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Research Article

Comparison of Nutritional Status of Adolescent Girls in Nutrition Intervention and Non- Intervention Area

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Abstract

Background: Adolescence is growing period when requirements for all nutrients increase. Hence, it is essential to improve nutritional status through nutrition interventions. Addressing the nutritional needs of adolescents could be an important step towards breaking the vicious cycle of intergenerational malnutrition.
Objective: To assess and compare nutritional status of adolescent school girls in nutritional intervention and non-intervention area.
Methods: A cross-sectional analytic study was conducted at Laxmipur sadar upazila as nutrition intervention area & neighboring Chatkhil upazila as non–nutrition intervention area. A total of 367 adolescent girls of age 10-19 years were selected purposively of them 177 and 190 were selected from intervention and non-intervention area respectively. Anthropometric data of the study subjects were collected by using standard techniques. Body mass index (BMI) and anemia were classified according to WHO cut off levels. Food intake pattern was observed by using seven days food frequency questionnaire (FFQ).
Results: The mean age(±SD) years of adolescent girls was 14.29±0.97 (yrs) in intervention and 14.55±1.23 (yrs) in non-intervention area. .Among the adolescents, the proportion of under nutrition was significantly higher in the non-intervention area compare to intervention area (64% vs 47.5%, $p<0.001$). In the intervention area about 46% girls had normal BMI where as in the non-intervention area only 27% girls had normal BMI. The percentage of overweight was similar in both the areas. Anemia was significantly higher in non-intervention area ($p<0.001$). Highly significant association was found between father education and mother occupation with BMI ($p=0.047$) and ($p=0.001$) in intervention area. Strong significant association was found between education and occupation of mother with BMI ($p=0.001$) in non-intervention area.
Conclusion: This study concludes that nutritional status was better in nutrition intervention area than non-intervention area so community-based nutrition intervention is effective for better nutritional status of adolescent girls.

Key words: nutritional status; adolescent girls; nutrition intervention area; non-intervention area

Introduction

Adolescence is a significant period of human growth and maturation, unique changes occur during this period and many adult patterns are established [1]. World Health organization (WHO) considers adolescence to take place between the ages ten to nineteen [2]. There are 28 million adolescents in Bangladesh, 13.7 million of them are girls [3]. In spite of impressive gain in the field of health and nutrition, significant proportions of young people in developing countries are under-nourished. The effect of earlier insult is visible in the adolescent age particularly in girls. Often health and nutritional status of adolescent girls are direct reflection of the cumulative effects of physical growth, the onset of menarche and increase in fat and muscle mass which place extra nutrition requirements on them [4]. Adolescent is the time helps to prepare for the nutritional demands of pregnancy, lactation, and heavy workloads that girls will soon experience, if they have not already. Adolescence is a time of accelerated growth in stature, after which final height is achieved. Prevailing malnutrition, anemia & stunting have adverse impact on MMR, IMR, and morbidity and have inter-generation effects. Poor nutritional status during adolescent is an important determinant of health outcomes at a later stage of life. The vicious cycle of malnutrition, if not broken, will goes on resulting in more and more severe consequences. Adolescence offers the last opportunity to intervene and recover growth faltered in childhood and also support growth spurt and skeletal development to break the vicious cycle of inter-generational under nutrition. So adolescent's girls need special care in view of their role in shaping the health and wellbeing of the present as well as future generation. The effects of intervention during

adolescence on the potential for growth in height, tend to achieve menarche at an earlier age than girls with poor nutritional status and aimed at increasing final stature will also cause an increase in weight, partially fat stores. It is very much true that the growth and prosperity of a nation depends heavily on the status and development of adolescent girls as they not only constitute one tenth of its population but also influence the growth of the remaining population. This type of study has not yet been done in this particular area previously however this study helps to find out the impact of the intervention either it was effectiveness for the improvement of the health and nutritional status of adolescent girl's or not. This study also assists to come out the changes in adolescent nutrition in NNP area following interventions .It is necessary for planner to understand the different situation and will be helpful in the formation of effective development programme for the nutritional up-liftment of these groups.

Methods

A cross-sectional analytic study was conducted among adolescent girls in intervention & non- intervention area. This study was conducted at Laxmipur sadar upazila as nutrition intervention area & neighboring Chatkhil upazila as non–nutrition intervention area. This area was conveniently selected for data collection. The study period was of one year duration from March 2012 to March 2013. Study population was 367 adolescent girls age of 13 to 19 years of interview in selected intervention & non-intervention area. Purposive sampling technique was used during data collection. Sample were selected conveniently and included for the study according to the fulfillment of the inclusion criteria. Data were collected by face to face interview technique using a semi-structured questionnaire. Weight was recorded by weight measuring scale to the nearest 0.1kg and height was measured by standing height, using appropriate scales to the nearest 0.5cm. Hemoglobin measurement, blood was drawn by finger prick with lancer after sterilization of the site with 70.0% alcohol. The hemoglobin test was done by using Sahli haemometer. After collection, data were checked thoroughly for consistency and completeness. Data were checked after collection of data to exclude any error or inconsistency. Collected data were analyzed by using appropriate statistical technique. Statistical tests were considered significant at p-values =5% (0.05). Frequencies were calculated for descriptive analysis. Chi-squared tests were performed on categorical data to find the relationships between variables. Multivariate logistic regression was performed to identify the predictors of nutritional status. All statistical analysis was performed with the software SPSS 20.0 for windows.

Results

Comparison of socio-demographic characteristics of the study subjects (Table 1)

Table shows that the age (years) m±sd of study subjects were 14.29±0.973 (intervention) and 14.55±1.232 (non-intervention). Table shows that majority of the mothers of study subjects received primary education in intervention and secondary-higher secondary in non-intervention area such as 45.2% and 83.2% as well as majority of them were house wife in both area like 93.8% and 98.4%. Table shows that the majority of the fathers of study subjects received primary education in intervention and secondary-higher secondary in non-intervention area such as 42.4% and 58.4% as well as the occupation of the majority of father were business (25.4%) in intervention area and non-intervention area, the majority was job in abroad (30.5%). Significant difference was found with education ($p<0.001$) and occupation ($p<0.001$) of father and mother between intervention and non-intervention areas. Significant difference was found with education ($p<0.001$) of mother between intervention and non-intervention area. Maximum study subjects in both areas were Muslim. Majority of the type of family of study subjects were nuclear in intervention and non- intervention area such as 88.7% and 78.4%.

Characteristics	**Intervention area** (n=175)	**Non-intervention area** (n=190) (n=175)	**p value**
	n(%)	n (%)	
Age (year) M±SD	14.29 ±0.973	14.55 ±1.232	
Age of adolescent girls			
13-<14yrs	104(58.8)	104(54.7)	0.270
14-<15yrs	52(29.4)	52(27.4)	
≥15yrs	21(11.9)	34(17.9)	
Education of father			
Illiterate	30(16.9)	2(1.1)	
Primary	75(42.4)	17(8.9)	
Secondary-higher secondary	49(27.7)	111(58.4)	0.001
Graduation	21(11.9)	50(26.3)	
Post-graduation	2(1.1)	10(5.3)	
Education of mother			
Illiterate	23(13.0)	6(3.2)	
Primary	80(45.2)	14(7.4)	0.001
Secondary-higher secondary	65(36.7)	158(83.2)	
Graduation	9(5.1)	11(5.8)	
Post-graduation	0(0.0)	1(0.5)	
Occupation of father			
Day labor	41(23.20	5(2.6)	
Agriculture	20(11.3)	3(1.6)	
Business	45(25.4)	55(28.9)	0.001

Service	28(15.8)	38(20.0)	
Job abroad	27(15.3)	58(30.5)	
Others	16(9.0)	31(16.3)	
Occupation of mother			
Housewife	166(93.8)	187(98.4)	
Agriculture	3(1.7)	0(0.0)	
Service	7(4.0)	2(1.1)	0.073
Job abroad	1(0.6)	0(0.0)	
Others	0(0.0)	1(0.5)	
Religion			
Muslim	159(89.8)	177(93.2)	0.361
Hindu	17(9.6)	13(6.8)	
Buddhist	1(0.6)	0(0.0)	
Type of family			
Nuclear	157(88.7)	149(78.4)	
Joint	19(10.7)	38(20.0)	0.018
Extended	0(0.0)	3(1.6)	
Others	1(0.6)	0(0.0)	

Table 1: Comparison of socio-demographic characteristics of the study subjects (n=367)
Results were expressed as number (%); χ^2test was performed and p<0.05 was level of significance.

Comparison of nutritional status of the study population (Table-2)

This table revealed that BMI according to proposed for the Asian people, BMI was found 46.3% normal, 47.5% underweight and 6.2% were increased risk but no girls were in high risk group in intervention area and 27.4% were normal, 64.7% were under weight and 6.3% were increased risk but 1.6% were in high risk. According to the western cutoff value (WHO), BMI status was found 51.4% normal, 47.5% underweight and 1.1% overweight but no girls were found in obese in intervention area and 32.1% were normal, 64.7% were under weight and 2.6% were overweight but 0.5% was obese in non-intervention area. The table reveals that Hemoglobin status was found 72.3% were normal, 20.3% mild anemia and 7.3% were moderate anemia in intervention area and 51.6% were normal, 43.7% were mild anemia and 4.7% were moderate anemia in non-intervention area. Significant difference was found Both BMI and hemoglobin status among intervention and Non- intervention area (p<0.001).

Characteristics	Intervention area (n=175)	Non-intervention area (n=175)	*p value*
	n (%)	n (%)	
BMI (For Asian people)			
Underweight	84(47.5)	123(64.7)	0.001
normal	82(46.3)	52(27.4)	
Increased risk	11(6.2)	12(6.3)	
High risk	0(0.0)	3(1.6)	
BMI (For western people)			
Underweight	84(47.5)	123(64.7)	0.002
normal	91(51.4)	61(32.1)	
Overweight	2(1.1)	5(2.6)	
Obese	0(0.0)	1(0.5)	
Hemoglobin level			
Normal	128(72.3)	98(51.6)	0.001
Mild anemia	36(20.3)	83(43.7)	
Moderate anemia	13(7.3)	9(4.7)	

Table 2: Comparison of nutritional status of the study population (n=367).
Results were expressed as number (%);χ^2test was performed and p<0.05 was level of significance.

Comparing socio-demographic and nutritional status between intervention and non-intervention area of the study respondents (Table 3)

According to m±sd of age was found 14.29±0.97 and 14.55±1.23 where P< 0.004 in intervention and non-intervention area. Income was 19960.45±15642.07 and 26521.05±26128.03 where P< 0.053 in

intervention and non-intervention area. Weight was 41.86±6.22 and 42.33±7.67 where p<0.001 in intervention and non-intervention area. It was indicated that positive significance association was found. The table shows that m±sd of height was 152.0±5.35 and 152.01±5.55 where p<0.980 in intervention and non-intervention area. It was indicated that negative significance association was found. The table reveals that m±sd of Hemoglobin was 11.65±0.85 and 11.49±0.63 where p<0.001 in intervention and non-intervention area. It was indicated that positive significance association was found. According to table m±sd of BMI was 19.13±3.18 and 18.23±2.88 where p<0.005 in intervention and non-intervention area.

Variables	Intervention(n=177)	Non-intervention(n=190)	p
	M±SD	M±SD	
Age	14.29±0.97	14.55±1.23	0.004
Income	19960.45±15642.07	26521.05±26128.03	0.053
Expenditure	17585.31±31064.14	16757.89±9435.06	0.106
Weight	43.88±7.15	41.50±5.98	0.001
Height	152.0±5.35	152.01±5.55	0.980
Hemoglobin	11.65±0.85	11.49±0.63	0.001
BMI	19.135±3.18	18.23±2.88	0.005

Table 3: Comparing socio demographic and nutritional of intervention and non-intervention area of the study respondents (n=367)
Results were published as number, t test was performed and p<0.05 was level of significance; BMI= Body Mass Index.

Correlation between BMI and others indicator of study subjects (Table 4)

The table shows that age (p<0.004) was strongly associated with BMI in intervention area, Hemoglobin was strongly associated with BMI in intervention area and non-intervention area where p value was (p<0.001) and (p<0.003).

Indicators	Intervention area (n=177)		Non-intervention area (n=190)	
	r	p	r	p
Age	0.217	0.004	- 0.015	0.842
Income	0.123	0.102	0.038	0.603
Expenditure	-0.099	0.190	-0.005	0.945
Age of menarche	-0.042	0.579	-0.079	0.276
Hemoglobin	0.387	0.0001	0.213	0.003

Table 4: Correlation between BMI and others indicator of study subjects (n=367)
Pearson's correlation coefficient are performed for the analysis; p<0.05 are considered as statistically significant.

Multiple regression analysis of BMI with socio-economic factor and hemoglobin of the study subjects (Table 5)

Multiple regression analysis was tested with BMI as dependent variable and others as independent variables. The table reveals that occupation of mother (p<0.023) and Hemoglobin (p<0.001) were significantly associated with BMI of study subjects. Other indicators were not significant with BMI.

Variables	Standardized coefficient(ß)	p value
Age	0.038	0.459
Income	0.029	0.603
Expenditure	0.018	0.728
Education of father	-0.028	0.685
Education of mother	0.013	0.845
Occupation of father	-0.011	0.843
Occupation of mother	0.115	0.023
Hemoglobin	0.305	0.001

Table 5: Multiple regression analysis of BMI with socioeconomic factors and Hemoglobin of study subjects (n=367).
Multiple regression analysis was performed with BMI as dependent variable.

Discussion

The second decade of life is a period of rapid growth and personal development without which individuals cannot acquire the competence needed to adapt to a diverse and changing world. The social environment can provide and present hazards to health and obstacles to development. The nutritional status of adolescents plays a dominant role in determining the rate of growth and development (WHO 1997) [5]. Adolescence is a period which includes puberty spurt during which maximum growth in terms of weight and height takes place by Ghai OP [6]. According to some studiesby Agrawal KN, Saxena A *et al* [7], high under-nutrition at earlier age of adolescence has been reported. Adolescent girls belonging to 10-12 years were suffering from under-nutrition / chronic energy deficiency grade III maximally. Factors which may contribute to this phenomenon

may be the earlier nutritional insult during pre-school period as well as adverse dietary practices during 5-9 years of age period. The results of the study revealed that, in rural Bangladesh, the prevalence of thinness and stunting among the adolescent girls aged 13-19 years was widespread and persistent. Severe thinness was 9% lower than 16% found in schoolgirls aged 10-16 years in Dhaka city by Abdullah M, Wheeler EF *et al* [8]. BMI according to proposed for the Asian people, was found 46.3% normal, 47.5% underweight and 6.2% was increased risk but no girls were in high risk group in NNP area and 27.4% was normal, 64.7% was under weight and 6.3% was increased risk but 1.6% was in high risk. According to the western cutoff value (WHO) [9], BMI status was found 51.4% normal, 47.5% underweight and 1.1% overweight but no girls were found in obese in NNP area and 32.1% was normal, 64.7% was under weight and 2.6% was overweight but 0.5% was obese in non NNP area. Of the pre-pubertal girls, 58% was thin, suggesting that undernutrition had delayed puberty in Bangladesh Nurul Alam, Roy SK *et al* [10]. One third (36.49%) of the urban Bangladeshi adolescents was undernourished, Mukhopadhyah A, Bhadra M *et al* at Kolkata [11]. The extent of under nutrition was slightly higher to those among Nepali refugees, reported at 1999 [12] (34%); and higher than those observed among rural African adolescents was (23%). However, the rate of undernutrition of another study those of rural Nepalese were (36%) [13]. Saha Sudip Kumar et al [14] reported, 32.3% urban school girls were in the normal range while 65.3% were overweight or obese. In the present study 48.3% of the adolescents were normal, nobody was overweight or obese and 51.7% were undernourished [15]. The extent of undernutrition was higher than those among Nepali refugees reported by Woodruff et al [13], but lower than those reported by one Indian study (53%) and two Kenyan studies chokson ST *et al* (61%) [16] and (57%) [17]. Hemoglobin status was found 72.3% normal, 20.3% mild anemia and 7.3% was moderate anemia in NNP area and 51.6% was normal, 43.7% was mild anemia and 4.7% was moderate anemia in non NNP area according to WHO [18]. Significant difference was found Both BMI and hemoglobin status among NNP and Non NNP area. Iron deficiency is common among adolescent girls in Bangladesh [8], that, compared to the NNP upazilas, intake of iron supplements was significantly higher (21% opposed to 8%) in the BINP upazilas [10]. This might be the effect of the distribution of iron and folic acid in the BINP community [19]. The prevalence of anemia was found 32.87% in Pakistan [20]. Many developing countries have the same picture. In India it is 38-72% [21], 68.8 % in Nepal and 46.6 % in Egypt. The findings of this study were in line with the other studies conducted in other countries and also with the National figures of Pakistan, which were 46% [22] (Nutrition Country Paper 1992 and WHO 1996) and 50.9% (NNS-2001-02). Nutritional status of adolescents, carried out by the International Centre for Research on Woman (ICRW), Washington by Kunt KM *et al* [23], anaemia was found to be a widespread nutritional problem and its prevalence ranged from 32-55%. However, in urban areas, 93.5% of adolescent girls were found to be anaemic in India by B Joshi *et al* [24]. Widespread undernutrition, micronutrient deficiency, low dietary knowledge, and low coverage of iron supplement among adolescents are concerns for public-health nutrition in Bangladesh. Adolescents are not the sole decision-makers. Parents, particularly mothers, often make decisions on their behalf, and they need to be sensitized about diet and nutritional needs in adolescence and adverse effects of undernutrition of adolescents to change their mindset. Significant association was found between education of father and BMI status and highly significant association was also found between education of mother with BMI of this study adolescent girls. One of the important parameter that determines nutritional status of an individual is the level of education in the family [25]. In that study when the nutritional status of adolescent girls was examined against highest education in the family it was evident that with increasing level of education, decline in under-nutrition was noticed among subjects [3]. Nutritional status of study subjects had been significantly influenced by their educational status and literacy status of their father. Importance of parental education in raising the nutritional status of children is well known [26]. Mother's education has profound effect on pre-school children whereas father's education seems greater importance in the care of adolescent girls in Lukhnow by Srivastava VK *et al* [27]. In this study no association was found between income, expenditure and nutritional status. Highly significant association was found occupation of mother, habit of drinking water with BMI and in NNP area highly significant association was found of education of mother, occupation of mother and habit of drinking water with BMI and in non NNP area. Similar pattern has been observed in subjects with and without latrine facility [3]. Several factors (age, highest education in the family, literacy status of study subjects, literacy status of father, main occupation of the family, socio-economic status, menstrual status and history of passage of worms) were found to be significantly associated with the nutritional status of the study subjects [4]. In this study, Hemoglobin is strongly associated with BMI in NNP area and non NNP area. Multiple regression analysis was tested with BMI as dependent variable and others as independent variables. Occupation of mother and Hemoglobin was significantly associated with BMI of study subjects other indicator were not significant with BMI. Although education was not associated with the risk of being thin, girls with higher education were less likely to be stunted than girls with lower education. Household economic condition (measured by the asset quintile) was not associated with the risk of being thin or stunted [28].

Conclusion

The study concludes that half of the adolescent girls had suffered nutritional deficiency diseases among non-intervention area. More than half of the adolescent girls in non-intervention area and about half of the girls in intervention area were undernourished. In non-intervention area Anemia was higher than intervention area. Association was found between nutritional status and socio-economic factors-education, occupation of mother and education of father. Significant difference was found between intervention and non-intervention area with nutritional status and anemia. So intervention is a positive impact on health and nutritional status of adolescent girls.

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