Evaluation of the Prevalence of Undernutrition and Factors Associated with it among Adolescents of Age Group 13 to 15 in the Rural and Urban Areas of Government Schools in Thiruvananthapuram, Kerala

Siju NS[1], Retheesh KH[2]

ABSTRACT

Introduction: Adolescent undernutrition is a problem in most developing countries including India. Studies on the assessment of nutritional status of adolescents are less in number and a National database has not yet been developed. This study was aimed to assess the prevalence of undernutrition and factors associated with it among adolescents aged 13 to 15 years in the Government schools under the urban and rural field areas of Community Medicine Department, Government Medical College, Thiruvananthapuram.

Material and Methods: A Cross Sectional study was conducted in Government High schools in the field area of Pangappara and Vakkom health centers which come under the department of community medicine, Medical College Thiruvananthapuram. The study population was school going adolescents of aged 13 to 15 years. It was a Census type study and 448 students from both field areas were included in the study. Data were collected using Semi structured interview schedule, administered by the Investigator.

Results: A total of 448 students participated in the study, 234 from Pangappara field area and 214 from Vakkom field area. Out of total 448, 237(52.9%) were boys and rest 211(47.09%) were girls. Overall prevalence of undernutrition among the study participants was 47.77%. Bivariate analysis of factors in this study revealed, deficient daily calorie intake, deficient daily protein intake, the male gender, low educational status of mothers, smoking and alcohol habits of students were significantly associated with undernutrition.

Conclusion: Undernutrition was very common among school going adolescent children with a prevalence of 47.77%, which was comparable with other studies. Undernutrition was more prevalent among male adolescents (54.4%) than female adolescents (40.3%). Between the urban and rural settings there was no significant difference in the prevalence of undernutrition. In this study, 51.8% of students were getting a protein deficient diet and 99.8% students were getting a calorie deficient diet which in turn contribute to undernutrition.

Keywords: Undernutrition, Overweight/Obesity, Adolescents, Malnutrition, Deficient Diet

INTRODUCTION

Adolescence is a vulnerable period in human lifecycle when nutritional requirements increase due to the adolescent growth spurt. In girls this period is characterized by rapid increase in height, weight and hormonal changes resulting in sexual maturation. Most girls begin a rapid growth spurt between the ages of 13 and 15 years.[1] Adolescence, one of the nutritional stress periods of life with profound growth, comes with increased demands for energy, protein, minerals and vitamins. In India, poor nutrition, early child bearing and poor reproductive health make the physical development in adolescent girls at risk.[2] Increased physical activity combined with poor eating habits and the onsets of menstruation contribute to accentuating the potential risk for adolescent's poor nutrition.[2] In India, reproductive health of adolescent girls is very poor and they suffer from nutritional deficiency.[3,4] During adolescence, gender based discrimination prevails in various ways viz. selective nutritional neglect of girls, differential investment or expenditure on health care, educational opportunities and work force participation.[5,6]

In boys the adolescent period is more active and involved in many experiments with life because of curiosity and peer pressure such as sexual activities, smoking, alcohol use etc, and this may also affect their health and growth. As that of their female counterpart this period warrants more nourishment and energy for their growth but the intake of food may not be enough compared to the requirement.[7]

Bio-chemical changes in the body make the endocrine glands more active and there is increase in height, weight, changes in voice muscular growth, appearance of pubic hair, growth of hair on the face arms, legs etc. The most striking physical change in this growth period is attainment of puberty which leads to development of reproductive capacity.

India is home to 243 million adolescents constituting 21.4% of the country's population. India has shown remarkable progress in adolescent health and has a number of nutrition intervention programmes, even then malnutrition is highly prevalent in the poorer states of the country. Recently India has launched RSKS (Rashtriya Kishor Swasthya karyakram) for the benefit of adolescents, which would target their nutrition, reproductive health, substance abuse and other issues.[8] Kerala has an admirable health status comparable to the developed countries.

[1]Assistant Professor, Department of Community Medicine, Government Medical College, Trivandrum, [2]Associate Professor, Department of Community Medicine, Government Medical College, Trivandrum, India

Corresponding author: Dr. Retheesh KH, Associate Professor, Department of Community Medicine, Government Medical College, Trivandrum, India

Improvement in health status of adolescents has inter-generational impact. Adolescent underweight has been identified as a risk factor for underweight in adulthood and it increases adult and child morbidity and mortality by leading to a variety of adverse health outcomes and low birth weight in babies.[9,10] Youth comprise a substantial proportion of the country's population. Nutrition and physical growth are integrally related; optimal nutrition is a requisite for achieving full growth potential.[11] India can take advantage of this 'demographic dividend' by investing in young people to achieve a healthy, socio-economically productive and poverty free society. Measurements of height, weight and nutrient intake are the reliable means to evaluate the nutritional status.

The primary causes of undernutrition in India are its large population, socio-economic differences and inadequate access to health facilities. On the nutrition status of women, the NFHS 3 (National Family Health Survey) indicates that adolescent girls have poorer Body Mass Index than any other age group. In addition, 54.8% of adolescent girls were anemic.[12] Nutritional assessments among adolescents are important as they are the future parents and constitute a potentially susceptible group. Studies on the assessment of nutritional status of adolescents are less in number and a National database has not yet been developed. The present cross-sectional investigation evaluated the proportion of undernutrition among adolescents (13 y to 15 y) under the field area of Community Medicine Department of Govt: Medical College Trivandrum, Kerala.

MATERIAL AND METHODS

Adolescents aged 13 to 15 years studying in Government high schools in the field practice areas of Department of Community Medicine, Medical College, Trivandrum participated in the study. There is only one Government school under the field area of Vakkom Health Centre, all students from standard 8, 9 & 10 were selected (214 students). From the field area of Pangappara Health Center 3 Government schools were there and all were selected. From these selected schools all students were selected from standard 8, 9 &10(234 students) and in total448 students participated in the study.

Nutritional status is the major outcome variable. Anthropometric measurements were taken to calculate the outcome variable. Covariates include socio demographic variables- age, gender, religion, education level of parents, socio economic status of family, type of family, birth order, habits of parents, occupation of parents, personal habits, food habits and physical activity, periodic deworming, and diet. Semi structured interview schedule was the study tool, administered by the Investigator.

Anthropometric indices

Nutritional status assessment was done mainly through anthropometric and clinical examination. Anthropometric examinations are very reliable and easy to carry out. In anthropometric examination, height for age is a reliable indicator of long term nutritional status and Quetelet

index (BMI) was calculated, which is a very reliable indicator of current nutritional status. BMI was calculated using the formula weight (kg)/ (height in meter) 2. BMI category: The BMI categorization was done using Tim Cole Anthropometric Standards reference for 5 – 19 yrs age group (BMI-for-age),recommended by National Institute of Nutrition, Hyderabad, India.

The data were entered in MS excel and analyzed using appropriate statistical software (SPSS trial version). The quantitative variables were summarized using mean and standard deviation. Qualitative variables were summarized using proportions. The association between independent variables was checked using tests of significance, chi-square test for qualitative variables and student t-test for quantitative variables in bivariate analysis. This was followed by multivariate analysis using logistic regression with variables having less than 0.2 P value.

RESULTS

A cross-sectional study was conducted among the school going adolescents of age 13 to 15 years in the field area of Community Medicine Department, Medical College, Thiruvananthapuram to find out the prevalence of undernutrition. Case control analysis was carried out comparing the under nutrition group with the normal weight / overweight students to find the factors associated with the undernutrition.

Among the 448 participants 214(47.77%) were underweight, 216(48.21%) had normal weight and 18(4.02%) were overweight/obese. (Table 1)

Undernutrition was more among boys (54.4%) compared to girls (40.3%). There was not much difference in the distribution of overweight/obese category; 8(3.45%) and 10 (4.7%) among boys and girls respectively. (Table 2)

Among male participants, average daily calorie intake is 1513.95 kcal which is less than average intake among females, which is 1532.24kcal. Average protein intake of males is 52.9gms and in females it is 53gms. (Table 3)

The factors which were associated with undernutrition in bivariate analysis (P<0.05) were male gender, smoking

Category	Total	Percentage (%)
Under Weight	214	47.77
Normal Weight	216	48.21
Over Weight	16	3.57
Obesity	2	0.45
Table-1: Distribution of study participants according to BMI		

Category	Male	Female
	Number (%)	Number (%)
Underweight	129 (54.4)	85 (40.3)
Normal weight	100(42.2)	116(54.9)
Over weight	7(3)	9(4.3)
Obesity	1(0.45)	1(0.4)
Total	237(100)	211(100)
Table-2: Gender wise distribution of undernutrition		

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Nutritional variables		Boys (237)	Girls(211)	Overall (448)
Calories(Kcal)	Mean (SD)	1513.95 (241.8)	1532.24 (236.6)	1522.56 (239)
Protein (gm)	Mean (SD)	52.9 (9.3)	53 (9.65)	53 (9.47)
Table-3: Gender wise distribution of Calorie and protein intake by the study participants				

Variable	Category	Adjusted odds ratio	95% CI	P value
Total protein	Deficient	1.06	1.04-1.09	< 0.001
Gender	Male	1.59	1.07-2.36	0.022
Education of mother	Low (10th or below 10th)	1.29	1.02-1.64	0.031
smoking	Current/ever user	8.81	1.08 - 71.64	0.042
Table-4: Result of multivariate analysis to find the predictors of undernutrition				

habits of the students, deficient daily intake of protein, deficient daily intake of calories, low educational status of mother and father, alcohol abuse by the students. After Binary logistic regression (Table 4) the positive predictors of undernutrition were male gender, smoking habits of students, low educational status of mother and daily deficient protein intake. These factors were found to have significant effect on undernutrition.

DISCUSSION

In the study (table-1), the prevalence of undernutrition was 47.77% (95% CI; 40.12 - 55.46), which is comparable with other studies.[13] In a study by Yamini Thankachi, the overall prevalence of under nutrition was 46.7% in rural and urban settings of Thiruvananthapuram District.[5]

The overall prevalence of overweight/obesity in this study was 4%. It was 5.4% in the study by Yamini Thankachi.[5] Vakkom field area is considered as a rural population and Pangappara field area as an urban population. These two field areas are very much comparable with other parts of Kerala. Average economic as well as social standards are higher in Kerala compared to other states of India.[14] Despite this the prevalence of undernutrition among adolescent school going children is high in Kerala compared to the northern states.[15] Increasing trend of overweight and obesity among adolescents were also observed in many studies.[10,16,17] In this study, the overall prevalence of overweight/obesity is 4% and it was5.4% in a previous study by Yamini Thankachi. These findings are comparable with similar studies.[18,19,20]

Factors Influencing the Undernutrition (table-4}

1. Gender

Among girl students, the prevalence of undernutrition was 40.3% and among the boys it was 54.4% (Table 2). The same trend was observed in other studies also.[21] In Kerala scenario, there was no evidence of gender wise discrimination of parents towards their children. Some other factors were influencing this gender difference in malnutrition. Habits such as smoking; alcohol abuse & fast food consumption were seen more among male children. Sports and games are energy spending activities in which male children were participating more than females. In this study, the age group taken was 13, 14 and 15 years. In this age group, the growth spurt is more in girls than boys due to the hormonal changes. Secondary sexual characters develop faster in females than

male children. As a social culture, parental control over girl child is more and they are restricted from outdoor physical activities.[22]

2. Education of Mother

Among mothers of participants, 326 had education below or up to 10th std (71.4%). Mothers with no schooling were 5 in number. The low educational status of mothers has a significant impact on the nutritional status of children.[23] Because in our society mothers have the key role in food preparation for their family and child care. With the local availability of raw materials, house wives will decide the type of food to be prepared. Mother's knowledge about the nutrition, quality and quantity of food items, understanding the basic nutritional needs of their kids all indeed influence the nutritional status of their children. Poorly educated mothers lacking nutritional knowledge might prepare food with poor nutritive value which in turn influences the nutritional status of their children. Mothers with poor education status might have poor knowledge regarding child care. Poor child care with poor hygienic conditions also cause recurrent infections which in turn affect the nutritional status of children.A decreasing trend in all forms of undernutrition is observed where the literacy status of mother increased.[24] Children whose mothers were illiterate showed 3 times higher prevalence of wasting than literate mothers.[25]

3. Smoking Habits of students

In this study of the 237 boys participated, 11 students have smoking habit i.e. 4.6% of total boys, all were ever smokers and none of them were current smokers. In the 11 students with smoking habit, 10 were under nourished There is a statistically significant relationship between smoking habit and undernutrition.[26] Smoking generally has a catastrophic effect on body. Smoking also decreases the appetite.[27] These factors might be the reason for undernutrition among smokers. Studies have shown that adolescents who had parents or close friends who were smokers were more likely to be smokers themselves.[28-30]

4. Protein intake

In this study, a significant relationship between deficient daily protein intake by the students and their nutritional status. Protein is an essential macronutrient and a prime requisite for growth and development. Quantity of protein requirement may vary from individual to individual depending on

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age, sex, physiological and psychological factors. For an adolescent boy of age 13-15 years, the average daily protein requirement is 54.3gms and for the girls of the same age is 51.9gms.[31]

In this study, the prevalence of protein deficient diet is 66.4% in underweight category and only 38.5% in normal/overweight category. The mean protein intake by the under nutrition group was 50.43gms /day and that of normal group was 55.35gms/day and this difference was found to be statistically significant.

In this study, the average intake of protein by male students is 52.9gms/day and for the female students, it is 53gms/day. For the boys, this is less than the daily average requirement and for girls it is more than the daily average requirement. So these findings justify increased prevalence of undernutrition among boys. The quality of protein is also an important deciding factor. Most of these students get the required protein mainly from the plant source, even though most of them have mixed food habits. The quality of protein from the plant source is less than the animal source.[31] So the daily protein deficient diet may contribute to the undernutrition in adolescents which was nearly 50% of total students in this study.

5. Other factors

The other factors which were associated with undernutrition in bivariable analysis (P<0.05) were deficient daily calorie intake and alcohol habits of students. The alcohol consumption habit has a linear relationship with the smoking habit. Also the daily calorie intake has a linear relationship with the daily protein intake. The Pearson Correlation Coefficient was 0.73 for the relation between smoking and alcohol habits among students. The Pearson Correlation Coefficient was 0.73 for the relation between daily protein intake and daily calorie intake.

The average calorie requirement for adolescent boys of age 13-15 years is 2750kcal/day and that of girls is 2330kcal/day. In this study, boys were getting an average calorie of only 1513.95 and 1532.24 for girls which were very much lower than the recommended daily allowance (RDA). Out of 448 students, only one is getting adequate amount of calories daily who has a normal weight. 99.8% of the study participants are getting a deficient calorie diet. In this study the mean intake of calories by the underweight group is 1465.44kcal and that of normal group is 1574.80kcal/day. Definitely this calorie deficient diet also contributes to the undernutrition of the study participants.

Out of 11 alcohol users, 10 are under nourished with a low BMI than required. Alcohol has a bad impact on physiological as well as psychological development and growth. Age, religion, education of father, occupation of parents, socio-economic status of family, type of family, number of siblings, birth order, habits of parents, food habits and immunization status were not significantly associated with undernutrition among the study participants.

CONCLUSION

The main finding of this study is that undernutrition is very common among school going adolescent children with a prevalence of 47.77% and was more prevalent among male adolescents (54.4%) than female adolescents (40.3%). There was no significant urban- rural difference in the prevalence of undernutrition. In this study, 51.8% of students were getting a protein deficient diet and a staggering 99.8% students were getting a calorie deficient diet despite the "mid-day meal programme. Even though the socio economic standards are high, the prevalence of undernutrition among adolescent school going children is higher in Kerala compared to other states. After Binary logistic regression, the positive predictors of undernutrition were male gender, smoking habit, low educational status of mother and daily deficient protein intake.

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