02 schools from slum, were randomly selected. From each selected school, a list of all sections in class 6th to 8th was obtained. Study sample consisted of 1274 adolescents. Kuppuswamy's socio economic scale was used to find out socio-economic status of child.

Data Collection

The required data were collected through personal interview, using pre-designed and pre-tested questionnaire prepared in vernacular language. School records of students were also consulted to collect information regarding personal, academic and socio-economic status.

Nutritional Status

All the anthropometric measurements were taken before meals. Their height and weight were measured to the nearest 0.1 centimetre using calibrated instruments as per WHO anthropometry guidelines [19].

Academic Achievement

Performance of adolescentsin First-term examination was used to determine academic performance. Marks were taken from school records and graded according to Central Board of Secondary Education's grading system i.e. from Grade A (very good) to Grade E (Very poor).

Statistical Analysis

The data were entered in MS Excel. Statistical analysis was done with the help of SPSS 20.

Descriptive statistical analysis was represented through frequency and percentages. As per WHO recommendations for adolescents and younger children, the cut-offs used were (i) to assess stunting (height-for-age): $< -2\,SD$ and $< -3\,SD$ as stunting and severe stunting, respectively; and (ii) Body Mass Index (BMI) $< -2\,SD$ and $< -3\,SD$ was used to assess thinness and severe thinness, respectively.

Ethics

Institutional review committee, Panjab University, Chandigarh, approved the study. Participants were informed that their feedback is of great importance and will not be shared with anybody. Prior permission from Director Public Instructions (DPI), District Education Officer (DEO) and principals of selected schools was also obtained.

Result

The data were collected from 1274 adolescent students studying at government schools in Chandigarh. Six hundred and forty eight (50.86 %), 433 (33.99%) and 193 (15.15%) students attended the schools located in urban, rural and slum areas respectively. Most of the students ie 766 (60.13 %) students were eating Mid-Day Meal programme with home cooked food. Forty five students (3.53%) ate food which they brought from home only (Table 1).

Nutritional Status of Studentsavailing Mid-Day Meal

Prevalence of stunting and severe stunting among adolescentswas 313 (25.59%) and 91 (7.40%) respectively. Highest prevalence of stunting was found in lower socio economic class 161 (28.14%) and it decreased with better socioeconomic status. Highest prevalence of thinness was found among upper+middle class together 155 (23.60%). Adolescentswith thinness and severe thinness were 279 (22.70%) and 89 (7.24%), respectively. (Table 2)

Academic Performance of Students Taking Mid-Day Meal

Six hundred forty one students secured C2 grade in first term examination. It was found that both socio economic status and location of the the school were affecting the grades of the students as presented in (Table 3). Lowest prevalence of stunting was found in students achieving highest grades A and B, in contrast to it severe stunting was highest in students getting lower grade i.e. D and E grades (Table 3).

Frequency of Mid-Day Meal Intake in a Week and Nutritional and Academic Achievement.

The students who were eating Mid-Day Meal four times or more per week, 596 (65.21%) had no stunting followed by 248 (27.13%) with stunting. Among students who were eating Mid-Day Meal thrice or less in a week, 229 (72.70%) had no stunting and 65 (20.63%) had stunting.

Majority of the students who were taking Mid-Day Mealfour times or more per week secured grade C 479 (52.41%) followed by grade B 241 (26.37%). Similarly, the students who were taking Mid-Day Mealthrice or less per week secured grade C 162 (51.43%) and grade B 103 (32.70%) (Table 4).

Incorporating Preferred Menu of Adolescents (Table 5)

It can be seen from the table V that 667 (52.35%) of the adolescents preferred fruit items in their mid-day meal scheme followed by more food 223 (17.50%) and milk (17.43%). The egg was preferred by only 96(7.54%) of the students. However least liked were other items 66(5.18%) out of the 1274 respondents. The results of the responded menu indicated that fruit was the most preferred item among all the reported items by students (Table 5).

Table 1: Demographic profile of study participants   (N=1274).

Characteristics	No. of Participants (%)
Gender	
Boys	687 (53.92)
Girls	587 (46.08)
Class	
6th standard	451 (35.40)
7th standard	413 (32.42)
8th standard	410 (32.18)
Location of school	
Urban	648 (50.86)
Rural	433 (33.99)
Slum	193 (15.15)
Religion	
Hindu	991 (77.79)
Sikh	189 (14.84)
Others (Muslim+ Christian + Others)	94 (07.38)
Socioeconomic status	
Upper & Middle	690 (54.16)
Lower	584 (45.84)
Source of food in school	
Mid-Day Meal + Homemade food	766 (60.13)
Mid-Day Meal	463 (36.34)
Food from home only	45 (03.53)

Note: Figure in parenthesis indicate percentages to the total in each category

Table 2: Prevalence of nutritional status in relation to socio economic status (N=1229)

	Upper + Middle N= 657 (%)	Lower N= 572 (%)	Total N=1229(%)
Stunting			
Normal	463 (70.47)	362 (63.29)	825(67.13)
Stunting	152 (23.14)	161 (28.14)	313(25.47)
Severe stunting	42 (06.39)	49 (08.57)	91 (7.40)
Thinness			
Normal	455 (69.25)	405 (70.80)	860(70.78)
Thinness	155 (23.60)	125 (21.86)	279(22.70)
Severe Thinness	47 (07.15)	42 (07.34)	89(7.24)

Note: Figure in parenthesis indicate percentages to the total in each category

Table 3: Students scholastic achievement according to socio economic staus and Location of school (N=1229)

	Scholastic Grade			
	A N=76 (%)	B N=344 (%)	C N=641 (%)	D and E* N=168 (%)
Socio economic status				
Upper + Middle	54 (71.05)	196 (56.98)	312 (48.67)	95 (56.55)
Lower	22 (28.95)	148 (43.02)	329 (51.33)	73 (43.45)
Location of school				
Urban	37 (48.68)	173 (50.29)	323 (50.39)	89 (52.98)
Rural	35 (46.05)	121 (35.17)	204 (31.83)	54 (32.14)
Slum	04 (05.27)	50 (14.54)	114 (17.78)	25 (14.88)
Stunting				
Normal	61 (80.26)	245 (71.22)	417 (65.05)	101(60.12)
Stunting	12 (15.79)	75 (21.89)	175 (27.30)	52 (30.95)
Severe Stunting	3 (3.95)	24 (6.98)	49 (7.65)	15 (08.93)

*There were only eight students with Grade E, hence they have been clubbed with Grade D.
Note: Figure in parenthesis indicate percentages to the total in each category

Table 4: Frequency of Mid-Day Meal (per week) according to nutritional status and scholastic grades (N=1229)

	Frequency of Mid-Day Meal intake per week	
	3 days & less N=315 (%)	4 days & more N=914 (%)
Stunting		
Normal	229 (72.70)	596 (65.21)
Stunting	65 (20.63)	248 (27.13)
Severe Stunting	21 (06.67)	70 (07.66)
Thinness		
Normal	232 (73.65)	629 (68.82)
Thinness	63 (20.00)	216 (23.63)
Severe thinness	20 (06.35)	69 (07.55)
Scholastic Grade		
A	21 (06.67)	55 (06.01)
B	103 (32.70)	241 (26.37)
C	162 (51.43)	479 (52.41)
D and E*	29 (09.20)	139 (15.21)

*There were only eight students with Grade E, hence they have been clubbed with Grade D.
Note: Figure in parenthesis indicate percentages to the total in each category

Table 5: Adolescents preference for additional items in MDMS (N=1274)

	What will you like to be added to menu?	
Choice	Frequency	Percent
Fruit	667	52.35
More food	223	17.50
Milk	222	17.43
Egg	96	7.54
Other Items	66	5.18
Total	1274	100.00

Discussion

A tudy conducted by Groeneveld *et al* in Guatemala showed that prevalence of stunting in low SES was four fold higher than the stunting in the children of high SES [20]. In our study, thinness had highest prevalence among upper and middle class together 155 (23.60%). Severe thinness is also highest among upper and middle class together 47 (7.15%). With poor performance from grade A to E the proportion of students belonging to upper and middle SES decreased while students from lower SES has inverse relationship. Proportion of the students obtaining low grades had higher prevalence of stunting and severe stunting similar to study

conducted by Alim *et al* in Aligarh, India where majority of MDM school children (67.3%) obtained grades B and C [12]. Similar results were obtained by Upadhayaya *et al* and Fernstone *et al* indicating the poor performance in intelligence test from children with poor physical growth [21,22]. Powell *et al* in Kenya reported a significant effect of breakfast on arithmetic achievement over the seven month period of the study [23].

Study conducted by Acham *et al* (Uganda) showed significant associations between height, weight, BMI and learning (p < 0.05) [24]. Gajre *et al* at Hyderabad (India) found that regular breakfast eating habit and weight for age percent were significantly ($P<0.001$) associated with immediate recall memory explaining 4.3 percent variation [25].

Frequency of Mid-Day Meal intake in a week and academic achievement in our study was similar to results of Alim *et al* at Aligarh where academic achievement of Non MDM school children was higher as compared to MDM school children [12].

As observed in our study (Table 5) fruit was the most preferred item of MDM scheme of the students reported by about 52 percent students Thereby it is suggested that it should be considered the menu item of the MDM adolescents of Chandigarh and other parts of the country. Abudayya *et al* [26] in Palestine reported that Intake of fruit and vegetables > 3 times/ week had the strongest association with school performance compared with those consuming fruit and vegetables ≤ 3 times/week. A higher proportion of adolescents with high fruit and vegetables consumption had good school performance (72.6% versus 59.9%, P < 0.001).

It is a accepted theory that nutritional status increases with the frequency of regular food intake and resultantly improves the academic standards. The results of our study also approve the same. As perusal of the Table 3 indicates that the academic performance decreases with stunting. It ranged from about 31 percent in grade E holder to about 16 percent in grade A holders. Same trend has been observed in severe stunting ranging from 9 percent in grade D / E holders to 4 percent in grade A holders. Whereas increasing trend has been observed in non-stunted students, it increased from 60.12% in grade D / E holders to 80.26% in grade A holder students. In a similar school going adolescents of Gaza strip, Palestine stunting was negatively associated with good school performance. When adjusting for sociodemographic variables and BMI, fruit and vegetables intake was positively associated with school performance (OR = 1.61, 95% CI: 1.11–2.32) and stunting was negatively associated (OR = 0.53,

95% CI: 0.31–0.90). Therefore our findings also support a broader implementation of school nutrition programmes [26].

Conclusion

The study revealed that Chandigarh is facing problem of adolescent malnutrition. Malnutrition is affecting mostly the people of poor socio-economic group. These adolescents are facing double edged problem as malnutrition also affects educational performance.

The Chandigarh administration (India) and other Non-Government Organizations need to plan and implement the programme more vigorously by incorporating preferred menu of adolescents specially fruit, etc for improving the nutritional status. As educational achievement was found to have been influenced by physical development, nutrition under school health programme is needed to be strengthened. Linking and tracking of nutritional status and health outcomes with Adhar-Card and simultaneous Monitoring & Surveillance of health status by Rastriya Bal Swasthya Karyakarm (RBSK) will be effective step to improve this scheme, resulting in good nutritional and academic performance of children as envisaged by the programme of Mid-Day Meal Scheme.

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