Fruits and vegetables consumption among students studying in Universiti Brunei Darussalam

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ABSTRACT

Introduction: Consumption of fruits and vegetables (FV) is an essential part of a healthy diet. It is an important step to reduce prevalence of non-communicable diseases. The aim of this research was to study FV consumption among Universiti Brunei Darussalam (UBD) students, mainly from two of the faculties: Institute of Health Science (IHS) and Faculty of Art and Social Sciences (FASS). Another objective of this study was to assess the knowledge and practice (including barriers) of FV intake among the students. **Materials and Methods:** The study was conducted among UBD students using a self-administered 24 hours recall questionnaire. Three-hundred-and-twenty-six participants (154 from IHS and 172 from FASS) were selected through convenient sampling. **Results:** Two-hundred-and-sixty-three participants (80.7%) do not know the recommended daily FV intake. There was no difference in knowledge on recommended daily fruits intake (p=0.158), however, there is a significant difference in knowledge on recommended daily vegetables intake between the two faculties (p=0.005). A total of 215 participants (71.2%) from both faculties consumed one-and-a-half or less serving of fruits while 219 participants (71.0%) consumed one-and-a-half or fewer servings of vegetables the day before. Fruits were preferably consumed as snacks while vegetables were preferred during lunch and dinner. Some of the barriers to consumption identified include household's choice, time and skills to prepare FV, quality, and variety of FV. **Conclusion:** Majority of the students were not aware of the recommended amount of daily FV intake and most were consuming less than two servings of FV per day. Therefore, intervention is required to increase FV consumption.

Keywords: Fruits, vegetable, intake, knowledge, awareness

INTRODUCTION

Consumption of fruits and vegetables (FV) is an essential part of a healthy diet. High FV consumption has been associated with lower risk of health problems such as obesity, cardiovascular diseases and cancer. [1] It has been found that there is an approximately 9% decrease risk of respiratory and upper part of digestive tract cancer with every 80 gm/day FV intake. [2] Studies have also shown that increase intake of dietary fibre are associated with lower risk of stroke. [3] According to World Health Organisation (WHO), 6.7 million deaths globally in 2010 due to non-communicable diseases (NCDs) could have been avoided with adequate intake of FV. [4] Thus, FV consumption is an important step to reduce the prevalence of NCDs.

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It is important to emphasise healthy diet among youths to ensure good health in the long term. FV are rich in dietary fibre, micronutrients such as folate, potassium, vit-

amin A, vitamin C, as well as phytochemicals including antioxidants. [5, 6] These substances have been implicated to protect the cells from cardiovascular diseases and cancer. [5] In addition, FV has low energy density [6]; in other words, FV can satisfy hunger with lesser calorie intake and therefore, it is a good approach to prevent obesity. Young adults are the future educators of the next generation thus, their habits will likely influence the future generation. Therefore, promoting FV intake among young adults is essential.

The WHO recommended FV daily intake of 400 gm or five servings. [7] The Ministry of Health of Brunei Darussalam follows similar recommendation of 2-3 servings of fruits and 2-3 servings of vegetables per day. [8] However, FV intake below the suggested amount has been found from various studies in different countries. A study conducted in a Malaysian university found that the average daily FV consumption of the university staff members were one serving of fruits and 0.7 serving of vegetables. [9] A national survey in Singapore in 2004 also reported inadequate mean of FV servings were consumed daily; 1.42 and 1.97 servings of fruits and vegetables respectively. [10] Another research conducted among students aged 13 to 15 in five east Asian countries carried out from 2006 to 2008 also had similar findings. [11] The mean daily intakes found were as follows: India 1.1 and 1.9, Indonesia 1.4 and 1.8, Myanmar 1.2 and 1.7, Sri Lanka 1.2 and 1.9 and Thailand 1.6 and 2.1 servings of FV respectively. [11] Therefore, insufficient FV consumption is still widely prevalent in the east Asia region.

The aim of this research was to study the consumption of FV among Universiti Brunei Darussalam (UBD) students, mainly from two of the faculties: Institute of Health Sciences (IHS) and Faculty of Art and Social Sciences (FASS). It was also of interest whether there is any difference in consumption of these two faculties. Another objective of this study was to assess the knowledge and practice of FV intake among the students. It was also to identify the tendencies and the possible barriers to FV consumption among the students. To investigate factors affecting FV intake across different population groups is one of the research interests in Health Promotion Centre, Brunei Darussalam. [12] Determining the factors affecting consumption is one of the steps to promote balanced and healthy diet.

MATERIALS AND METHODS

The study was conducted in UBD. Students enrolled in UBD during the study period from the selected faculties were considered as the source population. Students attending FASS and IHS, with the exclusion criteria of students from other UBD faculties were taken as the eligible population. The participants were selected by convenient sampling. The participants, consisting primarily of undergraduates and master students, were mainly approached at the end of their class with the help of the lecturers and invited to join the study. The classes from FASS includes English linguistic, Malay linguistic, Geography, Philosophy and Painting while from IHS includes Medical, Biomedical Sciences, Nursing, Midwifery and Paramedic students. The data was collected from 154 IHS students and 172 FASS students. The total number of students during the study period was 1716 students in FASS and 409 students in IHS.

The participants were given a self-administered questionnaire (Appendix) where they reported their consumption of FV the day before. The number of servings then counted according to Brunei's National Dietary Guidelines. [13-15] A focused 24 hours recall questionnaire was used because of the short recollection period thus, they are more likely able to recall with higher precision. [16] The questionnaire was adapted from Yeh *et al.* [17] Initially the questionnaires were pre-tested among a group of ten students from each faculty. Some

ulty. Some questions were taken out due to the difficulty faced by the participants to comprehend the question. The option "I do not eat fruits/vegetables" was added to the questions "When are you more likely to eat fruits/ vegetables?".

The participants were given time to read the Participant Information Sheet (PIS) and if they could not comprehend the PIS, guidance were given. They were informed about their rights to refuse to participate in the study. There were no identifying information taken from the questionnaire thus, the study were anonymous. Ethical approvals were received from Institute of Health Sciences Research Ethics Committee and Medical and Health Research Ethics Committee, Ministry of Health of Brunei Darussalam.

Data entry and analysis were carried out using SPSS version 21.0. [18] Median and interquartile range (IQR) were performed for the number of FV servings consumed. Mann-Whitney test were used to compare the FV consumption between IHS students and FASS students. Frequency was used to describe the categorical data, including the tendency to consume FV with main meals and the possible barriers to FV consumption.

RESULTS

All the students approached agreed to participate in the study (100% response rate). The sample consisted of 326 participants; 154 participants from IHS and 172 participants from FASS. Majority of the respondents (92.6%) were between 16 to 25 years old. Details of the sociodemographic characteristics of the participants are shown in Table 1.

There were several item non-responses; one (0.3%) for level of education, seven (2.1%) for gender, three (0.9%) for age and barriers to fruits consumption, four (1.2%) for barriers to buy more fruits, tendency to consume vegetables during meals, barriers to consume and buy more vegetables, 24 (7.4%) for amount of fruits consumed and 18 (5.5%) for amount of vegetables consumed.

Table 1: Demographic of participants.

Variables	n (%)
Faculty	
IHS	154 (47.2)
FASS	172 (52.8)
Age group (year)	
16-20	148 (45.8)
21-25	151 (46.7)
26-30	14 (4.3)
31-35	7 (2.2)
36-40	3 (0.9)
Gender	
Male	100 (31.3)
Female	219 (68.7)
Level of education	
Year 1	138 (42.5)
Year 2	113 (34.8)
Year 3	25 (7.7)
Year 4	34 (10.5)
Master	15 (4.6)
Ethnicity	
Malay	266 (83.4)
Chinese	41 (12.9)
Others	12 (3.8)

IHS: Institute of Health Sciences,; FASS: Faculty of Art and Social Sciences

Knowledge on FV consumption: Most of the participants (80.7%) from both faculties do not know the recommended number of FV intake per day. There was higher percentage of participants from FASS that know the recommended number of daily FV intake; 20 (11.6%) and 21 (12.2%) compared to 15 (9.7%) and 18 (11.7%) from IHS, fruits and vegetables respectively. However, there was higher percentage of participants from IHS who claimed they know the recommendations however, gave a wrong answer; 18 (11.7%) and 19 (12.3%) compared to FASS, 10 (5.8%) and five (2.9%), fruits and vegetables respectively. There is no significant difference in knowledge on recommended daily fruits intake (p=0.158), however, there is a significant difference in knowledge on recommended daily vegetables intake between the two faculties (p=0.005). These results are shown in Table 2.

Frequency and median FV intake: A total

Table 2: Knowledge on recommended fruits and vegetable (FV) consumptions.

Variables	n	Do not know n (%)	Know n (%)	Claimed to know, but gave wrong answer n (%)	X^2 statistic[a] (df)	*P* value[a]
Knowledge on recommended daily intake of fruits						
IHS	154	121 (78.6)	15 (9.7)	18 (11.7)	3.69 (2)	0.158
FASS	172	142 (82.6)	20 (11.6)	10 (5.8)		
Total	326	263 (80.7)	35 (10.7)	28 (8.6)		
Knowledge on recommended daily intake of vegetables						
IHS	154	117 (76.0)	18 (11.7)	19 (12.3)	10.63 (2)	0.005
FASS	172	146 (84.9)	21 (12.2)	5 (2.9)		
Total	326	263 (80.7)	39 (12.0)	24 (7.4)		

of 215 participants (71.2%) from both faculties consumed 1.5 or less serving of fruits the day before. Sixty-two participants (42.2%) from IHS and 80 participants (51.0%) from FASS did not consume any fruits at all. Similar figures were found for consumption of vegetables. One-and-a-half or fewer servings of vegetables were consumed by a total of 219 participants (71.0%). Sixty participants (41.4%) from IHS and 83 (50.9%) participants from FASS consumed no vegetables. Details are shown in Tables 3 and 4.

Both FV intake of the participants from the two faculties were positively skewed. Thus, median values were used to compare. The two median for fruits consumption are not significantly different (p=0.061). There is also no significant different in median for vegetables consumption between the two faculties (p=0.083). The results are shown in Table 5.

FV tendencies and barriers: There was no major difference in fruits consumption tendencies between the two faculties. Majority of the participants preferred to consume fruits as snacks; 116 (75.3%) from IHS and 124 (72.1%) from FASS. There was a high tendency to consume vegetables during lunch, chosen by 117 respondents (77.0%) from IHS and 116 respondents (68.6%) from FASS, and during dinner, selected by 114 (75.0%) from IHS and 124(73.4%) from FASS. The results are shown in Figures 1 and 2.

Table 3: Portions of fruits consumed by participants.

		Faculty/Institute		Total
		IHS (n=145) n (%)	FASS (n=157) n (%)	
Fruits portion consumed	0.0	62 (42.5)	80 (51.0)	142 (47.0)
	0.5	1 (0.7)	4 (2.5)	5 (1.7)
	1.0	30 (20.7)	31 (19.7)	61 (20.2)
	1.5	2 (1.4)	5 (3.2)	7 (2.3)
	2.0	25 (17.2)	18 (11.5)	43 (14.2)
	2.5	3 (2.1)	1 (0.6)	4 (1.3)
	3.0	7 (4.8)	10 (6.4)	17 (5.6)
	3.5	0 (0.0)	1 (0.6)	1 (0.3)
	4.0	9 (6.2)	3 (1.9)	12 (4.0)
	4.5	2 (1.4)	1 (0.6)	3 (1.0)
	5.0	3 (2.1)	0 (0.0)	3 (1.0)
	5.5	1 (0.7)	0 (0.0)	1 (0.3)
	6.0	0 (0.0)	1 (0.6)	1 (0.3)
	8.0	0 (0.0)	1 (0.6)	1 (0.3)
	9.5	0 (0.0)	1 (0.6)	1 (0.3)

There was similar response between the participants from the two faculties regarding their barriers to FV consumption, as shown in Figures 3 and 4. Nearly half of the participants from each faculty, 69 participants

Table 4: Portions of vegetables consumed by participants.

		Faculty/Institute		
		IHS (n=145) n (%)	FASS (n=163) n (%)	Total
Vegetables portion consumed	0.0	60 (41.4)	83 (50.9)	143 (46.4)
	0.5	2 (1.4)	3 (1.8)	5 (1.6)
	1.0	35 (24.1)	35 (21.5)	70 (22.7)
	1.5	0 (0.0)	1 (0.6)	1 (0.3)
	2.0	26 (17.9)	22 (13.5)	48 (15.6)
	2.5	2 (1.4)	0 (0.0)	2 (0.6)
	3.0	7 (4.8)	5 (3.1)	12 (3.9)
	3.5	2 (1.4)	1 (0.6)	3 (1.0)
	4.0	3 (2.1)	7 (4.3)	10 (3.2)
	5.0	2 (1.4)	3 (1.8)	5 (1.6)
	5.5	1 (0.7)	0 (0.0)	1 (0.3)
	6.0	2 (1.4)	0 (0.0)	2 (0.6)
	7.0	3 (2.1)	0 (0.0)	3 (1.0)
	8.0	0 (0.0)	1 (0.6)	1 (0.3)
	10.0	0 (0.0)	1 (0.6)	1 (0.3)
	16.0	0 (0.0)	1 (0.6)	1 (0.3)

(46.0%) from IHS and 74 participants (43.3%) from FASS chose household's choice as their barrier to consume fruits, while for vegetables, it was chosen by 45 (30.2%) and 54 (32.3%) from IHS and FASS respectively. Another common barrier was time to prepare FV; for fruits 38 (25.3%) and 32 (18.7%) and vegetables, 47 (31.5%) and 48 (28.7%), for IHS and FASS respectively. The skills to prepare vegetables was faced as a barrier by 31 (20.8%) participants from IHS and 34 (20.4%) from FASS. One-fifth of the respondents also from each faculty dislike vegetables; 32 respondents (21.5%) from IHS and 35 respondents (21.0%) from FASS.

Perceived barriers to buying more FV between the two faculties were also much the same. Quality was the common main barrier to buy more FV; 67 (44.4%) and 68 (45.6%) from IHS and 64 (37.9%) and 75 (44.9%) from FASS, fruits and vegetables respectively. Variety was also another common barrier; 51 (33.8%) and 55 (36.9%) from IHS and 56 (33.1%) and 43 (25.7%) from FASS, fruits and vegetables respectively. The findings are shown in Figures 5 and 6.

Table 5: Comparison of fruits and vegetables (FV) consumption between the two faculties.

Variable	HIS (n=145) Median (IQR)[c]	FASS (n=157) Median (IQR)[c]	*Z* statistic[a]	*P* value[a]
Fruits consumed (serving)	(2.0)[b]	0.0 (1.5)[b]	-1.87	0.061
Vegetables consumed (serving)	1.0 (2.0)[b]	0.5 (2.0)[b]	-1.73	0.083

[a] Mann-Whitney test
[b] Skew to the right
[c] IQR = Interquartile range

DISCUSSIONS

The recommended number of servings of fruits and vegetables intake by Ministry of Health Brunei Darussalam is two to three servings per day of fruits and two to three servings of vegetables. [19] Majority of the students do not know the recommended number of fruits and vegetables intake per day. Despite studying health sciences, there are less IHS students that know the suggested number of fruits and vegetables servings by Brunei's Ministry of Health compared to FASS students. However, there is higher percentage of IHS students that claimed they know the suggested amount of servings however, gave a different answer than required. Most of these students answered five servings of fruits or five servings of vegetables per day. Consuming five servings of FV daily is the recommendation according to the WHO guidelines. [7] However, the five servings daily is the total FV intake suggested by the WHO rather than five servings of fruit and five servings of vegetables per day. These suggest the possibility of improper understanding and lack of awareness of the recommendations. Therefore, students need to be educated on importance and benefit of adequate FV consumption.

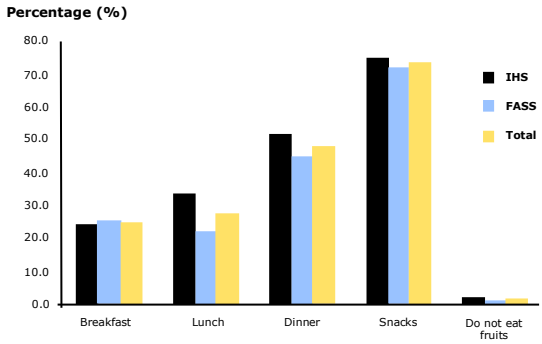


Fig. 1: Fruits consumption during meals for the two faculties.

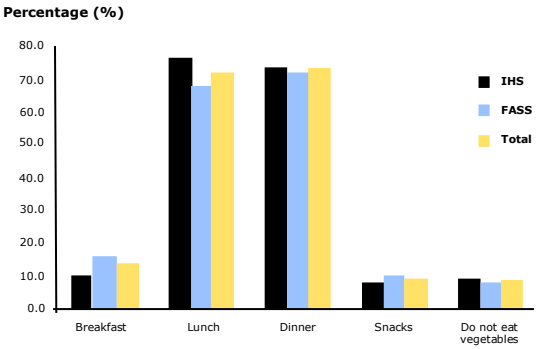
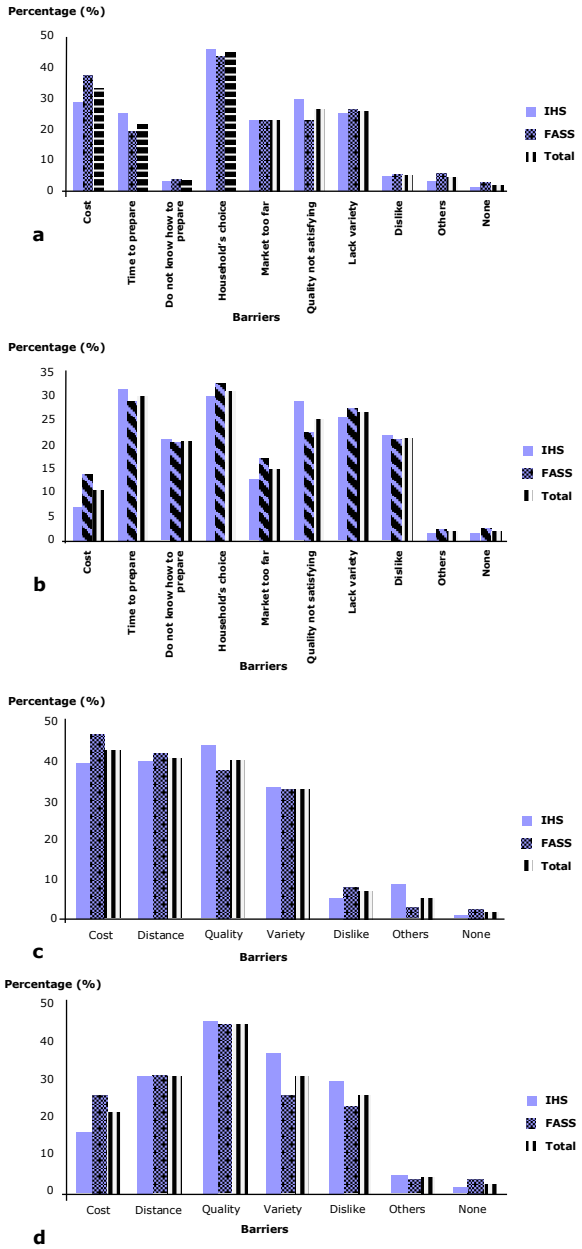


Fig. 2: Vegetables consumption during meals for the two faculties.

A large fraction of the students consumed less than the recommended amount of daily FV intake, 71.2% for fruits and 71.0% for vegetables. A study in a university in Saudi Arabia reported 78.0% of the students were consuming inadequate portion of FV. [20] Another research carried out on university students in the United States found that 79.0% of the students consumed one or less than one serving of FV. [21] These studies conducted among university students in other countries share similar results with present study percentage.

Majority of the students (73.6%) prefer to consume fruits as snacks and tend to consume vegetables during lunch (72.6%) and dinner (74.1%). As students spent long hours in the university, they are likely to have meals or snacks in campus. Studies have shown that increase availability of healthy food menu in workplace cafeterias and advertising them led to increase intake by the workers. [22, 23] Thus, making FV available within the campus cafeteria and promoting the menu might be relevant. It may also be important to promote regular meals intake as irregular meals have been associated with lower FV intake. [24, 25]

Household's choice was identified as the main barrier to consumption for both FV among the students. Household can be defined as people living in the same house. [26]



Figs. 3: a) Barriers to fruit consumption, b) barriers to vegetable consumptions, c) barriers to buy fruits, and d) barriers to buy vegetables.

Some of the students relied on their household members to obtain FV for their consumption; 44.5% and 31.3%, fruits and vegetables respectively. Apart from family members, peer influence may also affect an individual's eating behaviours. [27] Thus, rather than focusing intervention only on students, it might also be important to target all members, particularly family members, of the society in promoting healthy diet.

There were a higher number of students stating they do not know how to prepare vegetables (20.6%) as a barrier compared to fruits (3.1%). This might be due to fruits being more readily eaten raw whereas most local vegetables such as '*sawi'*, spinach, and eggplant, need to be cooked first. There were also more students disliking vegetables (21.2%) compared to fruits (5%). Time to prepare was also faced as barrier to FV consumption. Hence, offering the students quick and tasty recipes using varieties of vegetables might help promoting vegetables intake. It might also be important to train the students to have better planning and time management skills as this might assist in increasing FV consumption.

Quality is one of the major barriers to buy more FV faced by the students; 40.9% for fruits and 45.3% for vegetables. FV are perishable goods; they spoilt easily. Variety was also perceived as a barrier to buy more FV; 33.4% for fruits and 31.0% for vegetables. Increasing variety might help in increasing consumption as the students will have more options to choose from. Furthermore, consuming a variety of FV is also important along with sufficient amount to provide a broad range of nutrients. [28] Improving quality and variety of FV will require combine efforts from agricultural sectors as well as wholesale and retail.

This study has several limitations. Random sampling was not done and we had used convenient sampling instead. The reliability of approximating the usual intake is low as 24 hour-recall does not reflect the difference in daily intake. [16] This might be overcome by taking multiple days of recall or alternatively, using food frequency questionnaire. The result is also limited by recall accuracy of the participants. Focus group intervention can be used to explore more intake barriers and enhance data collected. Further research can also look into the difference in intake between students commuting from home and those staying at the hostels.

In conclusion, majority of the students (80.7%) were not aware of the recommended amount of daily FV intake with 71.2% and 71.0% of the students were consuming less than two servings of fruits and vegetables per day respectively. Therefore, intervention is required to increase FV consumption. The students prefer to consume fruits as snacks while vegetables during lunch and dinner. Menu consisting of more FV should be made available and promoted in campus. Household's choice, quality and variety of FV were identified as barriers by nearly half of the participants. Thus, involvement of other parties such as household members, agricultural sector and vendors might be crucial. Lack of culinary skills, dislike of vegetables, and time to prepare also impeded consumption one-fifth of the students. The students should be offered lesson on FV nutrition and quick FV recipes. Also, time management and planning skills workshops should integrate healthy lifestyle aspects.

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