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Nutritional Status and Food Habit among School Going Adolescent of Bangladesh

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Abstract	Original Research Article

Introduction: Adolescence is a time of high nutrient demands because of rapid growth and development during puberty. It is also a time when individuals experience increasing control over their food choices and develop dietary habits that affect their weight status and extend into adulthood. ***Objective***: To assess the Nutritional status and food habit among school going adolescent of Bangladesh. ***Methods***: A community based cross-sectional observational study was conducted in Savar Zilla School & Morning Glory School and College, Savar, Dhaka, Bangladesh from January to December 2022. A total of 100 students belonging to 8th, 9th and 10th classes participated. Information were collected regarding socio- demographic features and main eating habits from 10-19 years girls who were willing to participate and had no history of chronic illnesses like heart diseases, asthma, physically handicapped etc. Height and weight measurements were done by standard techniques and BMI was calculated using WHO Anthroplus software. BMI & Height for age were taken as a key indicator to assess their nutritional status. Data was analyzed by proportions, mean ± SD and χ^2 test. ***Results***: Mean age was 13.33 ± 1.09 years. Prevalence of thinness, overweight or obesity and stunting were 16%, 11.0% and 21.0% respectively. Significant association was found between different age groups, consumption of roots & tubers, cereals, puffed rice, green non-leafy vegetables, fatty foods, eating at fast food centre, skipping of meals, going hungry, physical activity, number of classes on healthy eating, trying to change their weight with the nutritional status of adolescent girls. ***Conclusion***: There is a need to increase more nutritional counselling on healthy eating habits in school and thus to take appropriate interventions to improve the nutritional status of adolescent.
Keywords: Adolescent Girls, Eating Habits, Nutritional Status, Stunting, Thinness.

INTRODUCTION

Adolescence is a time of high nutrient demands because of rapid growth and development during puberty. It is also a time when individuals experience increasing control over their food choices [1] and develop dietary habits that affect their weight status and extend into adulthood [2, 3]. WHO identifies adolescence as the period in human growth and development that occurs after childhood and before adulthood, from ages 10 to 19 years [4]. Today there are 1.2 billion adolescents worldwide. Nearly 90 percent live in developing countries. Adolescents make up about 18% of the world's population. More than half of all adolescents live in Asia. In absolute numbers, India is home to more adolescents around 243 million than

any other country [5]. Many life style factors and poor eating habits acquired during adolescence can lead to serious diseases later in life. Healthy eating behaviour during adolescence is a fundamental prerequisite for physical growth, psychosocial development and cognitive performance, as well as for the prevention of diet-related chronic diseases in adulthood [6]. The children in developing countries presently suffer from the double jeopardy of malnutrition urban children are afflicted with problems of over nutrition while rural and slum children suffer from effects of under nutrition [7]. Although the prevalence of obesity is increasing worldwide, the increase has been faster in developing countries because of declining level of physical activity as well as nutrition transition characterized by a trend towards consumption of a diet high in fat, sugar and

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refined foods and low in fiber [8, 9]. However, during the transition into young adulthood, adolescents eat away from home more often and with their families less often [10], and they consume a larger percent of energy intake at fast-food and other restaurants [11]. Fast-food restaurant use is particularly common among adolescents and has a detrimental impact on their nutrient intake [12]. Thus, the effect of home availability on adolescents food choices may be attenuated by their food choices away from home.

MATERIALS AND METHODS

A community based cross-sectional observational study was conducted in Savar Zilla School & Morning Glory School and College, Savar, Dhaka, Bangladesh from January to December 2022. A total of 100 students belonging to 8th, 9th and 10th classes participated. The students were selected using purposive sampling. Participants were between 12 - 18 years. Students who refused to participate were excluded from the study. Data was collected using "pre-tested" & "self- administered questionnaire" on the participant's general information, family medical history, and participant's medical history and sleeping hours.

Eligibility criteria were those who were present, age 12-18 years, those willing to participate, not sick and those with no history of chronic illnesses like heart diseases, asthma, mental illness, physically handicapped or disabilities like scoliosis and kyphosis. The class teacher and students were briefed about the study and were interviewed only after obtaining verbal consent. Data was collected using a pre-designed, pretested semi-structured questionnaire on socio-demographic variables, eating habits and some related factors like frequency of going hungry due to unavailability of foods at home, addiction to smoking/ chewing tobacco, alcohol, class on benefits of healthy eating and eating more fruits and vegetables held during past one year, self-image of body weight, and if anything done to combat, physical activity etc.

Questions on eating habits were adapted from the "Global school-based student health survey 2013 (GSHS) by World health organization WHO" [13].

Self-reported weight, height, and physical activity in the last seven days were recorded. "Waist & hip" measurements were taken using a "non-stretchable measuring tape". OMRON electronic blood pressure measuring device was used to measure the blood pressure.

Social media usage among adolescents was obtained using pre-tested questions. The questions were based on the frequency of social media usage, the purpose of using social media, frequency of receiving and posting food pictures on social networking sites, frequency of posting pictures of dishes ordered in a restaurant. Before data collection, informed, "Written consent" was obtained from the school principal, and assent was taken from the students.

Statistical Analysis

Data entry was done using Microsoft excel and data analysis was done using Stata version 21. The descriptive statistics mean standard deviation and percentages were used. The Chi-square on the categorical and independent two-sample t-tests on continuous variables was applied to test the significant differences in general characteristics, eating habits, anthropometric measurements, blood pressure by gender, and hours of social media usage. A value of probability ≤ 0.05 was accepted as the level of significance.

RESULTS

Total 100 adolescents included in our study. Among 100 adolescents male were 75% and female were 25%. Mean age of the study population was 13.33 ± 1.09 years. Majority (84%) were Muslim. Class 10th (19.0%) students were lesser in number compared to class 8th & 9th. Most (62%) of them belonged to joint family. Very few parents (8.0% father & 9.0% mother) were illiterate / just literate. Majority (98.7%) lived with their parents & most students (95.3%) ate with them. More than three fourths of the girls attained menarche. Mean age at menarche was 12.27 ± 0.85 years. None had addiction to smoking/ chewing tobacco and alcohol. Socio-demographic characteristics of the study population have been shown in (Table-1).

Table-1: Socio- demographic characteristics of the adolescent (n=100)

Socio- demographic variables	Number (%)	Mean ± SD
Age in years		
10-14	87 (87.0)	13.33 ± 1.09
15-19	13 (12.0)	
Sex		
Male	75 (75.0)	
Female	25 (25.0)	
Religion		
Muslim	84 (84.0)	
Hindu	10(10.0)	
Others	06(6.0)	
Class		

Socio- demographic variables	Number (%)	Mean ± SD
8th	38 (38.0)	
9th	42(42.0)	
10th	19 (19.0)	
Type of family		
Nuclear	38 (38)	
Joint	62 (62)	
Number of family member		
1-4	43 (43.0)	
5-6	22 (21.0)	
≥7	35 (35.0)	
Father's education		
Illiterate/ just literate	8 (8.0)	
Primary	31 (30.0)	
Secondary	26 (26.0)	
Higher secondary & above	35 (35.0)	
Mother's education		
Illiterate/ just literate	9 (9.0)	
Primary	23 (23.0)	
Secondary	46 (46.0)	
Higher secondary & above	22 (22.0)	
Living with		
Parents	99 (98.7)	
Relatives	1 (1.3)	
Eat with		
Parents	95 (95.3)	
Alone	5 (4.7)	
Menarche		
Attained	77 (76.7)	12.27 ± 0.85
Not attained	23 (23.3)	
BMI (kg/m^2)		
Mean ± SD		18.4±2.94

Table-2: Distribution of study population according to frequency of consumption of different food items during last one week (n=100)

Food items	Occasionally		Regularly	
	Never N (%)	1-3 times N (%)	4-6 times N (%)	Daily N (%)
Fruits	4 (4.0)	50 (50.0)	23 (23.0)	23 (23.0)
Green leafy vegetables	11 (11.0)	39 (39.0)	25 (25.0)	25 (25.0)
Green non-leafy vegetables	4 (4.0)	48 (48.0)	25 (25.0)	23 (23.0)
Red or yellow coloured vegetables	23 (23.0)	57 (57.0)	13 (13.0)	7 (7.0)
Roots and tubers	13 (13.0)	45 (45.0)	7 (7.0)	35 (35.0)
Cereals	3 (3.0)	20 (20.0)	4 (4.0)	73 (73.0)
Puffed rice	3 (2.0)	20 (13.3)	14 (9.3)	113 (75.3)
Pulses	8 (8.0)	26 (26.0)	21 (21.0)	45 (45.0)
Milk or milk products	13 (13.0)	29 (29.0)	19 (19.0)	39 (39.0)
Fruit juices	29 (29.0)	47 (47.0)	15 (15.0)	9 (9.0)
Egg	7 (7.0)	48 (48.0)	28 (28.0)	17 (17.0)
Meat	3 (3.0)	43 (43.0)	36 (36.0)	19 (19.0)
Carbonated Soft drinks	17 (17.0)	42(42.0)	21 (21.0)	20 (20.0)
Fatty or fried foods	9 (9.0)	51 (51.0)	27 (27.0)	13 (13.0)
Salty foods	19 (19.0)	48 (48.0)	22 (22.0)	11 (11.0)
Eating at fast food centre	20(20.0)	53 (53.0)	19 (19.0)	8 (8.0)

Frequency of consumption of different food items by the students during last week have been shown in Table-2. It was found that almost half of the participants consumed fruits, vegetables, egg & meat occasionally. Nearly two thirds consumed fruit juices occasionally while one third consumed pulses occasionally. More than three fourths consumed cereals & puffed rice regularly, while 42% had occasional consumption of milk & milk products.

Table-3: Relationship between nutritional status (overall thinness) Vs socio-demographic factors, eating habits & associated factors (N=100)

Socio-demographic factors, eating habits and other factors		Overall Thinness			Test statistics				
		Yes N (%) 16 (16.0)	No N (%) 84 (84.0)	Total N (%) 100 (100)	χ2	df	p	OR	95% CI
Age (years)	10-13	14 (21.5)	51 (78.5)	65 (100)	4.37	1	0.037	2.9	(1.03-8.38)
	14-19	3 (8.6)	32 (91.4)	35 (100)					
Going hungry	Yes	4 (44.4)	5 (55.6)	9 (100)	12.31	1	<0.001	5.8	(2.00-16.85)
	No	11 (12.1)	80 (87.9)	91 (100)					
Consumption of green non-leafy vegetables	Regularly	11 (22.9)	37 (77.1)	48 (100)	3.99	1	0.046	2.5	(1.00-6.26)
	Occasionally	6 (11.5)	46 (88.5)	52 (100)					
Consumption of cereals	Regularly	13 (19.7)	53 (80.3)	66 (100)	5.58	1	0.018	8.2	(1.06-62.84)
	Occasionally	1 (2.9)	33 (97.1)	34 (100)					
Consumption of puffed rice	Regularly	14 (18.2)	63 (81.8)	77 (100)	3.86a	1	0.049	-	-
	Occasionally	0 (0)	23 (100)	23 (100)					
No. of classes on healthy eating	≥2	8 (10.7)	67 (89.3)	75 (100)	7.54	1	0.006	0.3	(0.12-0.73)
	≤1	7(28.0)	18 (72.0)	25 (100)					

[a]Fishers Exact significance (2- sided) p = 0.026

The association between nutritional status (based on presence of overall thinness) and socio-demographic features as well as eating habits of study population has been shown in Table-3. It was found that overall thinness was more prevalent in 10-13 years age group (21.5%) compared to 14-19 years age group (8.6%) and this was statistically significant (OR=2.9; CI=1.03-8.38). The prevalence of thinness was higher among those who went hungry due to unavailability of food at home (44.4%) than who did not (12.1%) and this was statistically significant (OR=5.8; CI=2.00-16.85). Similarly, the prevalence of thinness was more among those who regularly consumed green non-leafy vegetables, cereals and puffed rice (22.9%, 19.7%, and 18.2%) than who occasionally consumed them (11.5%, 2.9% and nil) and these associations were also statistically significant (p=0.046, 0.018 and Yates corrected p=0.049 respectively). It was also found that the prevalence of thinness was more among them who had attended lesser number of classes on healthy eating habits (28.0%), while those who attended more number of classes had lower prevalence of thinness (11.0%). This relationship was statistically significant (p=0.006). Nutritional status of the survey area was assessed according to three anthropometric indices of nutritional status: weight-for-age, height-for-age and weight-for-height Z-score referred to as underweight, stunting and wasting respectively. In the study we used a recently adopted nutrtitional status indicator named BMI-for-aged between 4 to 14 years according to CDC BMI-for-age standards.

Table-4: Relationship between nutritional status (overweight & obesity) Vs eating habits & associated factors (N=100)

Eating habits & associated factors		Overweight or Obesity			Test statistics				
		Yes, N (%)11 (11.0)	No, N (%)89 (88.0)	Total, N (%) 100 (100)	χ2	df	p	OR	95% CI
Skip meals	Yes	6 (18.8)	26 (81.2)	32 (100)	5.50	1	0.016	3.5	(1.21-9.98)
	No	4 (5.9)	64 (94.1)	68 (100)					
Consumption of fatty foods	Regularly	6 (28.6)	15 (71.4)	21 (100)	17.25	1	<0.001	8.2	(2.69-25.25)
	Occasionally	4 (5.1)	75 (94.9)	79 (100)					
Eating at a fast food centre	Regularly	4 (25.0)	12 (75.0)	16 (100)	13.73	1	<0.001	6.7	(2.21-20.44)
	Occasionally	4 (4.8)	80 (95.2)	84 (100)					
Physical Activity	Yes	4(4.7)	82 (95.3)	86 (100)	16.48	1	<0.001	0.1	(0.04-0.39)
	No	4 (28.6)	10 (71.4)	14 (100)					
No. of classes on healthy eating	≥2	6 (8.1)	68 (91.9)	74 (100)	5.27	1	0.022	0.3	(0.11-0.88)
	≤1	5 (19.2)	21 (80.8)	26 (100)					
Consumption of roots & tubers	Regularly	6 (18.8)	26 (81.2)	32 (100)	4.06	1	0.044	2.9	(0.10-8.19)
	Occasionally	5 (7.4)	63 (92.6)	68 (100)					
Trying to Change weight	Yes	8(26.7)	22(73.3)	30 (100)	23.40	1	<0.001	32.4	(4.16-252.0)
	No	1 (1.4)	69 (98.6)	70 (100)					

The association of nutritional status (based on presence of overweight or obesity) with socio-demographic factors and eating habits of adolescent school girls has been shown in Table-4. It was revealed that the prevalence of overweight or obesity was higher among those who skipped meals (18%) than who did

not (5%). This was statistically significant (OR=3.5; CI=1.21-9.98). It was also found that those who regularly consumed fatty foods, regularly ate at a fast food center, regularly consumed roots and tubers and those who were trying to change their weights had higher prevalence of overweight or obesity (28%, 25%, 18% and 26% respectively) than who occasionally consumed them or those who were not trying to change their weight (5%, 4%, 7% and 1% respectively). This relationship was statistically significant (p<0.001, p<0.001, p=0.044 and p<0.001 respectively). The study also found that the students who attended lesser number of classes on the benefits of healthy eating and who did not do physical activity had higher prevalence of overweight or obesity (19% and 28% respectively) than those students who attended more number of classes and who did physical activity (8% and 5% respectively) and these were statistically significant (p=0.022 and p<0.001 respectively). However, there was no association of other independent variables (socio-demographic characteristics, eating habits and other factors) with nutritional status categorized on the basis of overall thinness or overweight or obesity or stunting (data not shown).

DISCUSSION

A cross-sectional study was conducted among rural adolescent with the purpose to assess their eating habits and nutritional status. This study was done among school going adolescents aged between 12-18 years old. The majority of samples include boys 85% boys and 25% girls. Significant (p=0.005) difference between the mean body mass index of girls (17.5±2.28) and boys (18.9±3.17) were found. However, the majority of students were having BMI below normal. The difference in the mean waist-hip ratio of boys and girls were highly Significant (p=0.00). Boys were more physically active compared to girls (p=0.010). Similarly, Dey *et al.,* [13] found the mean age (years) of rural adolescent school girls as 14.0 ± 1.6. In this study 87.0% of the respondents belonged to early adolescence (10-14 years), while 12.0% belonged to late adolescence (15-19 years) age group. This was inconsistent with Das *et al.,* [14] and Kollur *et al.,* [15] where 55% belonged to early adolescence (10-14 years) and 45% to late adolescence (15-19 years) age group. This was due to exclusion of class XI and class XII students in the present study, while later studies were done in community and not in school based setting. In the present study majority (84%) of the study population were Muslim and 16% were Hindu and others. Similarly, Das et al., [14] found that most of the respondents (77.6%) were Hindus and the others were Muslims. In the present study 9.0% of mothers and 8.0% of fathers of respondents were illiterate or just literate. However, Das et al., [14] found that 33.6% of mothers and 22.3% of fathers of respondents were illiterate. This is due to differences in study period. This clearly reflected the increase in literacy rate with time. In the present study majority (98.7%) lived with their

parents. Similarly, Onyiriuka *et al.,* [16] found that majority (84.7%) of the respondents lived with their parents. There was less frequent consumption of fruits, vegetables, pulses, milk or milk products, egg, meat etc among the adolescents of this study. Similarly, Seema Choudhary *et al.,* [17] found in their study that daily consumption of body building (viz. pulses and milk) and protective (viz. fruits, green vegetables and other vegetables) foods by an adolescent was practically non-existent in the study area. In fact, they found that pulses, vegetables and milk products were avoided by 4%, 14% and 7% study subjects, respectively. In the present study the prevalence of normal BMI for age, overall thinness and overweight or obesity were 73%, 16% and 11.0% respectively. Similarly, Das *et al.,* [14] found the prevalence of thinness as 14.7%. This was not consistent with the study done by Kankana De *et al.,* [18] where the problem of under-nutrition was worse as the prevalence of normal BMI-for-age, overall thinness and overweight were 50.1%, 48.3% and 1.6% respectively. In the present study the prevalence of normal height-for-age and stunting was 79.3% and 20.7% respectively. However, Maiti *et al.,* [19] found the prevalence of stunting as 34.8%. This difference could be due to the differences in the age groups considered for study and/ or the criteria used for classification of stunting as later study was done among 10-14 years girls using Vishveshwara Rao's classification for height-for- age. In the present study it was found that the prevalence of overweight or obesity was higher in girls who skipped meals than who did not (OR=3.47, 95% CI =1.21-9.98). This was consistent with the study done by Onyiriuka *et al.,* [14] and Niklas *et al.,* [20]. It was found in the present study that physically inactive girls had higher prevalence of overweight or obesity (27.9%) compared to those who were physically active (χ^2 =16.48, df=1, p=<0.001). Similar findings were found by Radmila Jovanovic' *et al.,* [21] (χ^2 =4.485, df=1, p=0.034). In this study significant association was found between different age groups, consumption of roots & tubers, cereals, puffed rice, green non-leafy vegetables, fatty foods, eating at fast food centre, skipping of meals, going hungry, physical activity, number of classes on healthy eating, trying to change their weight with the nutritional status of adolescent girls. In the present study there was no association between socio- demographic factors like literacy status of parents, religion, and marital status etc. with nutritional status. Similarly, Das et al., [14] found no significant association (p>0.05) of thinness or stunting with per capita monthly family income and literacy status of parents. However, Singh et al., [22] found that caste, religion and marital status was significantly (p < 0.05) associated with nutritional status of adolescents. These differences could be because of regional differences as later study was done in rural area of Varanasi where there was one more important category of adolescent girls who were married but gauna did not occur. In this study caste and per capita monthly family income were excluded from

questionnaire during pre-testing as the students were not able to answer it, so its impact on nutritional status could not be studied.

CONCLUSION

The prevalence of overall thinness, overweight or obese and stunting in this study was 16%, 11.4% and 20.7% respectively. There was less frequent consumption of fruits, vegetables, pulses, milk or milk products, egg, meat etc. Nearly one third had regular consumption of fatty, fried & salty foods and regularly ate at fast food centre. The risk factors for thinness were lower age group, going hungry due to unavailability of food at home, attending lesser number of classes on benefits of healthy eating and regular consumption of green non-leafy vegetables, cereals and puffed rice. The risk factors for overweight or obesity were skipping of meals, physical inactivity, regularly eating at fast food centre, regular consumption of fatty or fried foods and roots and tubers, trying to change weight and attending lesser number of classes on benefits of healthy eating.

REFERENCES

1. Affenito, S. G. (2007). Breakfast: A missed opportunity. *J Am Diet Assoc., 107*, 565-569.
2. Affenito, S. G., Thompson, D. R., Barton, B. A., Franko, D. L., Daniels, S. R., Obarzanek, E., Schreiber, G. B., & Striegel-Moore, R. H. (2005). Breakfast consumption by African-American and white adolescent girls correlates positively with calcium and fiber intake and negatively with body mass index. *J Am Diet Assoc., 105*, 938-945.
3. Albertson, A. M., Thompson, D., Franko, D. L., Kleinman, R. E., Barton, B. A., & Crockett, S. J. (2008). Consumption of breakfast cereal is associated with positive health outcomes: Evidence from the National Heart, Lung, and Blood Institute Growth and Health Study. *Nutr Res., 28,* 744-752.
4. WHO Adolescent health. Adolescent development [Internet]. [Cited 2015 Nov 26].
5. UNICEF. Progress for children A report card on adolescents [Internet]. New York: 2012 Apr [cited 2015 Nov 26].
6. French, S. A., Lin, B. H., & Guthrie, J. F. (2003). National trends in soft drink consumption among children and adolescents age 6 to 17 years: Prevalence, amounts, and sources, 1977/1978 to 1994/1998. *J Am Diet Assoc., 103*(10), 1326-31.
7. Chatterjee, P. (2002). India sees parallel rise in malnutrition and obesity. *Lancet, 360*, 1948.
8. Monteiro, C. A., D'A, B., Conde, W. L., & Popkin, B. M. (2000). Shifting obesity trends in Brazil. *European Journal of Clinical Nutrition*, *54*(4), 342-346.
9. Popkin, B. M., Lu, B., & Zhai, F. (2002). Understanding the nutrition transition: measuring rapid dietary changes in transitional countries. *Public health nutrition*, *5*(6a), 947-953.
10. Masthi, N. R., Pruthvi, S., & Phaneendra, M. S. (2018). A comparative study on social media usage and health status among students studying in pre-university colleges of urban Bengaluru. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*, *43*(3), 180-184.
11. Singh, M. M., Amiri, M., & Sabbarwal, S. (2017). Social media usage positive and negative effects on the life style of Indian youth. *Iranian Journal of Social Sciences and Humanities Research*, *5*(3), 123-127.
12. WHO Maternal, newborn, child, and adolescent health. Adolescent development: A critical transition.
13. Dey, I., Biswas, R., Ray, K., Bhattacherjee, S., Chakraborty, M., & Pal, P. P. (2011). Nutritional status of school going adolescents in a rural block of Darjeeling, West Bengal, India. *The Health, 2*(3), 75–7.
14. Das, D. K., & Biswas, R. (2005). Nutritional Status of Adolescent Girls in a rural area of North 24 Parganas district, West Bengal. *Indian J Public Health, 49*(1), 18–21.
15. Kollur, L. R., Pratinidhi, A. K., & Kakade, S. V. (2014). Nutritional status of adolescent girls from a community in Maharashtra – A cross sectional study. *Int J Med Sci Public Health, 3*, 951-4.
16. Onyiriuka, A. N., Umoru, D. D., & Ibeawuchi, A. N. (2013). Weight status and eating habits of adolescent Nigerian urban secondary school girls. *SAJCH South African J Child Heal, 7*, 108-12.
17. Choudhary, S., Mishra, C. P., & Shukla, K. P. (2010). Dietary pattern and nutrition related knowledge of rural adolescent girls. *Indian J Prev Soc Med*, *41*(3), 4.
18. De, K., Das, S., Bose, K., & Chakraborty, R. (2013). Nutritional status of rural Bengalee girls aged 10-18 years of Salboni, Paschim Medinipur, West bengal, India. *Asian Journal of Biological and Life Science*, *2*(1), 68-72.
19. Maiti, S., De D, C. K., Jana, K., Ghosh, D., & Paul, S. (2011). Prevalence of stunting and thinness among early adolescent school girls of Paschim Medinipur district, West Bengal. *Int J Biol Med Res*, *2*(3), 781-3.
20. Nicklas, T. A., Baranowski, T., Cullen, K. W., & Berenson, G. (2001). Eating patterns, dietary quality and obesity. *Journal of the American college of nutrition*, *20*(6), 599-608.
21. Jovanović, R., Nikolovski, D., Radulović, O., & Novak, S. (2010). The influence of physical activity to nutrition state of pre-school children. *Acta Medica Medianae*, *49*(1), 17-21.
22. Singh, S., Kansal, S., & Kumar, A. (2012). Assessment of nutritional status of adolescent girls in rural area of district Varanasi. *Indian J Res*, *6*(6), 30-34.