

Prevalence of Malnutrition among Adolescent School Girls aged 11 to 18 Years in Shillong, India

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Abstract - Malnutrition is an imbalance of nutrients that results from either too little or too much food, leading to impaired health. It encompasses wasting, stunting, underweight, obesity, and micronutrient deficiencies with consequences as developmental delays, increased susceptibility to illness, and a higher risk of death, particularly in children and adolescents. The study aimed to assess the nutritional status of adolescent school girls in Shillong, India, in relation to different socio-economic characteristics as age, place of residence, religion, parents' education and occupation, ethnicity, etc. BMI (Body Mass Index) served as the metric for evaluating nutritional status, allowing for the classification of girls into underweight, normal weight, overweight, and obese categories. Primary data from 750 girls of age 11 to 18 years were collected from 10 schools of Shillong, India, under UGC sponsored minor research project, using stratified random sampling technique. The findings revealed 20.4 percent under-weight, 7.2 percent over-weight and 1.9 percent obese. The majority of under-weight girls belonged to the age group of 11 years; and the prevalence of healthy-weight status was comparatively higher among tribes (74.8%) than that among non-tribes (66.1%). Prevalence of under-weight status among primitive Khasi tribes was 16.7 percent. Pearson's Chi-square test, followed by multinomial logistic regression analysis indicated that age, religion, ethnicity, parents' education and occupation, total children ever born to mother, monthly family income and dietary practices were significantly associated with the malnutrition.

Key words: Shillong, malnutrition, adolescent girls, BMI, Pearson's chi-square test, multinomial logistic regression.

INTRODUCTION

Shillong, the capital of Meghalaya, one of the smallest states in India constituting the headquarters East Khasi Hills district situated at an average altitude of 4,908 feet above sea level, with the highest point being Shillong -Peak at 6,449 feet [1]. It is said that the rolling hills around the town reminded the European settlers of Scotland and hence, the city is also known as the Scotland of the East. As per 2011 India census, the city had a population of 314,610, with males constituting 46% of the population and females 54%. Average literacy rate of 86%, which was higher than the national average of 63.5%, with male literacy is 85%, and female literacy is 88%. The Khasi tribes make up the majority of the population. All the other north-east Indian tribes, in particular, Jaintias, Garos, Mizos etc. as well as a moderate number non-tribes making the city a fairly cosmopolitan.

Adolescence is a period of transition between childhoods to adulthood and occupies a very pivotal role in human life, as characterized by an exceptionally rapid growth [2, 3]. Physical, cognitive, social and emotional changes are observed during this period. These changes along with the adolescents' growing independence, search for identity, concern with appearance, need for peer acceptance and active lifestyle significantly affect their eating behaviors and nutritional status. Rapid physical growth creates an increased demand for energy and nutrients which help maintenance of body function, body growth and protection of organs of the body; and nutritional deficiencies can lead to many far reaching consequences. In developing countries, malnutrition is one of the glaring deficiencies in adolescent girls, probably due to low intake of haemopoietic nutrients since childhood and increased demand for nutrients coupled with menstrual loss of iron. In India, adolescents constitute around 21% of the whole population and the prevalence of thinness in girls was estimated as 46.8% in NFHS-3 and 42% in NFHS-4 respectively [4, 5, 6]. The high rate of malnutrition among adolescent girls not only affects their present life but also associates with their future health problems related to pregnancy and low birth weight babies and risk of non-communicable diseases [7, 8,9]. So if their nutritional needs are not met, they are very likely to suffer from anemia and give birth to under-nourished children, thus transmitting malnutrition to future generation [4].

Concerning the severity of consequences, the study aimed to analyze the nutritional status of adolescent school girls of Shillong in relation to some socio-economic, anthropometric, physical activities and dietary factors.

DATA AND METHODOLOGY

Primary data of 750 girls of 11 to 18 years of age from 10 schools of different localities of the city were collected during May 2010- February 2011, under UGC sponsored minor research project, using the technique of stratified random sampling. The information on anthropometric, socio-economic and dietary habits were taken and the sample data were analyzed to assess the nutritional status according to age, place of residence, religion, economic status of family, ethnic group, parents' education and occupation, dietary practices, physical activities etc. Different levels of BMI, viz. under-weight, healthy weight, over-weight and obese, was used as an indicator of nutritional status. BMI was computed as the ratio of body weight (in Kg.) to the square of height (in meter); and the CDC BMI-for-age growth chart, developed by National Centre for Health Statistics, USA, was used to classify the individuals into different weight-status categories as underweight, healthy weight, over weight and obese [10]. Pearson's Chi-square test applied to assess the association of nutritional status with different socio-economic and dietary factors. The odds ratios were computed using multinomial logistic regression analysis to study the degree of dependence of these factors on malnutrition. SPSS software was used to analyze the data.

RESULTS

In the study, Christianity (45.9%) and Hinduism (42.5%) were the dominant religious groups among the selected girls, followed by Islam (7.3%), Sikhism (1.2%), Khasi religion (1.1%), and others, with tribes as 50.8% followed by non-tribes as 49.2%. The results indicated that the majority of the subjects (70.5%) were of a healthy weight, while a minority presented as overweight (7.2%), underweight (20.4%), or obese (1.9%). The prevalence of under-nutrition among primitive Khasi tribes was 16.7 percent. In the subsequent analysis, the over-weight and obese groups were amalgamated into a single category due to low cell frequencies. Table 1 to table 6 give an overview of the findings. The prevalence of underweight was higher among non-tribal girls (24.7%) than among tribal girls (16.3%), and a significantly high proportion of 11-year-old girls were found to be underweight. Among different religious groups, Christians exhibited the highest rate of healthy weight individuals (76.5%), and Hindus followed with 67.7%; however a significantly high prevalence of malnutrition was observed among Muslim girls. "Dietary practices indicated a higher proportion of underweight individuals among vegetarians (23.3%) compared to non-vegetarians. Daily milk consumption appears linked to healthy weight status in girls as 73.0% of daily consumers were healthy weights, while only 66.4% of non-consumers were. There is a notable association between skipping breakfast and underweight status among girls. The results showed approximately 10% of all girls skip breakfast daily, and over half of those who do so (51.3%) were underweight, in contrast, among girls who never skip breakfast, only 14.5% were underweight. Prevalence of healthy weight status was higher among physically active girls. In the study, only 13.3% of the girls reported engaging in daily physical activity (exercise or morning walk); however, the prevalence of healthy-weight status was significantly higher among this group (77.3%) compared to those who were sedentary (62.7%). Pearson's χ^2 test statistics reveal that age, religion, ethnicity, dietary habits, parents' education, family income, total children ever born to mother and physical activities have significant association (p-values <0.01) with the nutritional status (table 1).

Multinomial logistic regression analysis indicated that age group, religion, father's education and occupation, mother's occupation, habit of skipping breakfast, and monthly family income were significant predictors of the nutritional status of adolescent girls (table 2). The parameter values suggest that girls aged 10-12 were 2.351 times more likely to be underweight than girls aged 16 or above, whereas those aged 13-15 years are more likely to be overweight or obese. Regarding religious affiliation, Muslim girls exhibit a higher likelihood of being both underweight and overweight (O.R. = 2.773 and 2.152 respectively). Higher educated parents had less likelihood of malnutrition among their daughters. Father's employment (across government, private, and self-employed sectors) was associated with a reduced risk of girls being underweight (O.R. = 0.301, 0.373, and 0.287); whereas, daughters of employed mothers (across government, private, and self-employed sectors) had significantly higher odds of being underweight (O.R.=3.298, 2.350 and 1.452 respectively). Daily breakfast skippers had a significantly higher risk of being underweight (Odds Ratio = 3.807). There was an inverse relationship between family income and the prevalence of underweight among girls as the girls from lower-income families were more likely to be underweight

than those from higher-income families. However, the chance of obesity was also more among girls of higher income families.

DISCUSSION

India is faced with many barriers that influence adolescent health. In 2014, the Rashtriya Kishor Swasthya Karyakram (RKSK) was implemented to offer a continuum of care that addresses the health and developmental needs of adolescents. In 2007, the Mid-day meal scheme, a centrally sponsored scheme, has been extended to cover adolescents for early detection and prevention of health issues [11, 12]. The Rashtriya Bal Swasthya Karyakram (RBSK), an initiative designed to address health concerns in children from birth to 18 years, also launched focusing on four key areas: Deficiencies, Disease, Developmental Delays, and Disability (4Ds) [13]. In 2018, POSHAN Abhiyan, was launched under National Nutrition Mission which mainly focus on under-nutrition, stunting and low birth weight babies among young child, women and adolescent girls [14]. But despite various efforts in the past two decades by the Govt. of India, malnutrition has continued to be a common health problem among adolescents, in particular for girls in Shillong. Though the proportion of under-nutritious girls was less than the prevalence of national average, but it seemed significant challenges persist in addressing the malnutrition and its complete eradication.

CONCLUSION

The eradication of malnutrition must be a primary objective. The study confirms the prevalence of malnutrition in the concerned population and a need of well-planned strategy for prevention and its complete eradication. The planning should prioritize an understanding of socio-economic factors and nutrition education.

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CONFLICTS OF INTERESTS

There are no conflicts of interests.

Table1. BMI Cross tabulation with different characteristics of the study population

Characteristics	Under weight	Healthy weight	Over weight and Obese	Total	Pearson's χ^2 test value (p value)
Age					17.476(0.001)
Less than 12	21 (40.4%)	28 (53.8%)	3 (5.8%)	52 (100.0%)	
12 to 13	57 (21.3%)	190 (70.9%)	21 (7.8%)	268 (100.0%)	
14 to 15	44 (16.4%)	199 (74.3%)	25 (9.3%)	268 (100.0%)	
16 or above	31 (19.1%)	112 (69.1%)	19 (11.7%)	162 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Religion					20.037(0.001)
Hindu	75 (23.5%)	216 (67.7%)	28 (8.8%)	319 (100.0%)	
Muslim	19 (34.5%)	30 (54.5%)	6 (10.9%)	55 (100.0%)	
Christian	49 (14.2%)	263 (76.5%)	32 (9.3%)	344 (100.0%)	
Other	10 (31.3%)	20 (62.5%)	2 (6.3%)	32 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Ethnic group					8.485(0.004)
Tribe	62 (16.3%)	285 (74.8%)	34 (8.9%)	381 (100.0%)	
Non tribe	91 (24.7%)	244 (66.1%)	34 (9.2%)	369 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Skip breakfast					26.190(< 0.001)
Every day	39 (51.3%)	33 (43.4%)	4 (5.3%)	76 (100.0%)	
Sometimes	71 (18.8%)	272 (72.1%)	34 (9.0%)	377 (100.0%)	
Never	43 (14.5%)	224 (75.4%)	30 (10.1%)	297 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	

Fish/ Meat					
Everyday	22 (11.1%)	150 (75.4%)	27 (13.6%)	199 (100.0%)	11.971(0.018)
Sometimes	117 (23.2%)	349 (69.2%)	38 (7.5%)	504 (100.0%)	
Never	14 (29.8%)	30 (63.8%)	3 (6.4%)	47 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Fruits					
Everyday	30 (14.8%)	158 (77.8%)	15 (7.4%)	203 (100.0%)	12.177(0.016)
Sometimes	118 (22.0%)	367 (68.3%)	52 (9.7%)	537 (100.0%)	
Never	5 (50.0%)	4 (40.0%)	1 (10.0%)	10 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Leafy vegetables					
Everyday	62 (17.0%)	270 (74.2%)	32 (8.8%)	364 (100.0%)	11.412(0.022)
Sometimes	79 (22.2%)	242 (68.0%)	35 (9.8%)	356 (100.0%)	
Never	12 (40.0%)	17 (56.7%)	1 (3.3%)	30 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Mother's education					
Primary	88(23.9%)	249(67.8%)	30 (8.1%)	367 (100%)	16.912(<0.001)
Secondary	57 (18.8%)	223 (73.4%)	24 (7.9%)	304 (100.0%)	
Higher	8 (10.1%)	57 (72.2%)	14 (17.7%)	79 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Father's education					
Primary	76 (28.5%)	173 (65%)	44 (16.5%)	266 (100%)	36.310(<0.001)
Secondary	66 (18.1%)	270 (74.0%)	29 (7.9%)	365 (100.0%)	
Higher	11 (9.2%)	86 (72.3%)	22 (18.5%)	119 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Family income (Rs)					
Less than 10,000	77 (29.3%)	171 (65.0%)	15 (5.7%)	263 (100.0%)	46.596(<0.001)
10,000 to 20,000	61 (20.2%)	221 (73.2%)	20 (6.6%)	302 (100.0%)	
20,000 and above	15 (8.1%)	137 (74.1%)	33 (17.8%)	185 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Total siblings					
1 or 2	24 (14.0%)	127 (74.3%)	20 (11.7%)	171 (100.0%)	15.180(0.019)
3 or 4	60 (18.8%)	230 (71.9%)	30 (9.4%)	320 (100.0%)	
5 or 6	37 (23.6%)	110 (70.1%)	10 (6.4%)	157 (100.0%)	
7 or above	32 (31.4%)	62 (60.8%)	8 (7.8%)	102 (100.0%)	
Total	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	
Exercise/ Morning walk					
Everyday					29.666(<0.001)
Sometimes	17 (16.8%)	78 (77.3%)	6 (5.9%)	101 (100%)	
Never	106 (20.4%)	370 (71.2%)	44 (8.4%)	520 (100%)	
Total	30 (23.3%)	81 (62.7%)	18 (14.0%)	129 (100%)	
	153 (20.4%)	529 (70.5%)	68 (9.1%)	750 (100.0%)	

Table2. Estimates of parameter in multinomial logistic regression analysis

Predictors	p-value	OR (Odds ratio)	p-value	OR (Odds ratio)
Underweight against healthy weight			Obese against healthy weight	
<i>Age group (yrs)</i>				
10-12	0.001	2.351	0.033	1.117
13-15	0.234	1.096	<0.001	1.943
16 and above	*	*	*	*
<i>Residence</i>				
Rural	0.002	.710	0.042	0.876
Urban	*	*	*	*
<i>Religion</i>				
Hindu	0.001	1.480	0.055	1.101
Muslim	0.001	2.773	0.002	2.152
Christian	0.001	.316	0.042	0.816
Others	*	*	*	*
<i>Ethnicity</i>				
Tribe	0.001	0.762	0.002	0.746
Non-tribe	*	*	*	*
<i>Father's education</i>				
Primary	0.001	2.715	0.022	0.541
Secondary	0.001	3.076	0.001	0.493
Higher	*	*	*	*
<i>Mother's education</i>				
Primary	.764	1.361	0.012	0.335
Secondary	.490	1.279	0.001	1.747
Higher	*	*	*	*
<i>Father's occupation</i>				
Government	0.011	.301	0.033	0.822
Private	0.002	.373	0.012	0.479
Self employed	0.011	.287	0.045	1.006
None	*	*	*	*
<i>Mother's occupation</i>				
Government	0.001	3.298	0.212	1.069
Private	0.022	2.350	0.311	1.255
Self employed	0.001	1.452	0.178	1.259
None	*	*	*	*
<i>Vegetarian</i>				
Yes	<0.001	1.588	0.013	1.479
No	*	*	*	*
<i>Skip breakfast</i>				
Everyday	<0.001	3.807	0.001	.727
Sometimes	0.001	2.001	0.001	.860
Never	*	*	*	*
<i>Monthly Family Income (Rs)</i>				
< 10,000	.<0.001	1.787	0.023	1.189
10,000-20,000	0.001	1.958	0.001	.788
20,000 and above	0.001	*	*	*
<i>Total no. of siblings</i>				
1-2	0.001	.625	0.001	0.764
3-4	0.001	.793	0.001	0.842
5-6	<0.001	.631	0.042	0.811
7 or above	*	*	*	*

* represents the reference category

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