Original Articles

Under-nutrition among adolescents: A survey in five secondary schools in rural Goa

SOHINI BANERJEE, AMIT DIAS, RAJAL SHINKRE, VIKRAM PATEL

ABSTRACT

Background. This study was done in 2008–09 to assess the nutritional status among adolescents (10–19 years of age, Classes V–XII) in 5 schools in rural Goa to inform the content of a health promotion intervention in these schools.

Methods. Three methods were used. First, nutritional status was measured by assessing body mass index among 1015 students during a health camp in each school. Second, a diet analysis was done to measure energy and protein intake of 76 randomly selected underweight students. Third, a self-report questionnaire survey measured the prevalence of hunger among 684 students.

Results. One-third of students (338; 37.8% boys and 27.5% girls) who attended the health camps were underweight and 59.2% of the 684 students who completed the survey reported experiencing hunger due to inadequate food consumption. More boys were underweight than girls ($p < 0.001$) and under-nutrition was uniform across all the years of schooling. Energy intake of underweight students was significantly lower than the recommended daily allowance. The results were shared with the School Health Promotion Advisory Boards to generate information on the stakeholders' perception about the issue and ways to address it.

Conclusion. There is an immediate need to address the high burden of hunger and under-nutrition in adolescents of both sexes in schools by instituting routine annual monitoring of nutritional status, extending the mid-day meal programme to all school-going adolescents, providing nutritional counselling for underweight adolescents and expanding research on the causes and impact of under-nutrition and evaluation of the impact of the enhanced mid-day meal programme.

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INTRODUCTION

Malnutrition, especially under-nutrition, is a major health problem affecting the development of children in many low- and middle-income countries. The WHO estimates that nearly half of all deaths in children under 5 years of age in developing countries could be attributed to under-nutrition.[1] In India, a number of studies[2–5] have reported on malnutrition, particularly under-nutrition among children under 5 years of age. The Government of India has adopted a number of schemes to address the problem of nutrition among children under 5 years of age and primary school students, the most notable being the Integrated Child Development Scheme (ICDS) and mid-day meal schemes. In comparison, fewer studies have focused on under-nutrition among adolescents[6,7] or programmes tackling adolescent nutrition.

This study aimed to describe the prevalence, causes and impact of under-nutrition in adolescents attending secondary schools in rural Goa. The study was carried out by Sangath, a non-governmental organization (NGO) based in Goa, as part of a larger programme aiming at developing and evaluating a health promotion intervention in schools in rural areas.[8] At the time the study was being conducted, the Government of Goa was in the process of extending the mid-day meal scheme from primary school to include students up to Class VIII.

METHODS

Setting and sample

The study was conducted in Goa, a state with a population of 245 044 adolescents (118 770 girls and 126 274 boys).[9] Five schools, all located in the mining region in the northern belt of rural Goa, were selected to participate in the study. Four of the five were secondary schools (Classes V–X) while one was a higher secondary school (Classes XI and XII). All were co-educational schools with a total strength of 1142 students.

Data collection

Information on the nutritional condition of students of 5 secondary schools was collected during the academic year 2008–09 using 3 methods: assessment of body mass index (BMI); assessment of energy and protein intake in under-weight adolescents; and a survey of the prevalence of self-reported hunger.

Assessment of BMI. Five health camps, one in each school, were held to assess the BMI using the WHO standards for BMI.[10,11] All students who were present on the particular day of the

camp (*n*=1015) were enrolled in the study. Based on BMI, students were classified to be normal, overweight, underweight (thin) and severely underweight (severely thin). The height of the adolescents was measured using a free standing height measurement scale and the weight was measured using an electronic measuring scale.

Assessment of energy and protein intake. Detailed information on the dietary intake of 76 adolescents randomly selected from those who were identified as having a low BMI was collected to estimate their energy and protein intake. The dietary assessment recorded food intake in the previous 24 hours.

Survey of self-reported hunger. Six hundred and eighty-four students completed a questionnaire containing a range of questions on health and educational issues, including their experience of hunger and its impact on their academic performance, physical and mental health. The two questions capturing students' perception of hunger were: 'In the past one month did you feel tired, drained or weak because you did not eat well/enough?' and 'Did you feel hungry in school because you did not have enough to eat?'

Findings from these three sources were triangulated and presented to members of the School Health Promotion Advisory Board (SHPAB) in each of the 5 schools. The SHPAB comprised the principal, representatives of the parent–teacher association (PTA), teachers, Sangath professionals and representatives of the funding agency. Discussions were held with the SHPAB to gather their opinion on the nutritional status of students and ways of addressing the issue of under-nutrition.

Ethical issues

Students and their parents were notified in advance of the activities to be conducted. As the information being collected was part of a routine school health programme, parents were asked whether they did not want their child to be included in the programme. No parent refused participation of their child. Adolescents were asked for their consent for each activity. Participation was voluntary and students were informed that non-participation would not affect their academic performance. Findings were shared with students and those who were underweight were provided nutritional counselling; in addition, workshops for parents and adolescents were held in schools on healthy eating and cooking practices.

Analysis

Data were entered and analysed using the Statistical Package for Social Sciences (SPSS) version 16 (SPSS Inc, Chicago). Proportions and confidence intervals (CI) were calculated. The chi-square test was used wherever appropriate. The level of significance was set at $p<0.01$.

RESULTS

Of the 1015 adolescents (565 boys; 450 girls) who attended the health camps, 338 (33.3%; 95% CI 30.2%–35.9%) were found to be underweight and 643 had normal weight (63.3%; 95% CI 60.3%–66.3%). The total number of underweight boys was 214 (37.8%; 95% CI 33.8%–41.8%) and the number of underweight girls was 124 (27.5%; 95% CI 23.4%–31.6%). This difference was statistically significant (chi-square 12.01, df 1, $p<0.001$). The prevalence of severe underweight was 10.4% (95% CI 7.88%–12.91%) for boys and 4.6% (95% CI 2.66%–6.53%) for girls. This difference was also statistically significant (chi-square 11.5, df 1, $p<0.001$).

The prevalence of being underweight across the school classes was 33% (Class V), 38.4% (Class VI), 41% (Class VII), 26.8% (Class VIII), 33.1% (Class IX), 27.6% (Class X), 24.6% (Class XI) and 40.6% (Class XII). The class-wise distribution of underweight boys and girls is shown in Tables I and II.

Of the 565 boys and 450 girls, 16 boys (2.8%; 95% CI 1.4%–4.2%) and 18 girls (4%; 95% CI 2.2%–5.8%) were overweight; this difference was not statistically significant (chi-square 1.1, df 1, p=0.2).

A 24-hour dietary assessment was done to measure the energy and protein intake of 76 (boys 43; girls 33) randomly selected underweight adolescents. They were asked to recollect the food consumed in the past 24 hours and the nutritional values of the items were calculated in terms of total amount of energy and protein content. The mean energy intake revealed that the diets were inadequate and the total calories consumed by them were much below the recommended dietary allowance (RDA)[12] specified by the Indian Council of Medical Research (ICMR; Figs 1 and 2). Protein intake was found to be variable.

Of the 684 adolescents who participated in the survey, 405 (59.2%; 95% CI 55.3%–62.7%) said that they felt hungry during school hours due to insufficient food intake and 280 (40.9%; 95% CI 37.2%–44.6%) reported feeling tired or weak in the past month because of hunger. The prevalence of self-reported hunger showed a gradual increase from Classes VII to XII: 56 (41.5%), 107 (59.4%), 64 (51.2%), 71 (71.7%), 55 (77.5%) and 52 (70.3%), respectively; a chi-square test for trend was statistically significant (chi-square [trend] 28.4, df 1, $p<0.001$) indicating that hunger was more common in higher classes.

DISCUSSION

We describe the nutritional status of adolescents studying in 5 schools in rural Goa. The findings show that under-nutrition affected about one-third of students; that boys were more commonly

TABLE I. Prevalence of underweight boys (%) in Classes V–XII (*n*=549)*

Class (*n*)	Nutritional status (%)		
	Normal	Thin	Severely thin
V (58)	63.8	24.1	12.1
VI (86)	57.0	33.7	9.3
VII (81)	49.4	28.4	22.2
VIII (105)	64.8	24.8	10.5
IX (70)	62.9	32.9	4.3
X (66)	60.6	28.8	10.6
XI (40)	80.0	15.0	5.0
XII (43)	58.1	34.9	7.0

* Numbers exclude boys who are overweight

TABLE II. Prevalence of underweight girls (%) in Classes V–XII (*n*=432)*

Class (*n*)	Nutritional status (%)		
	Normal	Thin	Severely thin
V (55)	69.1	5.4	5.5
VI (72)	63.8	30.6	5.6
VII (56)	67.8	25.0	7.1
VIII (70)	84.2	14.3	1.4
IX (89)	68.5	25.8	5.6
X (44)	86.4	13.6	0
XI (23)	65.2	26.1	8.7
XII (23)	56.5	34.8	8.7

* Numbers exclude girls who are overweight and obese

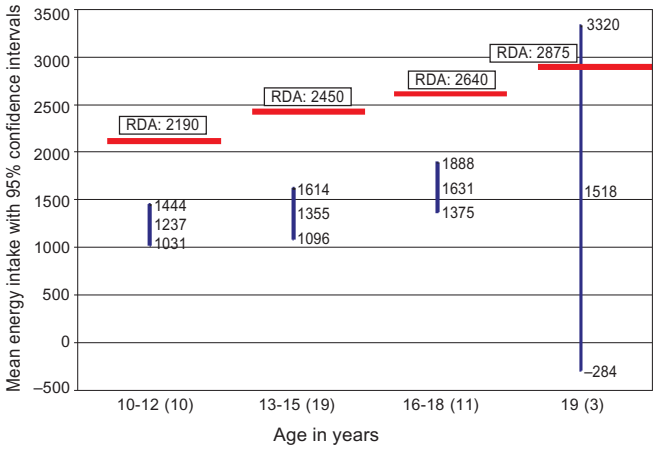

FIG 1. Mean energy intake of 43 underweight boys (10–19 years) compared with the recommended dietary allowance (RDA)

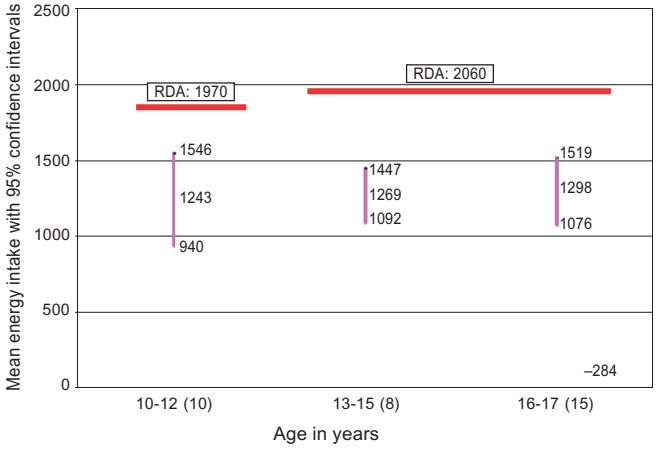

FIG 2. Mean energy intake of 33 underweight girls (10–17 years) compared with the recommended dietary allowance (RDA)

affected than girls; that the dietary intake in terms of energy was below recommended limits for underweight adolescents and that self-reported hunger and its consequences were very common.

BMI is a widely used indicator for estimating nutritional status.[13] Based on this indicator, 4 of 10 boys and almost 3 of 10 girls in the secondary school years were underweight. Higher (or similar) prevalence of under-nutrition among boys as compared with girls has also been documented by other researchers in India.[14,15] The prevalence of being underweight was similar throughout the school years. Energy needs are highest during adolescence (10–19 years),[16] as the body undergoes rapid physiological changes and growth during this phase. All the underweight adolescents who were evaluated for energy and protein intake were found to have energy intakes below the RDA. Thus, not having enough calories is the most likely reason for being underweight. Similar findings of low energy consumption among adolescents have been reported by other researchers.[7,17]

More than half the adolescents who participated in the survey reported experiencing hunger during school hours as a result of inadequate food consumed and just under half reported feeling weak as a consequence of lack of food. A number of studies[18,19] have documented the adverse impact of hunger on the academic, behavioural, physical and mental health of adolescents. Hungry adolescents suffer from two to four times as many health problems, such as fatigue, headaches, irritability, inability to concentrate; they are more likely to be ill and absent from school.[20] The high burden of under-nutrition among adolescents in secondary schools, its relationship to hunger and its adverse impact on school performance was widely acknowledged by the members of SHPAB. They suggested that the mid-day meal be scaled up to Class XII. The problem of being overweight was also observed, albeit in a relatively small proportion of students. Being overweight in adolescence predicts adult obesity and actions should be taken to prevent this emerging problem, for example through awareness on need for adequate physical activity in schoolchildren as a part of health-promotion activities.

One limitation of our study was the lack of full participation of all students in the research procedures; this may have imposed a selection bias. Despite these limitations, the data from multiple sources all point towards the high burden of hunger and under-nutrition in secondary school adolescents in our sample of schools, and confirm that these are problems of both genders. Indeed, our data suggest that boys are more at risk than girls, a finding which has not been acknowledged widely. Hunger increases substantially with age and being underweight is prevalent throughout the school years, hence the need to extend mid-day meals to senior classes. A study assessing the impact of the mid-day meal programme on educational and nutritional status of adolescents in Karnataka found that students in mid-day meal programme schools have better enrolment and attendance, higher retention rate and reduced drop out rate, better scholastic and higher growth performance.[21] A light snack in the morning, before school begins, may help alleviate hunger in children who have not had any breakfast. In addition, SHPAB members suggested awareness programmes on healthy eating practices for all students. Routine monitoring of weight and height (at least once a year) should be done to identify underweight adolescents for nutritional counselling. Moreover, there is a need for further research to evaluate the reasons for inadequate food availability and intake. Other associated conditions such as worm infestations and diarrhoeal diseases, which may play a role in under-nutrition and hunger, should also be considered. There is also a need for evaluation of micronutrient deficiencies. However, the immediate intervention required in schools is to supplement the diet of students, so as to make up for the deficiency in their daily energy requirement.

In conclusion, our study confirms a high prevalence of under-nutrition among adolescents in rural schools even in one of India's wealthiest states. Hunger is a common experience reported by adolescents. It affects the adolescent's health and school performance. We call for immediate action to address this grave social and health problem in our schools by instituting routine annual monitoring of nutritional status, extension of the mid-day meal programme to cover all school-going adolescents, provision of nutritional counselling for underweight adolescents and research on the causes and impact of under-nutrition and evaluation of the impact of the enhanced mid-day meal programme.

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Conflict of Interest: None

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Prevalence and pattern of substance use among the higher secondary school students of Imphal, Manipur, India

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ABSTRACT

Background. Substance use often begins in adolescence. We did a study to describe substance use and its associated factors among adolescent students in Imphal.

Methods. We defined substance use as the use of licit and illicit substance other than when medically indicated. Using a WHO self-administered questionnaire, we collected information about substance use from 61 randomly selected students of 17 government/private higher secondary schools. We calculated the prevalence of substance use according to selected characteristics.

Results. We surveyed 1020 students, 551 of whom reported prior substance use (prevalence of ever use: 54%, 95% confidence interval [CI] 42%–67%). Prevalence of recent and current user was 35% (95% CI 28%–43%) and 22% (95% CI 17%–28%), respectively. Among ever users, tobacco (46%) was used most commonly, followed by alcohol (29%), cannabis (14%) and opiates (12%). On multivariate analysis, substance use was significantly higher among boys (adjusted odds ratio [AOR] 2.6, 95% CI [2.0–3.4]), whose father (AOR 2.0, 95% CI 1.6–2.7) or sibling (AOR 2.1, 95% CI 1.5–3.0) used substance. It was significantly lower among children of Hindu/Jain religion (AOR 0.5, 95% CI 0.4–0.7).

Conclusion. Prevalence of tobacco and alcohol use was high among students. Familial use of substances was associated with the behaviour of adolescents. Friends were the key proximal determinant. We recommend introducing a substance use prevention policy in schools to educate students about various adverse effects and to impart refusal skills.

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