Original research article

Cross-sectional study to assess the prevalence of thinness and associated risk factors among school going adolescents

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Abstract

Aim: The Prevalence of Thinness and Associated Risk Factors among School Going Adolescents.

Materials and methods: This was a cross-sectional study conducted in the Department of Home Science, Purnea University, Purnea, Bihar, India, for 1 year. The study was conducted in 3 secondary school in Purnea, Bihar. This study was conducted among adolescents aged between 12 and 18 years attending secondary school in Purnea, Bihar. A simple random sampling technique was used to pick the five schools and a Systematic sampling was used to obtain the number of children from each school. A sampling frame derived from a list of pupils aged between 12-18 years in the randomly selected schools was then used.

Results: A total of 100 adolescent girls were included in the study with a response rate of 100%. The mean age of respondents was 16.17 (±2.77 standard deviation) years. Nearly one-quarter (25%) of respondents was found to be in the first quintile range of wealth index. Majority 90(90%) of the respondents were followers of Hindu, followed by Muslims (8%). 65(65%) of the respondents were urban dwellers. Regarding parents of the study participants 30 (30%) of mothers and 36 (36%) of fathers were educated at least at a primary school level. By occupation majority 72(72%) of mothers and 40(40%) of fathers were housewives and farmers, respectively. From the respondents, 55(55%) and 55(55%) were involved in moderate to vigorous work and moderate intensity sport activities for ≥10 min continuously per day, respectively. Regarding to eating habit of the respondents, 22(22%), 20 (20%), and 65 (65%) of them ate fruits, vegetables, and snack, respectively, at least once/day. In general, only 5(5%) of the respondents consumed at least three meals/day. 88 (88%) of the respondents had used adequate diet diversity and the rest had used inadequate diet diversity. Of the respondents, 45(45%) had begun their first menstruation in the age range of 14–16 years of age and 5 (5%) had begun their first menstruation above 16 years of age. **Conclusion** Thinness was found to be a serious problem in the study area. Strategies are needed to improve the nutritional status of adolescent girls before they reach conception to break the vicious cycle of intergenerational malnutrition.

Keywords: Adolescent, anthropometry, growth, thinness.

Introduction

Thinness among children and adolescents can be described clinically as the low body mass index (BMI)-for-age.[1] In 2016, 192 million children worldwide were moderate and severe thin, while, in the same year, 124 million children worldwide were obese.[2] Thinness has a considerable impact on the health, development and well-being of children and adolescents which can also extend into adulthood.[1] Specifically, thinness is associated with stunting, menstrual irregularity, delayed maturation, nutritional deficiencies, and reduced cognitive capacity.[3,4] In addition, it is connected to frailty in muscular strength and work capacity, and

lessens bone density into later life.[1] The problem of thinness concerns countries with different levels of socioeconomic status and is attributed to medical, social, and economic issues.[5] Especially in European countries, thinness is more prevalent among young females, potentially due to their desire to attain a dreamlike beauty of thinness displayed by fashion industry.[6,7] Moderate or/and severe thinness could be a sign of malnutrition attributed to unhealthy eating behaviors. The factors that make susceptible a child/adolescent to under nutrition or malnutrition are complicated.[8] Thinness could be an indicator of malnutrition even though thin children and adolescents are not inevitably undernourished.[9] Adolescence is a period of rapid growth and development by which up to 45% of skeletal growth takes place and 15 to 25% of adult height is achieved.[10] In addition to the increased nutritional requirements during adolescence period, poor dietary diversity and dietary inadequacies are more likely threats among adolescents due to their erratic eating pattern and having specific psychosocial factors.[11] Malnutrition passes from generation to generation, because adolescent girls that enter pregnancy with poor nutrient store are more likely to give birth to low birth weight or intrauterine growth restricted baby that is more vulnerable to metabolic disorders later in life.[12] So, adolescence period is a unique opportunity to break a range of vicious cycles of structural problems that are passed from one generation to the next, such as poverty, gender discrimination, violence, poor health, and nutrition.[11]

Materials and methods

This was a cross-sectional study conducted in the Department of Home Science, Purnea University, Purnea, Bihar, India, for 1 year.

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Data were collected using semi-structured and pretested questionnaire adopted (except some variables) from the Food and agriculture organization Guidelines for measuring household and individual dietary diversity, 2011[13] and WHO steps instrument for chronic disease risk surveillance[14] with certain adjustment. Interviewer-administered questionnaire was used to collect data from adolescent girl students. Weight was measured to the nearest 0.1 kg using calibrated digital weight scales (prestige, New Delhi, India) in a standing position with light cloths and barefoot. Height was measured to the nearest 0.1 cm using height measuring stadiometer (prestige, New Delhi, India) in standing position. The scales were carefully handled and periodically calibrated by placing standard calibration weight of a 2 kg iron bar on the scale before use to ascertain accuracy. To avoid data variability among data collectors, specifically trained data collectors was used for anthropometric measurements.

Validity was maintained by using standardized questionnaire that was properly developed from review of published articles and WHO Stepwise approach for surveillance of non communicable diseases in developing countries, proper training of the measures on data collection procedures, proper categorization and coding of the questionnaires and 10% of the completed questionnaire was reviewed and checked for completeness and relevance every day by principal investigator. Reliability of the questionnaire was checked by pretesting of the tool on 5% the study subjects from institutes other than selected and measuring of height and weight were taken twice, and an average of the two reading was recorded.

Operational definition

Adolescence is the age group from 10 to 19 years.[15] Thinness - is defined as BMI for age below<−2 Z-score of the 2007 WHO standard reference values.[16] Individual dietary diversity score: is acceptable indicator for adequate intake of micronutrients in developing countries. The classification was based on the mean distribution of scores. i.e., adequate ≥6 and inadequate <6

The wealth quintile: is an index of the economic status of households. Parents of respondents were ranked into four wealth quintiles. First quintiles = lowest, second quintiles = low, third quintiles = middle, and fourth quintiles = highest.

The dependent variables was prevalence of thinness (yes/no) while the independent variables were sociodemographic variables (age, religion, residence, wealth index, educational status of father, occupational status of father, educational status of mother, occupational status of mother), Individual variables (physical activity, age of menarche, eating habit, diet diversity, history of illness, alcohol use), environmental variables (source of drinking water, availability of home gardening and availability of latrine facilities).

Results

A total of 100 adolescent girls were included in the study with a response rate of 100%. The mean age of respondents was 16.17 (±2.77 standard deviation) years. Nearly one-quarter (25%) of respondents was found to be in the first quintile range of wealth index. Majority 90(90%) of the respondents were followers of hindu, followed by Muslims (8%). 65(65%) of the respondents were urban dwellers. Regarding parents of the study participants 30 (30%) of mothers and 36 (36%) of fathers were educated at least at a primary school level. By occupation majority 72(72%) of mothers and 40(40%) of fathers were housewives and farmers, respectively [Table 1].

From the respondents, 55(55%) and 55(55%) were involved in moderate to vigorous work and moderate intensity sport activities for ≥10 min continuously per day, respectively. Regarding to eating habit of the respondents, 22(22%), 20 (20%), and 65 (65%) of them ate fruits, vegetables, and snack, respectively, at least once/day. In general, only 5(5%) of the respondents consumed at least three meals/day. 88 (88%) of the respondents had used adequate diet diversity and the rest had used inadequate diet diversity. Of the respondents, 45(45%) had begun their first menstruation in the age range of 14–16 years of age and 5 (5%) had begun their first menstruation above 16 years of age [Table 2].

Nearly half of the respondents 52(52%) reported that home gardening was available in their home. Seven hundred and seventeen 88(88%) of the respondents reported that they had home latrine, and majority 93 (93%) of the respondents indicated that they had used a relatively safe drinking water [Table 3].

The overall prevalence of thinness among adolescent girl students in was 13.5% CI (9.21–13.78).

In the bivariate logistic regression analysis, thinness was significantly associated with age of the respondent, educational status of father, fruits eaten in the past 24 h, vegetables eaten in the past 24 h, drinking water treatment and age of menarche.

In the multivariate analysis, the age of the respondent, educational status of mother, menstruation status, women dietary diversity, and wealth index were significantly and independently associated with thinness.

Early adolescent girls were 2.8 times more likely to become thin as compared to late adolescent girls (adjusted odds ratio [AOR] = 2.8, 95% CI: 1.5–5.3). Adolescent girl students whose mothers had not been taken formal education were 5.5 times more likely to be thin as compared to those whose mothers are completed college and above education (AOR = 5.5, 95% CI: 3.4–6.5). Adolescent girl students who began menstruation were 50% less likely to be thin than those who did not begin menstruation (AOR = 0.6, 95% CI: 0.4,

0.9). Adolescent girls who used inadequate diet diversify were 4.0 times more likely to be thin as compared to those who used adequate diet diversify inthe past 24 h preceding the survey (AOR = 4.0, 95%CI: 2.4,7.0). Adolescent girls from a family with first wealth quintile were 3.9 times more likely to become thinas compared to those adolescent girls from a family with fourth wealth quintile (AOR = 3.9, 95% CI: 1.6, 5.6). Similarly, adolescent girls from a family with secondwealth quintile were 1.8 times more likely to be thinas compared to those adolescent girls from family with fourth wealth quintile (AOR = 1.8, 95% CI: 1.3–2.9) [Table 4].

Table 1: Sociodemographic characteristics of adolescent

Parameter	Number	Percentage
Age of adolescent		
Early	24	24
Middle	23	23
Late	53	53
Residence		
Urban	65	65
Rural	35	35
Religion		
Hindu	90	90
Muslim	8	8
Other	2	2
Educational status of father		
No formal education	30	30
Primary	36	36
Secondary	14	14
College and above	20	20
Occupational status of father		
Farmer	40	40
Merchant	30	30
Daily labourer	10	10
Government employee	20	20
Educational status of mother		
No formal education	45	45
Primary	30	30
Secondary	13	13
College and above	12	12
Occupational status of mother Housewife	72	72
Daily labourer	7	7
Government employee	13	13
Merchant	8	8
Wealth quintile 1st quintile	25	25
2nd quintile	26	26
3rd quintile	24	24
4th quintile	25	25

Table 2: Individual characteristics of adolescent girls

Characteristics	Number	Percentage

Physical activity		
Moderate to vigorous work beside education		
Yes	55	55
No	45	45
Vigorous intensity sports ≥10 min continuously		
Yes	46	46
No	54	54
Moderate intensity sport ≥10 min continuously		
Yes	55	55
No	45	45
Eating habit (Frequency Fruit eaten in the past 24 hr)		
One time	22	22
Two times	20	20
Three times	10	10
Frequency of vegetables eaten in past 24 h		
One time	20	20
Two times	15	15
Three times	10	10
Frequency of snack eaten in past 24 h		
One time	65	65
Two times	20	20
Three times	5	5
Frequency of meal eaten in past 24 h		
One time	45	45
Two times	50	50
Three times	5	5
Dietary diversity		
Inadequate	12	12
Adequate	88	88
Alcohol use		
Yes	10	10
No	90	90
History of illness		
Yes	5	5
No	95	95
Age of first menarche		
<14	10	10
14-16	45	45
>16	5	5

Table 3: Environmental characteristics of adolescent

Availability of home gardening	Number	Percentage
Yes	52	52
No	48	48
Availability of home latrine		
Yes	88	88
No	12	12
Source of drinking water		
Safe*	93	93
Unsafe**	7	7

Table 4: Logistic regression analysis of factors associated with thinness among adolescent

Characteristics		BMI for age	COR (95% CI)	AOR (95% CI)
	Thin	Not thin		
Age of adolescent				
Early	18	6	4.8 (2.9-7.7)	2.8 (1.5-5.3)*
Middle	15	8	2.2 (1.2-3.7)	1.8 (0.9-3.1)
Late	20	33	1	1
Occupational status of father				
Farmer	23	27	1	
Merchant	17	13	1.83 (1.08-3.05)	
Daily laborer	4	6	1.12 (0.44-2.77)	
Government employee	12	8	1.74 (1.03-2.91)	
Educational status of mother				
No formal education	25	20	5.46 (1.67-17.85)	5.5 (3.4-6.5)*
Primary	14	16	3.63 (1.08-12.17)	4.4 (1.1-9.5)*
Secondary	6	7	2.47 (0.66-9.20)	2.3 (0.5-3.7)
College and above	4	8	1	1
Fruits eaten in 24 h				
Yes	15	37	0.51 (0.32-0.76)	
No	30	18	1	
Vegetables eaten in 24 h				
Yes	15	30	0.61 (0.40-0.92)	
No	30	25	1	
Drinking water treatment				
Yes	15	20	0.51 (0.33-0.77)	
No	35	30	1	
Menstruation status				
Yes	12	18	0.29 (0.18-0.44)	0.6 (0.4-0.9)*
No	50	20	1	1
Age of first menarche				
<14	4	6	1.08 (0.39-2.89)	
14-16	15	30	1.42 (0.32-6.24)	
>16	2	3	3.81 (1.48-9.74)	
Do not start	30	10	1	
Individual dietary diversity				
Inadequate	8	4	3.90 (2.44-6.20)	4.0 (2.4-7.0)*
Adequate	28	60	1	1
Wealth index				
1st quintile	18	7	6.04 (2.78-13.10)	3.9 (1.6-5.6)*
2nd quintile	15	11	4.98 (2.25-10.98)	1.9 (1.3-2.9.)*
3rd quintile	7	17	1.47 (0.57-3.72)	1.6 (0.6-3.7)
4th quintile	10	15	1	1

*$P<0.05$. BMI: Body mass index, AOR: Adjusted odds ratio, COR: Crude odds ratio, CI: Confidence interval

Discussion

In India, many studies have been conducted to identify the extent and consequence of under nutrition in different population groups. However, the issues of undernutrition particularly of thinness were neglected among adolescent girls. Thus, this study was able to disclose the prevalence and associated factors of thinness and stunting among school adolescent girl students in Bihar.

The prevalence of thinness in this study was 13.5%. This finding is nearly the same to a cross-sectional study conducted in Haryana, India (13.73%).[17] Moreover, the national level survey conducted on adolescent girls which reported the prevalence of 14%.[18] This similarity might be because the study populations in both study areas were students who involved in lesser activities which require less energy expenditure. However, this prevalence is lower than the finding of the previous study done in Bangladesh (26%).[19] This discrepancy might be due to set up the difference. This study was carried out in an urban area while the other study was conducted in the rural community.

Moreover, this prevalence was also lower than the previous study done in Kenya (15.6%) and Tigray region, Northern Ethiopia (58.3%).[20,21] This difference might be due to the time gap. These studies were conducted 16 years back in Kenya and 9 years back in Tigray, Northern Ethiopia.

As can be noted from findings of multivariate analysis of logistic regression, the likely hood of being thin was found to be significant among early adolescent and middle adolescent compared to late adolescent girls. Similar significant association between the adolescence age and thinness was indicated in the findings of other previous studies done in India.[21] This could be because of the early growth spurt seen in girls with a sudden increase in height in early age group.

Adolescent girl students whose mothers had not been taken formal education were 5.4 times more likely to be thin as compared to those whose mothers are completed college and above education. This finding is supported by a previous study done in Bangladesh.[19] This is because if the level of education of the mother is low, her finances and her contribution to the total family income will be low. This places the family at a lower social class and poor nutritional status as well.

Adolescent girls who began menstruation early were 50% less likely to be thin than their counterpart. This finding is in line with the finding of other previous study done in Kenya.[21].[21] This might be because early commencement in menstruation status is an indicator of good nutritional status.

Adolescent girls who used inadequate diet diversity were 4.0 times more likely to be thin as compared to their counterpart in the past 24 h. This might be explained by the fact that intake of diverse diet increases the likelihood of meeting the nutrient requirements of adolescent girls. Adolescent girls from a family with first wealth quintile were 3.9 times more likely to become thin as compared to those adolescent girls from a family with fourth wealth quintile. This finding contradicts the finding found in a study done in Bangladesh.[19,22] This might be because the higher household asset quintile reflects the higher economic status of the household, indicating the better long-term economic status of the household and hence, better nutritional status.

Conclusion

Thinness was found to be a serious problem in the study area according to the WHO cut-off values for public health significance. Age of the respondent, educational status of the mother, individual dietary diversity, wealth quintile, and menstruation status were significantly associated with the thinness of the respondent. Therefore, to overcome the problem: Parents should develop the habit of serving well-diversified foods to their adolescents, school teachers, and health workers should teach adolescent girls to eat healthy and well-diversified

foods. The health-care administrator should design strategies and programs addressing the nutritional status of adolescent girls.

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