Progress in Nutrition 2019; Vol. 21, N. 1: 86-92 DOI: 10.23751/pn.v21i1.6384

Original article

Fruit and vegetable consumption of last grade medical students and related factors

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Summary. *Objective:* This study aimed to determine consumption of fruit and vegetable (F&V) among last grade medical students who will have important roles in community nutrition and health. *Material methods:* This cross-sectional study was conducted on 246 last grade students of Erciyes University School of Medicine (Kayseri, Central Anatolian, Turkey) at 2014-2015 academic terms in June and July 2015.We examined gender, accommodation, marital status, family type, number of individuals living together, homeland, weight and socioeconomic status, number of meals, having regular snacks, eating away from home, water intake, tobacco and alcohol using, regular physical activity. Weight and height was measured and BMI was calculated. Main outcome measure was the intake of F&V by WHO recommendations. Percentage values were used for qualitative data. Comparisons between eating and health habits and adequacy of F&V intake were analyzed using chi-square test. *Results:* Only 38.6 % of students consumed adequate F&V. Rate of adequate F&V intake was higher in students who had regular snacks, ate away from home less than once a week, used no tobacco and lived not alone. *Conclusions and Implications:* The adequate consumption of F&V among last grade medical students' was low. Knowledge and behaviors of last grade medical students about F&V consumption must be improved.

Key words: Fruit, vegetable, medical students.

Introduction

Foods provides not only macro and micro nutrients needed for life but also other bioactive compounds such as antioxidants (carotenoids and vitamins C and E) which have beneficial effects for health promotion and disease prevention (1). The lack of antioxidants is a risk factor for cardiovascular diseases and malignant tumors (2). Consuming adequate amount of fruits and vegetables (F&V) protects overall health and is associated with a reduced risk of cardiovascular disease and certain cancers (3). F&V are the sources of fiber, vitamins, minerals, and phytochemicals. Vitamins, minerals and phytochemicals have important antioxidant and anti-inflammatory roles in metabolism (4).

As a result healthy nutrition behavior with increased intake of plant-based foods plays important roles in the prevention of chronic diseases, such as coronary heart disease, certain types of cancer, stroke and type II diabetes (5-8). World Health Organization (WHO) proposes eating at least 400 g, or five portions of fruits and vegetables per day to reduce the risk of chronic diseases (9).

Lock et al. (10) reported that increasing individual fruit and vegetable intake to up to 600 g per day could reduce the total worldwide burden of disease by

1.8 %, and reduce the burden of ischemic heart disease and ischemic stroke by 31 % and 19 % respectively. Moreover they estimated the potential reductions for stomach, esophageal, lung and colorectal cancer 19 %, 20 %, 12 % and 2 %, respectively.

Universities and particularly medical students have important roles in developing a healthy lifestyle and promoting nutrition education in the community (11-12). Having less knowledge about healthy nutrition could affect the students' general health conditions (12). On the other side, messages given by doctors in the care and management of chronic diseases related to nutrition are very important and last grade medical students are expected to do this after a short time. So they must be well-educated to give the right messages and to be the right roll-models in the community (12-13). To our literature review there is limited data on F&V intake of medical students (14). The aim of this study was to determine intake of F&V and related factors among the last grade medical students who will have important roles in community nutrition and health after a short time.

Material and Methods

Study Design and Sampling

This cross-sectional study was conducted on 246 last grade students of Erciyes University School of Medicine (Kayseri, Central Anatolian, Turkey) at 2014-2015 academic terms in June and July 2015. The target population of the study was 257 students attending the last grade and all target population was planned to be recruited to the study. But 11 students were excluded from the study because of absenteeism to school. For the study, ethical approval from Erciyes University Medical Faculty Ethics Committee (Erciyes University Ethical Committee approval no: 2015/362) and official permission from deanery of Erciyes University Medical Faculty were provided and the procedures followed were in accordance with the Helsinki Declaration. All of the participants provided informed consent.

Data Collection

The questionnaire consisting of 30 questions prepared by the researcher based on literature; 8 of the questions were about sociodemographic characteristics (age, gender, marital status, family type, number of individuals living together, homeland, accommodation and socioeconomic status) and 22 of them were about their dietary habits. The questionnaire was filled out by the students at the clinics. Body weight and height was measured with calibrated scale and stadiometers (Seca 769, Hamburg, Germany) in clinics. Based on body weight and height measurements BMI values calculated and classified as underweight (BMI <18,5 kg/m^2), normal weight (BMI 18,5-24,9 kg/m^2), overweight (BMI 25,0-29,9 kg/m^2) and obese (BMI ≥30,0 kg/m^2) according to World Health Organization (WHO) criteria (15). In addition, the amounts and kinds of F&V they consumed in 24 hours were asked to the students. The evaluation of F&V portions; a medium-sized fruit, or 3 or 4 of berries and 80 g vegetables has been recognized as one portion. The evaluation of adequacy F&V intake; 5 or more portions of F&V per day considered adequate, less than five portions considered inadequate (9).

Statistical Analyses

Data were analyzed using SPSS 16.0 (Statistical Package for the Social Sciences, SPSS Inc. Chicago, USA) software under the supervision of academicians from Erciyes University, Faculty of Medicine, Department of Biostatistics and Medical Informatics. Data was tested with Shapiro-Wilk test for normal distribution. Percentage values were used for sociodemographic characteristics. Comparisons between eating and health habits and adequacy of F&V intake were analyzed using the chi-square test. Values were considered significant at $P < .05$.

Results

Of the participating students 50.8 % were males, with mean age of 24.6 ± 1.7 years. Sociodemographic characteristics of the students are presented at Table 1.

Only 38.6 % of the students consumed adequate F&V while 7.7 % of them consumed neither fruit nor vegetable based in the last 24 hours before the questionnaire was performed. A quarter of the students (25.2 %) did not consume any fruit and 15.0 % of them

Table 1. Sociodemographic characteristics of the students.

Sociodemographic characteristics	n (246)	%
Gender		
Male	121	49.2
Female	125	50.8
Marital status		
Single	235	95.5
Married	11	4.5
Number of individuals living together		
Alone	23	4.1
2-3	29	46.3
>3	194	49.6
Homeland		
Marmara region	3	1.2
Aegean region	11	4.5
Mediterranean region	43	17.5
Central Anatolian region	131	53.3
Eastern Anatolian region	27	11.0
Southeastern Anatolian region	11	4.5
Black sea region	14	5.6
Foreign national	6	2.4
Accommodation		
Dormitory	14	5.7
Home	232	94.3
Self-reported economic status		
Poor	4	1.5
Middle	118	48.0
Good	124	50.5

did not consume any vegetable. The mean portions of F&V are shown at the Table 2.

49.1 % of the group was having regular snacks per day. Mostly preferred snack group was consisted of chocolate, biscuits, candies (78.5 %) and fruit preference rate was 19.1 %. Half of the students ate away from home at least once a week and while eating out mostly preferred meals were; fast-food (48.4 %) and kebab, pide (44.3 %). Rate of students consuming fewer than 3 meals a day were 17.5 %.

Table 2. The mean portions of F&V consumption

Features of F&V intake	Mean ± SD
Fruit consumption	1.67 ± 1.58
Vegetable consumption	2.71 ± 2.26
F&V consumption	4.10 ± 2.90
Variety of consumed fruit	1.40 ± 1.13
Variety of consumed vegetable	2.15 ± 1.60
Variety of consumed F&V	3.50 ± 2.21

The most known chronic diseases associated with inadequate F&V consumption among the students were cancer (29.6 %) and cardiovascular diseases (29.4 %). The mean BMI of the group was 23.08 ± 3.50 kg/m$^{2.}$ Most of the students (70.7 %) had normal weight.

The rates of inadequate F&V intake in males and females were similar (61.2 % and 61.6 % respectively). There was no significant relation between F&V intake and BMI categories. Likewise there was no significant relation between F&V intake and number of meals per day, water intake, alcohol using and regular physical activity. The rate of adequate F&V intake was significantly higher among the students having regular snacks per day and eating away from home at least once a week ($P < .05$). Also the rate of adequate F&V intake was significantly lower among tobacco user and living alone students ($P < .05$) (Table 3).

Table 4 summarizes declared barriers for F&V intake by the students. The remarkable barriers to F&V intake were "It is difficult to keep F&V" (45.5 %) and "It takes time to prepare vegetable meal" (45.5 %). We also analyzed the students' own opinions about their daily F&V intake (Table 5).

Discussions

The current study examined intake of F&V among the last grade medical students using a cross-sectional design and to the best of our knowledge this is the first study about the last grade medical students' F&V intake.

We found out the mean portion of F&V intake was 4.10 ± 2.90 per day among the last grade medical students. A cross-sectional study which recruited 18-25 years aged 960 female university students reported that the mean portion of F&V intake was 3.21 ± 2.65 of the students (16). Another study from Turkey which recruited seven universities' students stated that F&V intake per day was 3.67 ± 1.81 (17). As our study consisted only medical students, the mean portion of F&V intake was higher as expected.

We found out 38.6 % of the students consumed ≥ 5 F&V portions daily as recommended by WHO. In the USA 7.9 % of college and university students reported that they ≥ 5 F&V portions daily (18). A study

Table 3. Comparison of students some characteristics with their sufficient fruit and vegetable situation

	F&V Intake			
	Inadequate		Adequate	
	n	%	n	%
Gender				
Male	74	61.2	47	38.8
Female	77	61.6	48	38.4
X^2=0.005 *P*= .943				
Self-reported economic status				
Poor	2	50.0	2	50.0
Moderate	70	59.3	48	40.7
Good	79	63.7	45	36.3
X^2=0.713 *P*= .700				
Accommodation				
Dormitory	9	64.3	5	35.7
Home	142	61.2	90	38.8
X^2=0.053 *P*= .818				
Number of individuals living together				
Alone	19	82.6	4	17.4
2-3	14	48.3	15	51.7
>3	118	60.8	76	39.2
*X^2=6.499 P= .039**				
Weight status				
Underweight	8	57.1	6	42.9
Normal	107	62.2	67	37.8
Overweight	32	62.7	19	37.3
Obese	4	50.0	3	50.0
X^2=0.513 *P*= .916				
Number of meals per day				
<3	25	16.6	18	18.9
3	111	73.5	67	70.5
>3	15	9.9	10	10.5
X^2= 0.283 *P*= .868				
Having regular snacks per day				
Yes	66	54.5	55	45.5
No	85	68.0	40	32.0
X^2= 4.695 *P*= .036*				
Eating away from home				
At least once a week	84	68.3	39	31.7
Less frequently	67	54.5	56	45.5
X^2= 4.956 *P*= .026*				
Water intake				
Adequate (> 8 glasses)	122	64.2	68	35.8
Inadequate (< 8 glasses)	29	51.8	27	48.2
X^2=2.817 P= .118				
Tobacco using				
Yes	32	76.2	10	23.8
No	119	58.3	85	41.7
*X^2=4.685 P= .036**				
Alcohol using				
Yes	28	62.2	17	37.8
No	123	61.2	78	38.8
X^2=0.016 *P*= .898				
Regular physical activity				
Yes	14	51.9	13	48.1
No	137	62.6	82	37.4
X2=1.162 P= .281				
Homeland				
Aegean, Marmara and Mediterranean regions	36	63.2	21	36.8
Other regions	115	60.8	74	39.2
X^2=0.099 *P*= .877				

Table 4. Defined barriers to F&V intake

Barriers to F&V intake*	**n**	**%**
It is difficult to keep F&V	112	45.5
It takes time to prepare vegetable meal	112	45.5
Vegetable meals are not satisfying	97	39.4
It is difficult to obtain F&V	89	36.2
Others living with do not like vegetable meal	60	24.4
Do not like vegetables	47	19.1
F&V are expensive	33	13.4
Do not like fruit	24	9.8
Having indigestion problems when eat vegetable	11	4.5
Having indigestion problems when eat fruit	11	4.5

**Multiple choices*

Table 5. Students' opinions about their F&V intake

	F&V intake			
	Inadequate		Adequate	
	n	%	n	%
Students' opinions about their F&V intake				
Adequate	21	28.8	52	71.2
Inadequate	130	75.1	43	24.9
X^2=46.582 P ≤ .001*				
Students' opinions about their F&V intake in future				
Increase	109	71.2	44	28.8
Decrease	2	40	3	60
No chance	40	45.5	48	54.5
X^2=16.657 P ≤ .001*				
Total	**151**	**61.4**	**95**	**38.6**

designed at 7 universities at United Kingdom this rate was 14.0 % (19). In Germany only about 5.0 % of the first grade university students reported that their F&V intake were ≥ 5 portions (20). In another study aiming to compare the eating habits of 1st and 3rd grade medical school students, the first and third year students rates of having adequate F&V consumption were 16.5 % and 10.5 % respectively (21). The rate of adequate F&V consumption at our study was higher than the others'. This difference was probably due to the fact that our study group was educated about the subject.

Our study showed the rates of adequate F&V intake in males (38.4 %) and females (38.8 %) were similar (P > .05). Parallel results to our study from Brazil which recruited 5000 adults reported adequate F&V intake were 12.8 % (95 % CI: 11.0-13.9) in males, and 13.9 % (95 % CI: 13.0-15.0) in females (P < .05) (22).

Although there were opposite results (23), most of the studies in the literature showed females' F&V intake were more than males' F&V intake (17, 19). Research from seven universities in the UK showed that 16.5 % females and 11.3 % males ate ≥ 5 F&V portions daily (19). Also another study from Turkey reported that female university students were more likely to eat F&V (17). As our sample had nutrition education the gender differences could be eliminated.

Turkey consists of seven geographical regions with different cultural characteristics. Eating habits also differ among these geographical regions. Among Marmara, Aegean and Mediterranean regions vegetable consumption is more common (24). We compared the students coming from these three regions F&V consumption with the others. There was no significant difference between the fruit and vegetable consumption of the students from these three regions compared to the students from other regions.Top of Form

We found no significant relation between F&V intake and BMI categories. But a recent study in overweight individuals found that a two-fold increase in F&V intake for 16 weeks significantly decreased BMI (25). There were opposite results to our study in Serbian National Health Survey 2013 which recruits 12.461 adults reported that frequency of fruit consumption was significantly related to all BMI categories in men and to underweight in women, and the number of daily fruit portions was related only to underweight and overweight in women; vegetable consumption frequency was significantly associated with underweight and normal weight in men, while number of vegetable portions was significantly associated with normal weight in men (26). The majority of our study group had normal weight and this may have caused a limitation in assessing the relationship between F&V consumption and weight.

We found out the students who ate away from home less than once a week had significantly higher rate of adequate F&V intake ($P < .05$). Similar to our study; there was a negative association between frequency of FAFH (foods prepared away from home) and F&V intake. (43.1 % versus 54.0 % eating out 0-1 meal per week, respectively) (27) The Household Income and Labor Dynamics in Australia (HILDA) survey revealed time scarcity reduced to consume F&V, eat away from home more, and eat more discretionary calories like foods high in salt, sugar or fat (29). Eating out may be tempted for the students as it is easy, quick or delicious but it seems to be a serious barrier to intake F&V.

The current study found the remarkable barriers to F&V intake were "It is difficult to keep F&V" (45.5 %) and "It takes time to prepare vegetable meal" (45.5 %). Another study suggested that storage difficulties may impact consumption (28).

Snacks may be a chance for increasing F&V intake. Also the rate of adequate F&V portion was higher among the students who had regular snack intake. Although the current study interestingly showed the last grade medical students preferred unhealthy snacks.

At our study the most frequently reported snacks were chocolate, biscuits, candies and only 19 % of the students preferred fruit. Similar to our finding Ünüsan and colleagues (17) found the most frequently ate snacks among female adolescents as candy, soda, donuts, and cookies and only fewer than 25.0 % of adolescents reported the intake of nutritious snacks such as fruits, vegetables, juice, and low-fat milk .

We noticed no relation between economic status and F&V consumption. Studies have found numerous correlates inhibiting the intake of F&V, such as low economic status, inaccessibility to fresh F&V and lack of self-efficacy (28-32). This difference may be due to the fact that most of the students economic status were similar.

It is well known that tobacco using is negatively associated F&V intake (33). We also found out the rate of adequate F&V intake was significantly higher in the students who don't use tobacco consistent with the most of the studies in the literature. A study recruited 1543 adults reported that tobacco users consumed significantly fewer F&V than non-tobacco users (34). The same result from another study showed tobacco users significantly consumed more fast-food and white meat but less F&V and dairy product (35).

There was no difference between students' F&V consumption and their accommodation at the current study. A study reported that students who lived in fraternity or sorority houses had higher intake than did students living off campus (36). These results are similar to Brown and colleagues' study (37). In that study, students who resided in residence halls (and had pur-

chased a meal plan) consumed more F&V than those who lived off-campus. It is important to remember that at current study the proportion of students staying at dormitory was very small when comparing the data of the study with the others'.

The rate of adequate F&V intake was significantly lower among living alone students. At a review searched eight electronic databases it was suggested that, compared with persons who do not live alone, persons who live alone had a lower consumption of F&V (38). F&V consumption are low among the people living alone because probably they often prefer to eat away from home or prepared food.

The relationship between physical activity and fruit and vegetable consumption has been assessed in the belief that a person who has adopted one health-related behavior may have adopted the others. Although most of the studies in the literature show that low physical activity was associated with lower F&V intake (4, 39) we found out no relationship between regular physical activity and sufficient F&V intake. But, a cross-sectional study which reported different results to our study showed that higher F&V consumers significantly had high rates of regularly physical exercise (58.3 %).[4] Another similar results from a study which recruits 998 American Indians reported that factors associated eating ≥ 5 portions of F&V per day included having physical exercise ≥ 4 days in the past week ($P < .001$) (40). Last grade students have not had the opportunity to do regular physical activity because their daily lives are very intense and active.

We examined the students' opinions about their F&V intake; 13.9 % of the students who had inadequate portions of F&V were thinking their consumption was adequate and 26.5 % of them were not planning any changes about their F&V consumption. We concluded this result could arise from insufficient knowledge about adequate and balanced nutrition and disbelief to unchangeable practical issues and situational barriers.

Conclusion

Last grade medical students' eating habits are important for community health as well as their health because they will be role-models. The adequate consumption of F&V among last grade medical students' was low. Students did not have sufficient information about the relationship between chronic disease and nutrition. The nutritional education given to medical students in these regards should be improved.
The difficulty of storing F&V and preparing vegetables were the most defined barriers among F&V consumption. Snacks containing F&V can be offered for sale in places where students can easily access them on campus. Education should be given to keep students away from smoking because besides its' many adverse effects it also prevents consuming adequate F&V. CON

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