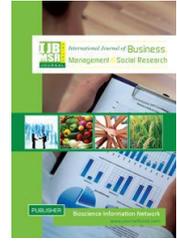


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## Vegetable consumption of the students of Khulna university in Bangladesh

Farhana Afroze Preya<sup>1</sup>, Md. Abu Hasan Chowdhury<sup>1</sup>, Mohammad Bashir Ahmed<sup>1</sup>, Md. Matiul Islam<sup>1</sup> and Md. Ruhul Amin<sup>2</sup>

<sup>1</sup>Agrotechnology Discipline, Khulna University, Khulna-9208, Bangladesh

<sup>2</sup>Dept. of Agricultural Extension Education, Sylhet Agricultural University, Sylhet-3100, Bangladesh.

✉ For any information: [ask.author@journalbinet.com](mailto:ask.author@journalbinet.com)

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### ABSTRACT

*It is often uttered that the young aged persons, particularly the students, are much reluctant in consuming sufficient amount of vegetables for supporting sound body functioning. The students of Khulna university have not yet been assessed regarding this issue. The study was conducted mainly to determine the vegetable consumption behavior of the students of Agrotechnology Discipline of Khulna University, Khulna-9208, Bangladesh. Data were collected from randomly selected one hundred twenty students of four batches of four different sessions (admission years: 2015 to 2018) of Agrotechnology Discipline on selected nine characteristics of the students along with their vegetable consumption behavior, through personal interview using an interview schedule during July-August, 2018. The overall average vegetable consumption rate by the students was 128.15 g/day/student. Most (95%) of the respondents showed low vegetable consumption behavior, while a few (4.17%) and very few (0.83%) students consumed above standard (>235 g/day/student) and standard (235 g/day/student) amount of vegetables respectively. All (100%) of the male students consumed below standard quantity of vegetables while most (90%) of the female students consumed below standard quantity of vegetables. But a few (8.3%) and a very few (1.67%) of female students consumed above standard and standard amount of vegetables, respectively. Most (95%) of the students, residing both halls and outside of the university campus, consumed below standard amount of vegetables followed by above standard and standard amount of vegetables. Female students consumed more vegetables (166.24 g/day/student) than the males (90.04 g/day/student) which differed significantly ( $t=9.73549$ ;  $p<0.01$ ). The students who resided outside of the halls consumed more quantity of vegetables (133.87 g/day/student) than the students residing in the halls (121.93 g/day/student) which also differed significantly ( $t=1.14668$ ;  $p<0.01$ ). Among the 10 selected characteristics of the respondents, only farm size ( $p<0.05$ ) and nutritional knowledge ( $p<0.01$ ) showed positive significant relationship with their overall vegetable consumption behavior. On the other hand, the annual family income, participation in co-curricular activities related organization, participation in co-curricular activities showed a negative significant relationship ( $p<0.01$ ) with their overall vegetable consumption behavior. The hall authority of the university as well as guardians should take necessary initiatives to supply more amounts of vegetables in the diet of the students to ensure adequate amount of vegetable consumption.*

**Key Words:** Consumption, Male-female students, Residential halls and Vegetables

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## I. Introduction

'Vegetable' is commonly used, and is applied collectively referring all edible plant matter, including the flowers, fruits, stems, leaves, roots, and seeds. The term vegetable is also applied somewhat arbitrarily, often by culinary and cultural tradition. It may exclude foods derived from some plants that are fruits, nuts, and cereal grains. However, it may include fruits from other such as tomatoes, and seeds such as pulses. Vegetables can be eaten either raw or cooked. Vegetables play an important role in human nutrition. They are mostly low in fat and carbohydrates, but high in vitamins, minerals and dietary fiber. Nutritionists encourage people to consume plenty of fruits and vegetables. Five or more portions a day often are recommended (Kays 2011). However, our day-to-day experience of living in the existing society finds that, vegetables are merely considered as a rich source of nutrients among the common people. The traditional outlook of our society is that, only the fishes, eggs, milk and meats contain the essential nutrients for proper functioning of the human body. Thus, many of us usually ignore adequate consumption of vegetables. Moreover, the richer section of the society also considers that the vegetable consumption would not demonstrate their richness. The students are also a vital part of the society. Their thinking, somewhat, also resembles the traditional thinking of the common people of the society in Bangladesh. Vegetables make up a major portion of the diet of human in many parts of the world. Vegetables play a significant role in human nutrition, especially as sources of vitamins (C, A, B1, B6, B9, E), minerals, dietary fiber and phytochemicals. Vegetables contain some phytochemicals which are strong antioxidants. Those are thought to reduce the risk of chronic diseases by protecting against free-radical damage, by modifying metabolic activation and detoxification of carcinogens. Vegetables even influence the processes that alter the course of tumor cells (Kays 2011).

A high vegetable diet has been associated with lower risk of cardiovascular disease in human. Low vegetable intake, in unbalanced diets, has been estimated to cause about 31% of ischemic heart disease and 11% of stroke worldwide (Hui et al. 2003). According to the World Health Report (2007) unbalanced diets with low vegetable intake and low consumption of complex carbohydrates and dietary fiber are estimated to cause some 2.7 million deaths each year, and were among the top 10 risk factors contributing to mortality. The exact mechanisms by which vegetable consumption reduces human diseases have not yet been fully understood, however the general consensus among physicians and nutritionists is that phytonutraceuticals in vegetables are responsible for mitigating some of these diseases (Hui et al. 2003).

The total amount of vegetables consumed will vary according to age and gender. Usually vegetables are lesser tasty than the foods from animal sources. For this reason the children might not eagerly consume vegetables. On the other hand, the young females are now-a-day much cautious about getting obese than the young males. This might lead to comparatively higher amount of vegetables consumption by the young girls. It is determined based upon the standard portion sizes typically consumed, as well as general nutritional content. For most vegetables and vegetable juices, one serving is half of a cup and can be eaten raw or cooked. For leafy greens, such as lettuce and spinach, a single serving is typically a full cup. No single fruit or vegetable alone provides all the nutrients needed for health. Thus, a variety of products should be chosen together. Some of the vegetables are good sources of carbohydrates (leguminous vegetables, sweet potato, potato, onion, garlic and fenugreek). Some contain proteins (peas, beans, leafy vegetables and garlic). Some vegetables contain vitamin A (carrot, tomato, drumstick, leafy vegetables). Some are rich in vitamin B (peas, garlic and tomato), Vitamin C (green chilies, drumstick leaves, Cole crops, leafy vegetables and leaves of radish). Some contain minerals (leafy vegetables, drumstick pods). As per dietician, daily requirement of vegetables is 75 g of green leafy vegetables, 85 g of other vegetables and 75 g of roots and tubers with other food (Lambert 2003). International dietary guidelines are similar to the ones established by the United States Department of Agriculture (USDA) (Newman 2013). In worldwide the daily recommendation for adults is 260-275 g of

vegetables per day. Average daily vegetable consumption in Bangladesh is 166.1 g person<sup>-1</sup> which is far below the recommendation by USDA. However, the desirable dietary pattern is 300 g person<sup>-1</sup> (leafy 100 g and non-leafy 200 g) which is higher than the recommended amount by the USDA (Nahar et al. 2013). According to the data provided by FAO and WHO (2014), the vegetable consumption is gradually increasing in Bangladesh (137.4 g person<sup>-1</sup> day<sup>-1</sup> in 1991, 140.5 g person<sup>-1</sup> day<sup>-1</sup> in 2000, and 166.1 g person<sup>-1</sup> day<sup>-1</sup> in 2010) (FAO and WHO, 2014).

Proper nutrition depends on the consumption of a variety of foods of sufficient quantity. The consumed foods should have nutritional quality, and should be balanced that permits growth and maintains proper body functions. The body's nutrient requirement varies with size, age, sex, health, activity, and genetic and biochemical characteristics of the individual. It is generally believed by the nutritionists and health professionals that the health benefit of vegetables should not be linked to only one compound or one type of vegetable, but rather a balanced diet that includes more than one type of vegetable is likely to provide better protection. All the vegetables may offer protection to humans against chronic diseases (Thomas 2008).

Usually the young students are not interested to consume adequate amount of vegetables daily. It is often encountered in the dining table by the older members of the family that the children or youths are reluctant to eat vegetables. The scenario is more or less similar for the university-going students both residing in the residential halls or outside, irrespective of gender type. Usually university students don't eat enough food and vegetables. However, their vegetable consumption behavior is not yet assessed, particularly in Khulna university of Bangladesh.

Considering the above facts, the researchers felt a thrust to conduct a study with the hope to identify the behavior on vegetable consumption by the students of Agrotechnology Discipline of Khulna University. It also aimed to identify whether their consumption level varies due to gender differences or due to difference in residence (either hall/own residence/mess).

### Objective of the study

- To analyze the selected characteristics (e.g., age, education, family size, etc.) of the students.
- To determine the vegetable consumption behavior of the students.
- To identify the differences in vegetable consumption behavior due to difference in students' gender (male/female) and residence (hall/outside hall).
- To explore the relationship between the selected characteristics (annual family income, nutritional knowledge, etc.) of the students and their vegetable consumption behavior.

## II. Materials and Methods

The study was a "descriptive and diagnostic" research (Kothari 2001). It was designed to study the vegetable consumption behavior of students. The study was confined to the students (total 145 undergrad students) of Agrotechnology Discipline, Khulna University, Khulna, Bangladesh. A number of 60 male and 60 female students were chosen; among them 30 male and 30 female students stay outside of the residential halls, and similar number of students (both male and female) stay in halls. Thus, 120 students (82.76% of the total undergrad students) were treated as the sample for the study. Irrespective of size of population, a number of 30 students were selected from each year and term which has been shown in Table 01.

**Table 01. Distribution of population and sampled respondents**

Year/Term (Batch)	Population (No. of students)	Sampled respondents
4 <sup>th</sup> year 2 <sup>nd</sup> term ('15 Batch)	32	30
3 <sup>rd</sup> year 2 <sup>nd</sup> term ('16Batch)	38	30
2 <sup>nd</sup> year 2 <sup>nd</sup> term ('17 Batch)	33	30
1 <sup>st</sup> year 2 <sup>nd</sup> term ('18 Batch)	42	30
Total	145	120

Data were collected from the respondents through personal interview using a pre-tested (tested for effectiveness for obtaining intended valid and reliable data by interviewing five students prior to

conduct full survey) interview schedule from the students during 15 July to 15 August in 2018. Nine selected characteristics of the respondents were treated as independent variables (viz. age, educational qualification, family size, annual family income, farm-size of family, participation in co-curricular activities related organization, participation in co-curricular activities, participation in agricultural activities, and nutritional knowledge) for this study. Vegetable consumption behavior was considered as dependent (=focus) variable of the study. The selected characteristics were measured according to the standard procedure using the units mentioned in [Table 02](#).

**Table 02. Measurement of independent variables**

Sl. No.	Independent variables (Selected characteristics)	Measuring units
1.	Age	Years
2.	Educational qualification	Years of schooling
3.	Family size	Actual number
4.	Farm-size of family	Hectare
5.	Annual family income	"000" BDT
6.	Participation in extracurricular activities related organization	Score
7.	Participation in extracurricular activities	Score
8.	Participation in agricultural activities	Score
9.	Nutritional knowledge	Score

Vegetable consumption behavior was determined based on the quantity of vegetable a student consumed every day. For this purpose data were collected from each of the students either male or female, and either stays in halls or at homes. The average amount was calculated from the amount consumed in consecutive seven days. Based on average consumed amount of vegetables, the respondent students were classified into different categories as shown in [Table 03](#). The standard amount of vegetable requirement (g/day/person) was considered as per the recommendation provided by [Lambert \(2003\)](#) for the convenience of data management.

**Table 03. Categories of respondents according to their vegetable consumption behavior**

Categories	Amount of vegetable (g/day/person)
Low consumption	<235
Medium consumption	235
High consumption	>235

After collection, data were analyzed and tabulated for interpretation. Statistical treatments such as number, mean, standard deviation, range, rank order etc. were used to interpret data. To explore relationship between any two variables Pearson's product moment correlation 'r', Spearman rank order correlation ( $\rho$ ) were employed. For analysis of data Statistical Package for Social Science (SPSS) was used. To compare between male and female students' vegetables consumption behavior "student's t-Test" was used.

### III. Results and Discussion

#### Facts on the selected characteristics of the respondents

Highest (42.50%) of the respondents belonged to very young age category while 40% and 17.5% of the respondents belonged less young and teen aged categories respectively. About half (48.3%) of the respondents were medium educated while 26.7% and 25% of the respondents were less and more educated respectively. Majority (66.6%) of the students' family were small in size while the rest (33.4%) of the respondents' had medium sized family. The average family size was also smaller than that of national average (4.4; [BBS, 2013](#)). It means that the family heads of all categories of respondents are conscious about population growth. Highest proportion (30.8%) of the respondents belonged to medium farm category followed by small (25.8%), large (21.7%), marginal (15%) and landless (2.5%) categories. Highest proportion (47.5%) of the respondents belonged to high income category while about one-fifth (20.8%) and one-third (31.7%) of the respondents belonged to low and medium income categories respectively ([Table 04](#)). The average annual income of the respondents' family was 4,57,760

BDT with a standard deviation (SD) of 1,91,940 BDT. Here, it is observed that the SD value is high. Actually, the students of Khulna University are of diverse family background ranging from poor to rich. Thus, the dispersion of the family income became high.

**Table 04. Facts on the selected characteristics of the respondents**

Characteristics	Categories	Score	Respondent (N=120)		Mean	Standard deviation
			Number	Percent		
Age of the respondents (years)	Teen age	≤19	21	17.5	20.99	1.44
	Very young	20-21	51	42.5		
	Less young	>21	48	40		
Educational qualification of the respondents (years of schooling)	Less educated	<12.5	32	26.7	14.00	1.13
	Medium educated	12.6-14.5	58	48.3		
	More educated	>14.5	30	25.0		
Family size of the respondents (actual number)	Small	≤4	80	66.6	4.27	0.77
	Medium	5-6	40	33.4		
	Large	>7	0	0.0		
Farm size of family (hectare)	Landless	<0.02	3	2.5	2.25	2.89
	Marginal	0.02-0.02	18	15.0		
	Small	0.2-1.0	31	25.8		
	Medium	1.1-3.0	37	30.8		
	Large	>3	5	21.7		
Annual family income of the respondents ('000' BDT)	Low	1-200	25	20.8	457.76	191.94
	Medium	201-400	38	31.7		
	High	>400	57	47.5		
Participation of the respondents in co-curricular activities related organizations (score)	No	0	58	51.7	0.69	0.82
	Low	1-20	57	48.3		
	Medium	21-40	0	0		
	High	41-60	0	0		
Participation of the respondents in co-curricular activities (score)	No	0	14	11.7	4.75	4.21
	Low	1-14	90	75.0		
	Medium	15-18	5	4.2		
	High	>18	11	9.2		
Participation of the respondents in agricultural activities (score)	No	0	6	5	4.37	2.71
	Low	1-14	107	89.2		
	Medium	15-18	6	5		
	High	>18	1	0.8		
Nutritional knowledge of the respondents (score)	Low	<12	2	1.67	17.96	2.26
	Medium	13-15	19	15.83		
	High	>16	99	82.5		

Majority (51.7%) of the respondents belonged to no participation category while 48.3% of the respondents belonged to low participation category in terms of participation in co-curricular activities related organizations. The respondent students are not or less interested to participate in co-curricular activities related organizations. The students think that the involvement in co-curricular activities related organizations will waste their study time which leads them to no or low participation. The reason behind no participation and low participation in co-curricular activities related organizations as mentioned by the respondents were “too much busy to study”, “political attitude of the organizers” and

“less eager to participate in the organizations”. Three-fourth (75%) of the respondents showed low participation behavior regarding participation in co-curricular activities followed by no participation, high and medium participation behavior. Most (89.5%) of the respondents showed low participation behavior regarding participation in agricultural activities while similar percentage (5%) of the respondents showed no participation and medium participation behavior. Only one respondent showed high participation behavior. Most (82.5%) of the respondents possessed high nutritional knowledge while 15.83% and 1.67% of the respondents had medium knowledge and low knowledge respectively. It is clear that the respondents are high in nutritional knowledge (Table 04).

### Vegetable consumption behavior of the respondents and consumption differences

The amount of vegetables consumed by the respondents ranged from 35-300 g/day/person with mean and standard deviation 128.15 and 57.34 g/day/person, respectively. According to vegetable consumption behavior, the respondents were distributed into 3 categories as shown in Table 05.

Data presented in Table 05 indicate that most (95%) of the respondents consumed less (below standard) amount than the recommended amount of vegetable while 4.17% and 0.83% of the respondents belonged to above standard and standard categories respectively. All (100.0%) the male respondents consumed less (below standard) amount of vegetables. None of the respondents belonged above standard and standard categories respectively. Most (90.7%) of the female respondents consumed less (below standard) amount of vegetables, while 8.33% and 1.67% of the respondents belonged to above standard and standard categories, respectively (Table 05).

**Table 05. Distribution of the respondents according to their vegetable consumption behaviour**

Characteristics	Categories	Amount of vegetable (g/day/person)	Respondent (N=120/60)		Mean (g/day/person)	Standard deviation
			Number	Percent		
Overall vegetable consumption behavior of the respondents	Below standard	<235	114	95.0		
	Standard	235	1	0.83	128.15	57.34
	Above standard	>235	5	4.17	Min. 35	Max. 300
	Total		120	100		
Vegetable consumption behavior of the male respondents	Below standard	<235	60	100.0		
	Standard	235	0	0.0	90.04	29.94
	Above standard	>235	0	0.0	Min. 35	Max.191
	Total		60	100		
Vegetable consumption behavior of the female respondents	Below standard	<235	54	90.0		
	Standard	235	1	1.67	166.27	52.74
	Above standard	>235	5	8.33	Min. 80	Max. 300
	Total		60	100		
Vegetable consumption behavior of the hall respondents	Below standard	<235	57	95.0		
	Standard	235	1	1.67	121.93	55.71
	Above standard	>235	2	3.33	Min. 35	Max. 250
	Total		60	100		
Vegetable consumption behavior of the outsider respondents	Below standard	<235	57	95.0		
	Standard	235	0	0.0	133.87	58.72
	Above standard	>235	3	5.0	Min. 45	Max. 300
	Total		60	100		

Most (95%) of the hall residing respondents consumed less (below standard) amount of vegetables, while 3.33% and 1.67% of the respondents belonged to above standard and standard categories, respectively. Most (95%) of the respondents residing outside of the halls, consumed less (below standard) amount of vegetable while 5% of the respondents belonged above standard category (Table 05). Data of the Table 05 also indicate that the female students consumed higher amount of vegetables (166.27 g/day/person) than the male students (90.04 g/day/person) and differed significantly ( $t=9.73549$ ,  $p<0.05$ ). Outsider students (connected with family/mess) consumed more vegetables than the students resided in halls and differed significantly ( $t=1.14668$ ,  $p<0.05$ ).

### Relationships between the selected characteristics (independent variables) of the respondents and their vegetable consumption behavior (dependent variable)

Both the Pearson's product moment correlation co-efficient ( $r$ ) and Spearman's rank order correlation co-efficient ( $\rho$ ) were used to explore the relationship between any two variables. Relationship between the dependent and independent variables with " $r$ " and " $\rho$ " values are shown in Table 06.

**Table 06. Relationships between the selected characteristics of the respondents and their vegetable consumption behaviour**

Characteristics (Independent variables)	Focus (Dependent variable)	Correlation coefficients	
1. Age	Vegetable consumption behavior	-0.128 <sup>NS</sup>	" $r$ "
2. Educational qualification		0.027 <sup>NS</sup>	
3. Family Size		-0.104 <sup>NS</sup>	
4. Annual family income		-0.387**	
5. Farm size		0.195*	" $\rho$ "
6. Participation in extracurricular activities related organization		-0.520**	
7. Participation in extracurricular activities		-0.310**	
8. Participation in agricultural activity		0.136 <sup>NS</sup>	
9. Nutritional knowledge		0.349**	

NS= Non-significant \*\* significant at the 0.01 level (2-tailed) \* significant at the 0.05 level (2-tailed).

Among the 9 selected characteristics of the respondents, only farm size ( $p<0.05$ ) and nutritional knowledge ( $p<0.01$ ) showed positive significant relationship with their vegetable consumption behavior. It means that the higher is the farm size and nutritional knowledge of the respondents, the higher is the vegetable consumption. On the other hand, the annual family income, participation in co-curricular activities related organization, participation in co-curricular activities showed a negative significant ( $p<0.05$ ) relationship with their vegetable consumption behavior. It means that the higher is the annual family income, higher participation in co-curricular activities related organization, higher participation in co-curricular activities, the lower the vegetable consumption. It might be due to that the rich family consumed more protein such as fish, meat, and pulse rather than vegetables. The finding of this study related to relationship between family income and vegetable consumption has disagreement with the findings of Dzadey (2009), Neumark-Sztainer et al. (1996) and Wandel (1995). They found that the level of vegetable consumption depends on one's family affluence and if the child's family was more affluent, then the higher level of vegetable consumption happened in that family atmosphere. The relationship between family affluence and vegetable consumption may be mediated by availability of vegetables, which could be an important determinant of vegetable consumption.

### IV Conclusion

The average vegetable consumption amount by the students was 128.15 g/day/student which was 171.85 g lower than the recommendation (300 g/day/student) provided by BIRDEM (FAO and WHO, 2014). The average amount of vegetable consumption is also 106.85 g lower than the standard given by Lambert (2003). This particular deficit amounts should be fulfilled by motivating the students to consume more vegetables in their daily diets. Most (95%) of the respondents showed low vegetable consumption behavior. The female students consumed more (166.24 g/day/student) vegetables than the male (90.04 g/day/student) and differ significantly ( $t=9.73549$ ). The students resided outside of the

halls consumed more quantity of vegetable than the students reside in the halls and differ significantly ( $t=1.14668$ ).

The students usually do not consume sufficient amount of vegetables which is a matter of great concern for the issue of sound health of the students. The guardians of both male and female students should motivate their sons and daughters to consume more vegetables as most of them consumed below standard amount (128.15 g/day/student) of vegetables against recommended amount (235 g/day/student). The hall authority of the university also should take initiative to supply more amounts of vegetables in the diet of the students both in male and female halls.

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