A community based study on factors influencing body mass index of adolescent girls in urban area of Bagalkot, Karnataka

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Abstract

Introduction: Among adolescents, girls are a doubly vulnerable group due to deep-rooted gender discrimination and other socio-cultural factors that are prevailing in our Indian society.

Objective: To study the factors influencing body mass index of adolescent girls residing in the urban field practice area of S. N. Medical College, Bagalkot.

Study design: A Community based cross sectional study.

Setting: Field practice area of urban health training center, Department of Community Medicine, S. Nijalingappa Medical College in Bagalkot.

Participants: 400 unmarried adolescent girls.

Sampling: Systematic random sampling.

Statistical Analysis: Data was tabulated in Microsoft Excel 2010 and analyzed by using Open Epi software. P-value was calculated using chi-square test and difference was accepted significant at more than 95% (p-value <0.05).

Results: Factors significantly associated with thinness were mother's literacy, family size, mid day meal and dietary intake less than RDA (p<0.05). Factors not significantly associated with thinness were religion, and father's literacy,

Conclusion: It was concluded that the prevalence of thinness was significantly high in girls whose mothers were illiterates. Thinness was also seen in girls from large families and Dietary intake less than RDA.

Keywords: Adolescent girls, Body mass index (BMI), Thinness, Urban area.

Introduction

There are about 1.2 billion adolescents comprising about 18% of the world's population.[1] Adolescents represent 19.6% of the population in India (253 million). Adolescent girls constitute nearly one tenth of Indian population.[2]

On an average adolescent girls mature by 10½ -11 years taking about 3-4½ years of duration from first sign of puberty to final maturation of secondary sexual characteristics. During this period, adolescent girls gain up to 50% of their adult weight, more than 20% of their adult height and 50% of their adult skeletal mass. Increase in height and weight will lead to increased nutritional requirement.[1] Adding to this, there are problems of urbanization, modernization and changing food habits.[3] The main nutritional problems affecting adolescent girls are undernutrition (underweight and stunting) and anemia.[4]

In many developing countries of South-East Asia Region, a large number of adolescents suffer from chronic undernutrition.[5] Studies from developing countries and underdeveloped countries reveal prevalence of undernutrition of about 20-58% (2009-2014) in adolescent girls.[6-7] On the contrary, in developed countries like China and Korea, prevalence of undernutrition in urban adolescent girls has declined to 4.2% in 2010.[8] But, in India, malnutrition is even higher i.e. 47% adolescent girls are undernourished.[10]

Adolescent girls who are undernourished are at risk for delivering low birth weight babies (22% in India), thus contributing to intergenerational cycle of malnutrition. One way to break this vicious cycle is to improve the nutrition of adolescent girls prior to conception.[11]

Apart from socio-economic and cultural factors, many other factors also play an important role in the causation of malnutrition in adolescent girls like worm infestation, poor environmental sanitation, lack of toilet facilities, menstruation and dietary practices.[12]

So the present study was carried out to study the factors influencing body mass index of adolescent girls residing in the urban field practice area of S. N. Medical College, Bagalkot.

Materials and Methods

The present community based cross sectional study was conducted in the field practice areas of urban health training center, Department of Community Medicine, S. Nijalingappa Medical College Bagalkot. The study period was from Jan 1st 2015 to Jun 31st 2016. There were 1784 adolescent girls as per data obtained from UHTC survey registers as on May 2014.

Local cultural values and ideas were respected. Confidentiality was assured. Informed written consent was taken from individual adolescent girl and their parents

before interview. The nature and purpose of the survey was explained in detail to them in their own language

Inclusion criteria
Unmarried Adolescent girls residing in the urban field practice area for more than a year and willing to participate in the study.

Exclusion criteria
Those who could not be contacted even after 3 consecutive visits.

Sample size
According to the study of Prashant K and Shaw C on "Nutrition Status of Adolescent Girls from an Urban Slum Area in South India"; the prevalence of malnutrition was 20.6%.[13]
Desired sample size (N) was obtained by formula-
N=4PQ/l^2 where P is prevalence of positive factor (20.6%), Q =100-P, l is allowable error (20% of P)
= 4 x 20.6 x 79.4/ $(4.12)2$
=385.53 = 386 approximately. So, a total of 400 study subjects were taken.

Sampling procedure
Systematic random sampling technique was used to enroll the study subjects.

Study tools
The preparatory phase was completed and necessary approval was obtained from the college authorities. Survey records of UHTC area were verified and a total number of adolescent girls were estimated and list was prepared. Predesigned, pre-tested, semi-structured questionnaire regarding socio-demographic variables, Dietary intake assessment by 24 hour recall method and Anthropometric Measurements.

Data analysis
Data was entered in Microsoft Excel 2010 spread sheet, and subsequently it was analyzed using SPSS (trial version 20) and Open Epi software. Descriptive statistics (mean, standard deviation and percentages) wherever necessary were employed. The various factors and their association with nutritional status were studied using Chi square test and Odds Ratio estimation as applicable. In case if expected value was less than 5 in more than 20% of cells in a table, Fisher's Exact test was used. P value of <0.05 was considered statistically significant and <0.001 as highly significant.

Results
Out of total 400 girls, 77.8% consumed Calories less than RDA and 22.2% consumed more than RDA. Mean calorie intake was found to be 1892.5 ± 425.4 Kcal.

Among the girls consuming diet less than RDA, 32.8% had thinness and 1% were overweight. In girls consuming diet more than RDA, 1.1% had thinness and 21.3% were overweight. This difference was statistically significant (p= < 0.001). Table 1

Table 1: Distribution of study subjects by dietary intake and BMI

BMI	Normal		Thinness		Overweight		Total	
Calorie intake	No.	%	No.	%	No.	%	No.	%
Less than RDA	206	66.2	102	32.8	3	1.0	311	77.8
More than RDA	69	77.5	1	1.1	19	21.3	89	22.2
Total	275	68.8	103	25.8	22	5.5	400	100.0
χ^2 value = 80.518, df=2, p=< 0.001								

Among the total 261 mid day meal beneficiaries, majority, 250(95.7%) consumed mid day meal and only 11(4.3%) did not consume mid day meal. Overall prevalence of thinness was 70(26.8%) The prevalence of thinness was marginally higher in 3(27.3%) in girls who did not consume mid day meal than in 67(26.8%) girls who consumed mid day meal. The prevalence of Overweight was 11(6.1%) and all of them were consuming mid day meal. Table 2

Table 2: Distribution of study subjects by mid day meal consumption and BMI

Mid Day Meal consumption	Normal		Thinness		Overweight*		Total	
	No.	%	No.	%	No.	%	No.	%
No	8	72.7	3	27.3	0	0.0	11	4.3
Yes	167	66.8	67	26.8	16	6.4	250	95.7
Total	175	67.1	70	26.8	16	6.1	261	100
Fischer exact, df=1, p=>0.99					Fischer exact, df=1, p= 0.966			

*0 was taken as 0.1 during analysis.

The prevalence of thinness was more in Hindu girls (28.2%) as compared to (21.9%) girls of Muslim and Christian religion. Study Subjects of Hindu religion have 1.393 times more chances of being thin as compared to Muslim and Christian girls [OR: 1.393;95%CI:0.8679,2.26; p=0.2377]. However, this difference is not statistically significant. There is no much

difference observed with prevalence of overweight among Hindu (5.3%), Muslim and Christian girls (5.8%) [OR: 0.986; 95%CI: 0.408, 2.401; p=0.986]. No association is found between religion and overweight. (Table 3)

Table 3: Association between Religion and BMI in Study Subjects.

Religion	Normal BMI		Thinness		Overweight		Total	
	No.	%	No.	%	No.	%	No.	%
Hindu	163	66.5	69	28.2	13	5.3	245	61.2
Muslim & Christian	112	72.3	34	21.9	9	5.8	155	38.8
Total	275	68.8	103	25.8	22	5.5	400	100
	χ^2=1.883, df=1, p=0.1702				χ^2=0.00027, df=1, p=0.986			
	[OR: 1.393;95%CI:0.8679,2.26]				[OR: 0.986;95%CI:0.408,2.401]			

In the present study, literacy rate of fathers was 78.2% (279). The Prevalence of thinness in study subjects was more with illiterate fathers (28.2%) as compared to literate fathers (25.1%). This difference was not statistically significant (p=0.7755). In the present study, literacy rate of mothers was 67.5% (264). The Prevalence of thinness was more in girls whose mothers were illiterate (52, 40.9%) as compared to girls who had literate mothers (18.6%). Girls whose mothers were illiterate are 2.855times at risk for thinness as compared to girls whose mothers were literates [OR: 2.855 (95%CI: 1.777, 4.602)]. This difference was significant statistically (p<0.0001).

The Prevalence of overweight was 16.8% in girls whose mothers were literates as compared to 1.6% girls who had illiterate mother. This difference was statistically significant (p=0.1422) (Table 4)

Table 4: Association between Mothers literacy* and BMI in study subjects

Mothers literacy	Normal		Thinness		Overweight		Total	
	No.	%	No.	%	No.	%	No.	%
Illiterate	73	57.5	52	40.9	2	1.6	127	32.5
Primary/middle	120	80.0	21	14	9	6	150	38.4
High school	57	67.1	23	27.1	5	5.8	85	21.7
PUC/Diploma	14	73.7	5	26.3	0	0.0	19	4.9
Graduate	4	50.0	0	0.0	4	50.0	8	2.0
Postgraduate	2	100	0	0.0	0	0.0	2	0.5
Total	270	69.1	101	25.83	20	5.1	391	100
	χ^2= 19.67, df=1, p<0.0001				Fischer exact, df=1, p=0.1422			
	OR: 2.855 [95%CI: 1.777, 4.602]				OR: 0.3008 [95%CI: 0.04613, 1.159]			

*[Analysis has been done between illiterates and literates]

The prevalence of thinness was 34.7% in girls who belonged to Joint family followed by 25.5% in girls who belonged to broken family and almost similar among girls who belonged to 3-geneartion (23.9%) and nuclear (23.4%) families. This difference was not statistically significant (p=0.3621).

Prevalence of overweight was 6.4% in girls who belonged to nuclear families and 6.4% in girls who belonged to broken families followed by 4.3% in girls of 3-generation families and 2.8% girls' belonged to joint families. No statistically significant association was found (p=0.4498). (Table 5)

Table 5: Association between type of family and BMI in study subjects

Type of Family	Normal		Thinness		Overweight		Total	
	No.	%	No	%	No.	%	No	%
Nuclear	165	70.2	55	23.4	15	6.4	235	58.8
Joint	45	62.5	25	34.7	2	2.8	72	18.0
Three-generation	33	71.7	11	23.9	2	4.3	46	11.4
Broken	32	68.1	12	25.5	3	6.4	47	11.8
Total	275	68.8	103	25.8	22	5.5	400	100.0
	χ^2=3.204, df=3, p=0.3621				χ^2=0.5712, df=1, p=0.4498			

Discussion

In the present study, 77.8% girls consumed calories less than RDA and 22.3% consumed more than RDA. Among the girls consuming diet less than RDA, 32.8% had thinness and 1% were overweight as compared to those consuming diet more than RDA (1.1% thin and 21.3% overweight). This difference was highly statistically significant (p= <0.001). This shows that dietary intake is less among our

study population which has led to higher prevalence of thinness.

Similarly, in a study done in urban areas of Jhansi, Uttar Pradesh, more than 50% of the participants had calorie consumption less than 80% of the RDA.[14] A study done in rural area of Belgaum, Karnataka found that majority of girls were having dietary intake less than 50% of Recommended Dietary Allowance.[15] A study in an urban slum of Dhaka in Bangladesh found that only 53% energy was covered of the recommended daily energy intake for urban adolescent girls.[16] A study done in North India revealed that 49.3% were found to have energy intake less than 75% of RDA.[17]

Majority of the study subjects consumed mid day meal (95.7%). The prevalence of thinness was marginally higher in subjects who did not consume mid day meal (27.3%) than in those who consumed mid day meal (26.8%).

In a study done in Rural and Urban areas of Bangalore[18] among mid day meal beneficiaries, it was found that the prevalence of undernutrition was 13.8% and in a study done in Mangalore[19] it was observed that prevalence of thinness among female students was 15.8%. These studies showed less prevalence than the present study.

In contrast to our findings, in a study done in Hyderabad, India among Mid day meal beneficiaries, it was found that 76.1% adolescents were malnourished.[20] These findings reflect that mid day meal is contributing in improving nutritional status in Karnataka.

The prevalence of thinness was more in girls who belonged to Hindu religion (28.2%) as compared to Muslim and Christian religion (21.9%). This difference was not significant statistically. Similar finding was seen in a study done in rural area of a district in Varanasi; Hindu girls were more vulnerable to under nutrition (27.7%) in comparison to Muslim girls (14.8%). Significant association with religion was found (p=0.04)[21] This could be due to the cultural practices, predominant type of diet among the religion. Majority of Hindus consume vegetarian diet.

In the present study, prevalence of thinness (28.2%) was more in girls whose father's were illiterate. There was no statistically significant association found between prevalence of thinness (p=0.7755) and literacy status of father.

Similar finding was found in a study done in Dibrugarh, Assam where the prevalence of thinness (31.39%) was high among girls whose father's were illiterate. No significant association was found between prevalence of thinness (p=0.1481) and literacy status of father.[22] Also, a study done in Raipur, Chhattisgarh showed no significant association between Fathers education and BMI of adolescent girls.[23]

In contrast to our study, a study done in Muzaffar nagar, Uttar Pradesh found strong association between the nutritional status of adolescent girls and education of father. The prevalence of under nutrition was maximum (100%) in adolescent girls whose fathers were illiterate (p<0.05).[24]

In the present study, prevalence of thinness was more in girls whose mothers were illiterate (40.9%) as compared to girls whose mothers were literate (18.6%). This difference was highly statistically significant (p<0.0001). This shows that mothers' education has significant influence on dietary intake and practices of adolescent girls.

Similar findings were found in a study done in Muz affarnagar, Uttar Pradesh where under nutrition was maximum (50%) in adolescent girls whose mothers were illiterate and strong association was found between the nutritional status of adolescent girls and education of mother.[24] Also, it was found that the prevalence of thinness (44.26%) was much higher among girls whose mother's were illiterate in a study done in Dibrugarh, Assam and this was statistically significant (p<.001)[22] In a study done in Adwa town, North Ethiopia it was found that Adolescent girls whose mothers did not have formal education were 2.34 times more likely to be thin as compared to those whose mothers have completed college and higher education.[25]

In contrast to findings of the present study, a study done in urban slums of Visakhapatnam City, Andhra Pradesh found that 26% adolescent girls were malnourished whose mothers were illiterate and 11% in those whose mothers were literate and this was not found statistically significant.[26]

In the present study, prevalence of thinness was more in girls who belonged to joint family (34.7%) followed by girls who belonged to broken family (25.5%) This difference was not significant statistically (p=0.3621). Similarly, a study done in Raipur, Chattisgarh showed no significant association between type of family and BMI.[23] In contrast, a study done in urban area of Jhansi, Uttar Pradesh found that a significant percentage of adolescents from nuclear families belonged to the normal weight category than in joint/extended families (P < 0.001).[14]

Conclusion

It was concluded that the prevalence of thinness was significantly high in girls whose mothers were illiterates. Illiterate mothers may not be able to give proper nutritious food to their daughters due to lack of knowledge and traditional practices. Thinness was also seen in girls from large families where per-capita nutrient intake is likely to be compromised. Dietary intake less than RDA and frequent missing of meals significantly contributed to thinness among these girls.

Ethical Approval

Permission for the study was obtained from the College authorities prior to commencement (Ref. No. File No: SNMC/IECHSR/2014-15/A-10c-1.1)

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