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Original Article (Pages: 9013-9025)

Availability and Accessibility of Fruit and Vegetable in Home and School for Iranian Students: A Cross-sectional Research in Schools of Tehran, Iran

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Abstract

Background: Availability and accessibility are reported as the main determinants of fruit and vegetable consumption among children. The present study was conducted to assess the status of availability and accessibility to fruit and vegetable at school and home among Iranian adolescents in Tehran, Iran.

Materials and Methods: This cross-sectional study was conducted to assess status of fruit and vegetable availability and accessibility among Iranian adolescents. In this study, 500 adolescents aged 11 to 14 years old were investigated in Tehran, Iran. Subjects were chosen by multi-stage random sampling method. The data collection tool was a valid researcher-made questionnaire consist of 21 questions. The data was analyzed using SPSS software version 16.0.

Results

68% (n=344) and 27.2% (n=136) of students reported that fruit and vegetables is available in their home always, respectively. Also, 19.6% (n=98), and 58.4% (n=292) of students reported that most of the times and always unhealthy foods were sold in schools' buffets, respectively; 88% (n=440) of students declared that they are allowed to take fruit and vegetable from the refrigerator and eat any time they want to. Results showed no significant difference between boys and girls in terms of availability and accessibility (P=0.268). In addition, there was a significant relationship between variables of residential area, family and home size, birth order and the parents' education level and availability and accessibility (P<0.05).

Conclusion: Fruit and vegetable availability and accessibility was not acceptable yet among guidance school students in Tehran. It is recommended to implement proper interventions for families, school managers as well as students to promote availability and accessibility of fruit and especially vegetable for adolescents.

Key Words: Availability, Accessibility, Fruit, Iran, Students, Vegetable.

*Please cite this article as: Rakhshanderou S, Mehrabi Y, Ghaffari M. Availability and Accessibility of Fruit and Vegetable in Home and School for Iranian Students: A Cross-sectional Research in Schools of Tehran, Iran. Int J Pediatr 2019; 7(2): 9013-25. DOI: **10.22038/ijp.2018.34681.3051**

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Received date: Aug.05, 2018; Accepted date: Sep. 22, 2018

1- INTRODUCTION

A healthy diet is essential for adolescents' optimal growth and development. Inadequate consumption of fruit and vegetable may make adolescents prone to the chronic diseases (1). According to the studies, fruit and vegetable intakes in children and adolescents in the United States are below recommended levels (2). Low fruit and vegetable intake is among top 10 reported risk factors of mortality in the world (3). Inadequate consumption of fruit and vegetable is responsible for 2.7 million deaths, 11 % of strokes, 31% of heart ischemic diseases, and 19% of gastrointestinal system cancers annually worldwide (4). Overall, 2.726 million deaths (4.9%), and 26.662 million disability adjusted life years (DALY) (1.8%) is attributed to the low consumption of fruit and vegetable (5).

There are many evidences about remarkable benefits of fruit and vegetable consumption and their health effects (6). According to the reports of the World Health Organization (WHO), and food and agriculture organization (FAO), daily consumption of 5 portions or at least 400 grams of fruit and vegetable will help to prevent several diseases (7). Evidences and documents of several studies have shown that there is a negative association between having a diet full of fruit and vegetable and some diseases like diabetes (4), obesity (8, 9), strokes (10), and hypertension (11). Due to having high amounts of fiber and water and also low fat, adequate fruit and vegetable consumption helps to manage the body weight (8). Despite of the importance of adequate fruit and vegetable consumption during adolescence, in most of the Western countries (12,13), Asian countries (14,15), Costa Rica (16), and African countries (17), fruit and vegetable consumption is much less than the recommended amount (18).

According to the report of Ministry of Health (Iran) about risk factors of non-communicable diseases in Tehran in 2009, the average daily fruit consumption was 1.57 portions in men, 1.82 in women, and 1.32 in the country. The average daily vegetable consumption was also 1.47 portions in men, 1.59 in women and 1.45 in the country. Therefore 84.87% of men, and 79.4% of the women in Tehran and 88.2% of the country population take less than 5 portions of fruit and vegetable daily (19). Since it affects the risk of contracting chronic diseases, low fruit and vegetable consumption in adolescents is very important (20). Several studies have shown that the habit of fruit and vegetable consumption in childhood will be moved to adolescence and food preferences and eating habits are stabilized during childhood and adolescence (21), and predict food intake patterns in adulthood. Therefor early and timely intervention may maximize its health results and benefits (22). The improvement of fruit and vegetable consumption in children and adolescents is considered as one of the most important issues in public health. To improve fruit and vegetable consumption among children and adolescents, it is essential to know its determinants (21).

According to the study results, availability and accessibility to fruit and vegetable in home, are reported as the main determinants of their consumption (21, 23, 24). Results of a study conducted by Pearson et al. showed that there is a positive association between fruit and vegetable availability in home and its consumption by children (24). In a study conducted by Kristjansdottir et al., on environmental determinants of fruit and vegetable intake among 11 years old children in Iceland, availability and accessibility to fruit and vegetable in home was one of the strongest determinants of their consumption (25). In addition, these researchers said that interventions to

increase fruit and vegetable consumption in children should target some environmental factors like availability of fruit and vegetables (26). Since availability and accessibility to fruit and vegetable in home and at school is one of the important determinants of its consumption in children and adolescents, the present study was conducted to assess the availability and accessibility to fruit and vegetable in home and school among adolescents in Tehran, Iran. We hope that results of this research provide some operational approaches to design, implement and evaluate educational interventions in Iranian adolescents.

2- MATERIALS AND METHODS

2-1. Study design and population

The present research is a cross-sectional descriptive-analytic study which is conducted on 500 adolescents aged 11 to 14 years old in Tehran, Iran, to assess the availability and adolescents' accessibility to fruit and vegetable at school and home. Subjects were chosen by multi-stage random sampling method. At first, due to considering geographical proportion, municipal regions of number 2, 4, 6, 10 and 16 in Tehran city were chosen as study regions from all 22 regions of Tehran (**Figure.1**).

Fig1: Municipal regions of Tehran city, Iran.

Then a male and a female guidance school from region area was chosen randomly (totally 10 schools). The number of students from each school was determined according to the sample size (50 students from each school) (**Table.1**).

Table-1: Sample size based on study region and selected school

Region Number	Number of Schools	Number of Female Students	Number of Male Students
2	2	50	50
4	2	50	50
6	2	50	50
10	2	50	50
16	2	50	50

2-2. Tool development

Techniques of literature review, semi-structured interactive interviews and expert review were used for tool development on the other hand data gathering tool in present study was researcher made after reviewing related and similar tools, and also considering interviews data, research team developed the first version of questionnaire. Then final version of questionnaire was prepared after validity (using 7 experts), and reliability phases.

2-3. Measuring tools: validity and reliability

The data collection tool was a researcher-made questionnaire with 11 questions about baseline characteristics and 10 questions about fruit and vegetable availability and accessibility; six out of these 10 questions were multiple choice (never, rarely, sometimes, most of the time, and always), and four questions had Liker 5 choice scale (strongly disagree, disagree, no idea, agree, and strongly agree) that respectively was scored from 1 to 5. Minimum and maximum range of score was 10 to 50.

The face validity of the questionnaire was assessed by using a sample of the target group (10 adolescents aged 11 to 14 years old who did not participate in the study). The content validity was assessed qualitatively and quantitatively by using experts' opinions (seven experts in health education and four experts in nutrition). In order to assess the content validity quantitatively, two methods including content validity ratio (CVR), and content validity index (CVI) were used. CVR>0.59 and CVI higher than 0.79 were acquired for all questions. Internal consistency (α=0.70), and test-retest (ICC=0.74) were used for reliability of tool. Questionnaires were completed by students at their classrooms.

2-4. Ethical consideration

After obtaining the permission from the relevant institutions, coordination with teachers and getting the informed consent from students, questionnaires were given to be completed. The way of answering questions was explained to the students and we assured them that questionnaires are anonymous and they will be analyzed all together.

2-5. Inclusion and exclusion criteria

The inclusion criteria were students with age 11 to 14 years old, informed consent and voluntary participation in the study.

2-6. Data Analyses

The completed questionnaires were collected and the data was entered into the computer. To analyze the collected data, we used SPSS software version 16.0 and descriptive statistics, t-tests and one-way ANOVA was applied.

3- RESULTS

The present study was conducted on 500 adolescents aged 11 to 14 years old in Tehran, Iran. The mean age of the participants was 12.61 ± 1.01 years. 250 (50%) of the subjects were girls and 250 (50%) were boys. The family size of the studied adolescents ranged from 2 to 9; 224 of the adolescents (44.8%) were the first and 194 (38.8%) were the second child of their families. In terms of fruit availability, 344 (68.8%) of the students reported that they always have fruit at home, 128 (25.6%) said most of the time, 19 (3.8%) sometimes, 8 (1.6%) rarely and only one person (0.2%) said that they never have fruit at home. In terms of availability of vegetable, 136 (27.2%) said always, 194 (38.8%) most of the time, 134 (26.8%) sometimes, and 35 (7%) adolescents reported that they rarely have vegetable in their refrigerator. 30 (6%) of the students reported that their family always provide unhealthy foods (sweets and junk foods) for them. The frequency of other answers to this question was: 60

(12%) most of the time, 202 (40.4%) sometimes, 166 (33.2%) rarely and 42 people (8.4%) said it never happens in their homes. The frequency of answers to this question that "If junk foods are sold in your school", was as follows: 292 (58.4%) always, 98 (19.6%) sometimes, 31 (6.2%) rarely and 66 people said that they don't have any buffet at their school (**Table.2**).

The independent t-test showed no significant difference between the mean score of fruit and vegetable availability and accessibility in boys and girls. Therefore we can say that there is no significant association between the availability and accessibility to fruit and vegetable and sex in this study. On the other hand, one-way ANOVA showed a significant association between fruit and vegetable availability and accessibility and the residential area (P=0.027). The results of multiple comparison with Scheffe test showed that there was a significant difference between the mean obtained score by those who were living in area 6 and area 16, with the mean difference of 1.82 (P=0.035). Therefore adolescents who live in the area 6 of Tehran are provided with more fruit and vegetable and have a better accessibility in comparison with those who live in the area 16.0. This test showed no significant difference between the fruit and vegetable availability and accessibility between those who were living in other areas.

One-way ANOVA showed a significant difference in the mean fruit and vegetable availability and accessibility score in various age groups. According to the results of one-way ANOVA, there was a significant association between fruit and vegetable availability and accessibility score and the family size (P=0.002). Multiple comparison by Scheffe test showed that there is a significant difference between fruit and vegetable availability and accessibility score in families with 4 members and those with 5 or more members. The mean difference score was 1.69 (P=0.002). Therefore, students who live in a family with 4 members had a higher accessibility to fruit and vegetable in comparison with those who were living in families with 5 or more members (**Table.3**). One-way ANOVA showed that there was a significant association between availability and accessibility to fruit and vegetable and parents' education level (P=0.001). Scheffe test showed that the difference between fruit and vegetable availability and accessibility in adolescents whose father had an under diploma education level and those with academic education level was 1.87 (P=0.001). This difference for those with under diploma educated fathers and diploma level educated fathers was 1.66 (P=0.01).

In other words, adolescents whose father had the education level of diploma and academic level, were provided with more fruit and vegetable in comparison with those whose father had an under diploma education level. Results of Scheffe test also showed that the mean difference of fruit and vegetable availability and accessibility score in adolescents with under diploma educated mothers and academic level educated mothers was 2.10 (P<0.001). The difference between the obtained scores by adolescents with diploma educated mothers and academic level educated mothers was 1.20 (P=0.035), and this difference was significant. Therefore adolescents with academic level educated mothers had more access to fruit and vegetable in comparison with other adolescents (**Table.3**).

There was a significant difference between fruit and vegetable availability and accessibility mean score and the size of the house (P=0.012). Scheffe test showed that there was a significant difference between the obtained score between adolescents who were living in houses less than 60 square meters and those who were living

in more than 120 square meters houses (mean difference=2.16, and P=0.028). Therefore adolescents who were living in smaller houses had less accessibility to fruit and vegetable in comparison with those who were living in bigger houses. There was a significant association between the mean fruit and vegetable availability and accessibility score and the birth order as well (P=0.022). The mean difference of obtained score between those who were the first child and those who were the third or more, was 1.70 (P=0.022) which was significant. Thus the first and second children of the family had a better accessibility to fruit and vegetable in comparison with other children (**Table.3**).

Table-2: Frequencies of items related to availability and accessibility of fruit and vegetable for students

Item	Mean ± SD	Number (Percent)				
		Never	Rarely	Sometimes	Most of the time	Always
Fruit is available in our home	4.61 ±0.66	1 (0.2)	8 (1.6)	19 (3.8)	128 (25.6)	344 (68.8)
In our refrigerator vegetable is available	3.86 ±0.90	–	35 (7)	134 (26.8)	194 (38.8)	136 (27.2)
My family members buy unhealthy foods for me	3.26 ±0.98	42 (8.4	166 (33.2)	202 (40.4)	60 (12)	30 (6)
In our school buffet, unhealthy foods is sold	1.27 ±0.86	66 (13.2)	13 (2.6)	31 (6.2)	98 (19.6)	292 (58.4)
My parents make fruits ready for me to eat	3.76 ±1.29	40 (8)	53 (10.6)	88 (17.6)	123 (24.6)	193 (38.6)
In our home, vegetable is served together with lunch and dinner	3.51 ±0.98	4 (0.8)	64 (12.8)	204 (40.8)	127 (25.4)	99 (19.8)
Item	Mean ± SD	Number (Percent)				
		Agree completely	Agree	No idea	Disagree	Disagree completely
My parents don't have enough time to buy fruit and vegetable	6.14 ± 1.03	12 (2.4)	16 (3.2)	108 (21.6)	105 (21)	257 (51.4)
My parents don't have enough money to buy fruit and vegetable	4.57 ±0.88	11 (2.2)	8 (1.6)	41 (8.2)	63 (12.6)	377 (75.4)
Even if the green grocery is not close to our home, my parents always buy fruit and vegetable	4.09 ±1.10	232 (46.4)	145 (29)	79 (15.8)	19 (3.8)	24 (4.8)
I am allowed to take fruit and vegetable from the refrigerator and eat ant time I want to	4.51 ±0.93	357 (71.4)	83 (16.6)	29 (5.8)	18 (3.6)	12 (2.4)

Table-3: Relationship between baseline characteristics and fruit and vegetable availability and accessibility among Guidance school students

Variables	Category	Number	SD± Mean	P-value
Gender	Male	247	37.87 ± 4.31	0.268
	Female	244	37.35 ± 4.63	
Age	11	79	36.75 ± 4.61	0.278
	12	128	37.73 ± 4.35	
	13	165	37.93 ± 4.57	
	14	119	37.62 ± 4.38	
Birth order	1	221	38 ± 4.29	0.022*
	2	192	37.60 ± 4.56	
	≤3	70	36.30 ± 4.75	
Household size	3	69	37.42 ± 4.89	0.002*
	4	294	38.15 ± 4.38	
	≤5	123	36.46 ± 4.33	
Father's job	Employed	181	37.71 ± 4.22	0.016*
	Unemployed	307	37.55 ± 4.65	
Mother's job	Housekeeper	361	37.65 ± 4.34	0.363
	Employed	127	37.49 ± 4.91	
Father's education	Low literate	121	36.35 ± 4.13	<0.001*
	Diploma	132	38.01 ± 4.41	
	Collegiate	223	38.23 ± 4.41	
Mother's education	Low literate	110	36.41 ± 4.52	<0.001*
	Diploma	161	37.31 ± 4.31	
	Collegiate	206	38.51 ± 4.41	
Residential area	2	99	38.13 ± 4.26	0.027*
	4	99	37.61 ± 4.19	
	6	97	38.55 ± 4.39	
	10	97	37.05 ± 4.76	
	16	99	36.73 ± 4.60	
Home size	60≤	65	36.68 ± 4.87	0.012*
	61-90	169	37.27 ± 4.51	
	91-120	126	37.65 ± 4.13	
	>120	91	38.83 ± 4.16	

* Significance at level of 0.05.

4- DISCUSSION

The present research was conducted to assess the status of availability and accessibility to fruit and vegetable at school and home among Iranian students of Tehran city, Iran. Two third of students reported that fruit is available in their home always. This ratio was reported approximately one third for vegetables. 88% of students declared that they are allowed to take fruit and vegetable from the refrigerator and eat any time they want to. Results showed no significant difference between boys and girls in terms of availability and accessibility. In addition, there was a significant relationship between variables of residential area, family size, home size, birth order and the parents' education level and availability and accessibility. As mentioned two third of students reported that they always have fruit at home and it indicates the importance of healthy diet for families in Tehran, Iran. The family has the most importance in promotion of healthy diet behaviors in children and adolescents. Parents should provide a supportive environment for children and

adolescents by increasing the availability of fruit and vegetable at home and applying some rules to control their nutritional behaviors. Results of a study conducted by Neumark- Sztainer et al. (27) on adolescents in Minnesota showed that fruit and vegetable intake has the strongest correlation with its availability at home. The final model showed that explained 45% of the variance was related to availability of fruit and vegetable at home. Interactive effects test showed that when the availability of fruit and vegetable at home was low, without considering taste preferences, the intake pattern had no difference. On the contrary, even when the taste preferences for fruit and vegetable was low, if they were available at home, the intake had an increase. Therefore researchers found out that in order to increase the fruit and vegetable intake in adolescents, it is necessary to target social and environmental factors like fruit and vegetable availability (27).

In response to a question about fruit and vegetable availability at home, less than one third of the adolescents said that it is always available in their refrigerator. Since providing and preparing vegetable takes more time and it is more difficult in comparison with preparing fruits and also it is usually mothers' responsibility, vegetable availability was much less than fruit. Another investigated issue was availability of unhealthy alternative foods at school. A limited number of adolescents said that their family members always buy unhealthy foods (sweet and junk food) for them. This result about availability and accessibility to unhealthy alternative foods such as cheese snack, potato chips, tamarind, fast foods, soft drinks, sweets and chocolates at school was different and most of the adolescents (almost two third) said that these foods are sold in their school buffet. Availability of these foods at school and home is a barrier of fruit and vegetable consumption. On the other hand, due to the change in adolescents' taste from childhood, tendency to consume these foods is more. According to a review study conducted by Krolner et al. on determinants of fruit and vegetable consumption in children and adolescents, access to unhealthy foods is one of the strong determinants of fruit and vegetable consumption (28). In addition, in some studies, the high access to unhealthy foods is considered as a barrier in fruit and vegetable intake and it seems that buying unhealthy foods at school is much easier and cheaper than buying fruit and vegetable (28-30). According to the qualitative studies conducted by these researchers, the availability of unhealthy alternative foods like junk foods and sweets at school and home was mentioned to be a barrier to fruit and vegetable consumption (31). Results of a study conducted by Nago et al. on adolescents in Benin City showed that availability of alternative foods is an important determinant of fruit and vegetable consumption. Adolescents in Benin expressed that sweets and chocolates are more available than fruit and vegetable at schools and children have more accessibility to them. In addition, since these foods are well-prepared, they are more attractive (32).

The studied adolescents in Tehran said that some foods like sweets and junk foods are always sold in school buffets and are easily accessible for adolescents. These foods are provided by parents and siblings at home too and they are usually consumed more than fruit and vegetable at home. Therefore accessibility to unhealthy foods at home and school is more than fruit and vegetable. Meanwhile due to being more delicious, more attractive and easier to be produced and consumed, junk foods are consumed more than fruit and vegetable (31). Most of the studies conducted on fruit and vegetable consumption, show the same result about availability of fruit and

vegetable at school which is absence or low availability of them (28, 33-36). Results of three studies on children in the United States have shown that low availability, low variety and low access to fruit and vegetable and also low attractiveness in comparison with fast foods, are obstacles of fruit and vegetable consumption (37-39). In Di Noia and Contento study, an increase in availability of fruit and vegetable in schools was considered as a promising strategy to enable Afro-American adolescents to consume fruit and vegetable (40). In this study, one third of the adolescents conceded that their parents prepare fruits for them to eat. All of the participating adolescents believed that if fruit and vegetable is prepared by their mothers, for example if it is washed, peeled and sliced or served together with their food, fruit and vegetable consumption will definitely be increased (31). Evidences of four studies have shown that fruit and vegetable consumption in children is dependent to the availability and accessibility to them.

In addition, availability and accessibility may affect other determinants of fruit and vegetable consumption. For example when fruit and vegetable availability is low, exposure to them will be limited and it will limit people's taste about fruit and vegetable flavor and therefore there will be less choices for consumers (23). Results of the present study showed that there is a significant association between fruit and vegetable availability and accessibility and variables of residential area, home size and the family size which are socio-economic indices. Availability of fruit and vegetable at home have been reported as an effective factor in their consumption, in 15 studies from various countries (28). The home size may be an indicator of socio-economic status and international differences, for example vegetables are often not available at Dutch homes, while it is available in Flemmish Belgium (34). In the present study, adolescents who were living in smaller houses had lower accessibility to fruit and vegetable. In Krolner et al.'s study, children from low income families reported that fruit and vegetable is not available in their homes (28), and it is confirmed in our study. Various studies on the relationship between income level and fruit and vegetable consumption have indicated that low income groups have tendency to consume less fruit and vegetables (41). Low income and high expenditure may have a negative impact on fruit and vegetable consumption (42). According to the results of Bigio et al.'s study, the per-capita income was positively associated with fruit and vegetable consumption (43).

The significant relationship between availability and accessibility to fruit and vegetable and parents' education level was another result of present study. Adolescents with academic educated parents had a higher accessibility to fruit and vegetable. The level of education has a direct effect on the job and an indirect effect on family income. Pearson et al. conducted a study on the association between family status and adolescent's fruit and vegetable consumption in 2009, found out that there is a positive association between parents' job and their education level and fruit and vegetable consumption (44). In Samuelson et al.'s study, also there was a positive association between availability of vegetable and mother's education level (45).

A research conducted by Namakin et al., also showed that there is a significant relationship between parents' education level and fruit and vegetable daily consumption among girls in Birjand city, Iran. Rasmussen et al., review study on fruit and vegetable consumption showed that four out of eight studies that had assessed the impact of mother's education level on adolescents' fruit and vegetable

consumption, had reported a positive association between them (47).

4-1. Strengths and Limitations of the study

Present research has some strengths such as using valid and reliable tool, surveying both male and female students, and also generality of results due to sampling method, sample size, and involving all regions of Tehran. There are some environmental factors that could effect on availability and accessibility of fruit and vegetable; these factors (such as shopping center frequency and supermarket availability) were not considered in present study that may be on of limitations. Also, using self-reported questionnaires was another limitation of present research.

5- CONCLUSION

According to the results of this study, approximately one third and two third of students reported that fruit and vegetables is available in their home always, but this status is not acceptable yet, especially for vegetables. Also, designing and performance of effective interventions are necessary on families and school manager. These interventions should be designed in a various, interactive and attractive way and by using proper educational methods. Parents and especially mothers have a key role in shaping and changing adolescents' nutritional behaviors by providing more fruit and vegetable at home. Findings of present study alarms this fact that all children must equally considered and avoid discrimination and provide fruit and vegetable for other children like the first and second ones. Researchers of the present study, strongly recommend to design and implement educational programs to promote parents' awareness of healthy diet and disadvantages of unhealthy foods. It is necessary that all authorities of education ministry, managers and teachers change their policies and provide a healthy snack for students. Schools buffets should offer fruit and vegetable instead of unhealthy foods which are abundant in most of the schools in Tehran, Iran.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGEMENT

Authors of this article would like to express their appreciation to education authorities, managers, teachers and all of students participated in this study.

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