

Fruit and Vegetables Consumption among Adolescents: a Study from a Developing Country

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Abstract: A diet rich in fruits and vegetables as an optimal eating behavior is recommended for adolescents' health. Therefore, the aim of this cross-sectional study was carried out among 402 adolescents to identify factors related to daily fruit and vegetables consumption in Tabriz, Iran. A general self-administrated questionnaire was used to assess demographic characteristics, subscale perceived family support and self efficacy. A valid food frequency questionnaire was also used to measure daily consumption of fruit and vegetables. Both univariate and multivariate logistic regression tests were performed to examine the association of fruit and vegetables daily intake with psychosocial predictors and gender. The mean age of adolescents was 12.93±0.49 years and 51.5 % were girl. Overall, the average serving size was 2.58 ±0.96 for fruit and 2.67±0.99 for vegetables. Only one third (30.3% and 34.6%) of adolescents had the optimal consumption of fruit and vegetables, respectively. Compared to boys, girls recorded high level of fruits (35.7 % vs. 24.6%) and vegetables (36.2 % vs. 32.8%) intake. Male gender (OR =2.03, 95% CI= 1.04-2.52, P=0.030), employed mothers (OR= 2.11, 95% CI=0.92-3.88, p=0.083), high-fat foods (OR= 2.11,95%CI=1.01-4.21, p=0.045), perceived emotional family support (OR=1.10,95%CI= 1.01-1.15, p=0.014) and practical family support (OR=1.04,95%CI=1.10-1.11, p=0.029) showed significant relationship with low consumption of fruits and vegetables. It was found that the boys were at risk of low levels of daily fruit and vegetable consumption. The lack of family support represents an increased risk for lacking in daily fruit and vegetable consumption. It seems that family support should be an integrated part of any health education/promotion programs to improve daily fruits and vegetables consumption among adolescents.

Key words:

INTRODUCTION

Children and adolescents are victims of unhealthy behaviors: poor nutrition, insufficient daily fruit, vegetables consumption, excessive high dense food intake. inactivity, smoking, etc [1].

Evidence show that adequate daily fruit and vegetables intake are necessary for adolescents health [2]. It is estimated that optimal daily fruit and vegetables consumption (3-5 servings per day) [2] will protect against the main non communicable diseases [3, 4].

Adherence to a healthy eating is multidimensional matter, which may be affected by the different personal, Social economical and cultural determinants [5, 6]. The main determinants of high consumption of fruit and vegetables among adolescents were previously well recognized. It was shown that high consumption of fruit and vegetables among adolescents were varied based on gender [7], age [5, 8], Preference [5, 9], self efficacy [10, 11], family socio economical status [5, 7, 12], parental characteristics [6, 13].

Due to the family potential resources, intimacy and reciprocal relationships, family is recognized as one of the most important determinants of children and adolescents healthy eating behavior [11, 12]. Social and family environment can affect adolescents choice, accessibility to healthy foods on preferable modes [14, 15], through providing facilities [16, 17], role modeling [16, 18], encouragement, reinforcement [6, 8, 17], parenting styles [19, 20], accompaniment [15, 18, 21], indirectly through communicating knowledge, belief, attitude [14, 22], that all referred as “family support “ [23]. Family support as an extensive and meaningful concept, can involve parents, siblings and other caregivers at home [23]. Interventional studies showed controversial results concerning family support [24, 25], however, Positive direct and indirect effects of family support were revealed via descriptive studies [5, 6, 13].

A national survey [26] about Iranian students eating behaviors indicated that in comparison with high level of salty, high fat snack and deep fried food intake, the frequency of fruit and vegetables consumption was lower than the amount recommendation by USDA [2], surprisingly shown that eating behavior among adolescents did not affect by their nutritional knowledge [27]. There may be some potential determinants, influencing the adolescents eating behaviors

As limited evidence exist regarding the Iranian adolescents fruit and vegetables consumption determinants, the current study was developed to identify factors that contribute to daily fruit and vegetables consumption among Iranian adolescents. It is hoped that the findings from this study might add to the existing literature on the topic and perhaps provide essential information intend to develop tailored interventions.

MATERIALS AND METHODS

Design and Data Collection: This cross sectional study of eating behaviors predictors was carried out among 402

adolescents in Tabriz, Iran. After obtaining written consent letter from authorities, schools administrators and one of the parents, timetable to collect data was developed jointly with the school officials. All of the adolescents completed the questionnaire by themselves at their classroom during lesson times on the third week of starting academic year in October 2010. The main investigator (BS) and Maryam Saghafi-Asl administered the survey questionnaires and was available to answer possible questions. All adolescents had given about 45 minuets to fill-in the questionnaires.

Participants: The participants were 12 to 15 years old (n = 402) studying at 7th grade during the investigation time. There were 183 schools from which 4 schools were randomly selected (two from boys’ schools and two from girls’).

Measures: A comprehensive questionnaire consisting of four sections were used to collect data:

- Demographic questionnaire this was a 10-item questionnaire including questions on age, gender and items on parental information (age, education, employment status, etc.).
- Family Affluence Scale (FAS) this was used to identify the socio-economic status of adolescents [28]. The measure consisted of five different items including car ownership (0, 1, 2, 3 or more), computer and laptop ownership (0, 1, 2, 3 or more), number of rooms excluding kitchen and bathroom (0, 1, 2, 3 or more), number of telephone line (0, 1, 2, 3 or more) and unshared bedroom (no = 0, yes = 1). Participants were asked to report the number of items. Then, the FAS score was calculated by summing the responses giving a score ranging from 1 to 12. for the analysis, the FAS score was categorized into: low (1-4), intermediate (5-8) and high (9-12).
- Self-efficacy this was an 8 -item questionnaire using questions from well-known instrument developed by Watson *et al.* [29]. Participants were asked: if they were requested to increase the level of their daily serving fruit and vegetables consumption or reducing unhealthy foods how confident they could do so? Respondents rated the perceived self-efficacy on a 5-point Likert scale (very unsure = 1 to very sure = 5) giving a possible score ranging from 10 to 50.

- Family support specific to healthy eating this was a 16-item questionnaire containing questions about perceived informational family support specific to healthy eating (PIFSHE-3 items), perceived emotional family support specific to healthy eating (PEFSHE- 3 items) and perceived practical family support specific to healthy eating (PPFSHE-11 items). The questions were derived from instruments developed by Sallis et al, Stanton et al [20,30,]. Participants were asked: how often their mother would advised, told, gave them information about advantages of fruit and vegetables daily servings and disadvantages of unhealthy foods (informational support); how often their mother would encourage them to eat fruit and vegetables, admire them during eating fruit and vegetables, or watch their participation (emotional support); and eat fruit and vegetables with them, provide fruit and vegetables so they can eat whenever they want, provide fruit and vegetables as snack to take school for them (practical support). There were also 3 items to assess the negative aspect of practical support as below how often their mother would buy high fat foods, ate high fat foods in front of their adolescents, critic or punished them when they want more fruit vegetables. Each respondent rated the perceived support on a 5-point Likert scale (never, rarely, sometimes/usually, always) giving a possible score ranging from 3-15 for informational support, 3-15 for emotional support and 11-55 for practical support, respectively.

The cornerback's alpha reliability coefficient was valued for the total scales. and test retest reliability (ICC) was valued 0.63-0.79

- Outcome measures: a valid, semi-quantitative food frequency questionnaire (FFQ) that included 118 food items from three main food groups and subgroups (fruit, vegetables, milk and dairy foods, high fat foods, salty and sweetened foods) [27, 31] were used to measure eating behaviors. Here data for fruit and vegetables and high fat foods was used for analysis. Fruit and vegetables items included fresh, dried fruit and vegetables (potato and fruit juice not included). High-fat food items as an unhealthy foods include red meats, tallow, animal fat, chicken wings, chicken skin, fast food and snacks, sausage, hamburger, hotdog, nugget, egg, Kentucky, pizza, fried foods: fried vegetables, French fries, fried potato, chips, fried red meat, burgers, high fat milk,

high fat yoghourt, creamy cheese, ice cream, creamy sweets high fat breed, creamy cake, Crème caramel, caster, traditional high fat desserts, halva, butter, mayonnaise souse.

Participants were asked to recall the frequency of the mentioned fruits, vegetables and high fat foods that they consumed during the last week. They were also requested to estimate the serving size of each food item according to common and domestic scales [27, 31], based on the USDA recommended Portion size [2].

The possible responses were ranged from never, to times per day and times per week. All the responses for each food group were recoded into daily consumption (never=0, below 1, 1,2,3 and more servings per day). Average daily consumption for each food group, were computed by summing the related each food groups servings selected by adolescents.

Comparative Validity of the FFQ was carried out using a 3- day food recall questionnaire among 40 adolescents as the nutrition criterion. (ICC valued =0.57- 0.87). Also the test- retest reliability for 2 week interval as it was checked, was 0.64, 0.76.

Analysis: Descriptive statistics including frequency, percentage, mean and standard deviations were used to represent the data. Both univariate and multiple logistic regression analysis were performed to examine the association between dependent variable (fruits and vegetables consumption) and independent variables including age, gender, mother's age and employment, parental education and marital status, the FAS, high fat foods, family support and self-efficacy. To perform logistic regression analysis, the dependent variable (fruit and vegetables consumption) were categorized into two levels: equal or greater than 3 servings per day (desirable outcome) and less than 3 servings per day (unpleasant outcome). All analyses were performed for entire sample and separately for girls and boys. Data were analyzed using SPSS statistics software version 11.5. $P < 0.05$ was considered significant.

Ethics: The ethics committee of Tehran University of Medical Sciences approved the study The aim of the study explained to adolescents and their parents. An informed written assent was taken from all the adolescents as well as one of their parents. Adolescents could withdraw from the study at any time before or during the completion of the questionnaire.

RESULTS

Participants' Characteristics: In all 402 students completed the questionnaire. The average age of the participants was 12.93 (SD=0.49) years and 51.5 % were girl. There were significant differences between boys and girls in some characteristics including their self-efficacy, their mothers' education and employment status. Overall, only 15.2 % of adolescents' mothers were employed (Table 1).

Adolescent' Daily Fruit and Vegetables Consumption: The average daily fruit intake among adolescents was 2.58 (SD=0.96), vegetables 2.67(SD=0.99) servings per day. Only 30.3%, 34.6% of the adolescents met the daily fruit and vegetables recommendation, respectively. Compared to boys, girls reported high levels of daily fruit (%35.7> % 24.6) and vegetables (%36.2>%32.8). Average daily fruit and vegetables intake was higher among girls compared to boys [fruit = 2.69 (SD=0.98) vs. 2.47(SD=0.94), vegetables = 2.70 (SD=0.99) vs. 2.65 (SD=0.96)]. Significant association between food intake with gender was recognized (p=0.02).

Predictors of Adolescents' Daily Fruit and Vegetables Consumption: mong different predictors of adolescents' daily fruit and vegetables intake, male gender (OR=2.03, 95% CI=1.04-2.52, P=0.030), high-fat food consumption (OR=2.11, 95% CI=1.01- 4.21, P= 0.045), perceived emotional family support (OR=1.10,95%CI= 1.01-1.15, p=0.014) and practical family support (OR=1.04, 95%CI=1.10-1.11, p=0.029) had significant relationship with low levels of daily fruit and vegetables consumption. Having employed mother was not associated significantly with daily fruit and vegetables consumption (OR=2.11, 95%CI= 0.92-3.88, p=0.083).

Predictors of Girl ' Daily Fruit and Vegetables Consumption: High-fat food intake (OR =3.34, 95%CI= 1.05-10.63, P=0.014), perceived practical family support (OR=1.10, 95%CI= 1.02-1.21, P=0.018) and self-efficacy (OR=1.10 95%CI= 0.91-0.99, P=0.014) had significant association with low levels of daily fruit and vegetables consumption.

Predictors of Boys' Daily Fruit and Vegetables Intake: Male adolescents age i.e. being more than 14 years old (OR= 4.55 95%CI=-1,21-17.22, P=0.029), perceived emotional family support (OR= 1,11 95%CI= 1.07-1.20, P=0.050) had marginally significant association with male daily fruit and vegetables intake.

DISCUSSION

This cross-sectional study showed that average daily fruit and vegetables consumption among boys and girls were lower than the daily recommended servings per day. Only one third of the adolescents reported consumption of fruit and vegetables over 3 servings in the last week. In comparison with Chinese adolescents [32], our findings showed that the level of fruit and vegetables consumption among Iranian adolescents were lower, but fairly higher than Patrick's findings related to American adolescents [33].

Low level consumption of fruit and vegetables among adolescents during school times is common and might be explained by several factors including exposure to unhealthy foods, their autonomy to select and intake the preferable, favorable snacks, eating away from home, peer influences, higher school assignments, lack of time or experiences to make healthy snacks by parents or by themselves [14,21]. In addition, Iran is in its transition period from traditional to modern society. New and modern life styles substitute for traditional methods and thus fast foods and unhealthy dietary behaviors are emerging among adolescents and families [26,27].

Comparing the average daily fruit and vegetables intake of boys and girls show that girls reported more daily consumption of fruit and vegetables, girls also had daily high-fat food intake compared to boys. Like previous studies [8,34,35], boys, especially older boys were recognized as the vulnerable group whom would not comply with daily recommendation of fruit and vegetables servings intake. Gender consumption differences might reflect the fact that boys have more autonomy than girls in their food choice, eating away from home, however the adolescence autonomy were recognized as a risk factor to attach unhealthy foods [21]. In contrast, some studies showed that girl adolescents had poorer dietary habits than males [35].

Some subgroups also had different daily intake of fruit and vegetables. Adolescents who had over 14 years old were detected as high-risk group. This finding is consistent with previous studies [35]. It seems that the more adolescents advance in age and cognition, the more their authority to select and consume preferred food may increase [14,21]. Community settings and peer influences may emerge. Therefore age as a personal factor would make them adhere to unhealthy behaviors as recognized in most of studies [5,36].

Adolescents who had employed mother were more at risk of lacking in daily fruit and vegetables intake; however, it was not significant (P= 0.08). It seems that

Table 1: The characteristics of the study sample

	Total (n= 402) No. (%)	girl (n = 207) No. (%)	boy (n= 195) No. (%)	P
Age (year)				0.452*
≤ 12	65 (16.1)	35 (16.9)	30 (15.4)	
13	301 (74.9)	157(75.8)	144(73.8)	
≥14	36 (9)	15(7.2)	21(1.08)	
Mean (SD)	12.93 (0.49)	12.90 (0.47)	12.95 (0.50)	0.302**
Mother age				0.163*
20-34	120(29.9)	61(29.5)	59(30.3)	
35-39	143(35.6)	82(39.6)	61(31.3)	
40-55	139(34.6)	64(30.9)	75(38.5)	
Mean (SD)	37.4(5.13)	36.97(4.50)	37.83(5.69)	0.091**
Mother employment				<0.001*
Housewife	341 (84.8)	161(77.8)	180 (92.3)	
Employed	61 (15.2)	46 (22.2)	15 (7.7)	
Parent marital status				0.052*
Married	385 (95.8)	202(97.6)	183 (93.8)	
Widow	17 (4.2)	5 (2.4)	12 (6.2)	
Mother education				0.020*
0-12	352 (87.6)	174 (84.1)	178 (91.3)	
> 12	50 (12.4)	33 (15.9)	17 (8.7)	
Mean (SD)	10.36(3.39)	10.99 (3.03)	9.89 (3.62)	<0.001**
Father education(yrs)				0.020*
0-12	320 (79.6)	156 (75.4)	164 (84.1)	
> 12	82 (20.4)	51 (24.6)	31 (15.9)	
Mean (SD)	10.89(3.66)	11.48(3.31)	10.27 (3.90)	<0.001**
F A S				80.158*
Low	61 (15.2)	25 (12.1)	36 (18.5)	
Medium	309 (70.9)	163 (78.7)	146 (74.9)	
High	32 (8)	19 (9.2)	13 (6.7)	
Self-efficacy				0.923**
Mean (SD)	29.01(7.09)	29.04(7.25)	28.97(7.04)	
PIFS				0.611**
Mean (SD)	18.55(5.62)	18.68(6.64)	18.4(4.28)	
PEFS				0.754**
Mean (SD)	9.31(3.2)	9.35(3.31)	9.25(3.15)	
PPFS				<0.001**
Mean (SD)	25.46(5.50)	26.61(5.62)	24.25(5.07)	

#significant at 0.05 level.< 0.05, * Derived from chi-square.** Derived from t-test

FAS: Family affluence scale

PIFS: Perceived informational family support

PEFS: Perceived emotional family support

PPFS: Perceived practical family support

Table 2: Distribution and comparison of daily fruit and vegetables consumption by gender

	All (n=402)	Girl (n=207)	Boy (n=195)	P#
Fruit intake (servings/ day)				
Mean (SD)	2.58(0.96)			
	2.69(0.98)	2.47(0.94)	0.020*	
Frequency (%) for optimal intake of daily fruit (≥3-5 servings)	122(30.0)	74 (35.7)	48(24.6)	
Vegetables intake (Servings day)				
Mean (SD)	2.68(0.99)	2.70(0.99)	2.65(0.96)	0.616*
Frequency (%) for optimal intake of daily vegetables (≥ 3-5) servings	139(34.6)	75(36.2)		
	64(32.8)			
High fat Foods intake(servings/day)				
Mean (SD)	3.56(0.82)	3.53(0.82)	3.48(0.82)	0.560*
Frequency (%) for optimal intake of daily high fat foods (< 2) servings))	50(12.4)	24(11.6)	26(13.3)	

significant at 0.05 level. * Derived from t-test

+ One serving of the fruit is equal to one medium apple, Pear, apricot, cherry, peach, nectarine, green plum, fig, grapes, kiwi, grapefruit, orange, persimmon, tangerine, pomegranate, dates, prune (yellow and red), sour cherry, strawberry, banana, sweet lemon, lime lemon, mulberry, dried fruits (fig, mulberry, peach and apricot), A slice of Cantaloupe, Persian melon, watermelon, one cup Cranberry, pineapple (raw and canned), one can Canned fruits,

++ One serving of vegetables is equal to one medium cucumber, carrot tomato or other fresh vegetable; one cup of raw and cooked leafy vegetables, shredded lettuce, celery, green pea, spinach, mushroom; one tablespoon of raw and cooked tomato, cucumber, squash, eggplant, carrot, garlic, onion, green pepper, turnip, green chilies number, cooked green bean, fried onion, cruciferous vegetables (including cauliflower, red and white cabbage);one slice of pumpkin

Table 3: Results obtained from logistic regression analysis for low level consumption servings of fruit and vegetables among girls

	*OR (95%CI)	P	**OR (95%CI)	P
Girl (n=207)				
High fat food consumption				
Low	1.0		1.0	
High	3.20(1.04-9.66)	0.042	3.34(1.05-10.63)	0.041
Self efficacy	1.10(0.91-0.98)	0.011	1.10(0.91-0.99)	0.014
PIFS	1.10(0.92-1.03)	0.311	1.10(0.88-1.05)	0.377
PEFS	1.02(0.94-1.11)	0.634	1.03(0.91-1.21)	0.688
PPFS	1.10(1.01-1.14)	0.033	1.10(1.02-1.21)	0.018
Boy (n=195)				
Age (yrs)				
≤12	1.0		1.0	
13	1.57(0.71-3.46)	0.262	2.32(0.97-5.18)	0.057
≥14	1.63(0.52-5.11)	0.402	4.55(1.21-17.72)	0.029
Mother Age				
40-55	1.0		1.0	
35-39	1.21(0.59-2.33)	0.637	1.20(0.55-2.41)	0.710
20-34	1.99(0.97-4.11)	0.059	1.96(0.91-4.24)	0.084
Self efficacy	1.01(0.96-1.04)	0.982	1.01(0.97-1.10)	0.560
PIFS	1.11(0.93-1.06)	0.902	1.04(0.96-1.13)	0.306
PEFS	1.03(0.84-1.12)	0.025	1.11(0.77-1.20)	0.050
PPFS	1.80(0.97-2.05)	0.613	1.10(0.92-1.11)	0.782
Gender				
Girl	1.0		1.0	
Boy	2.10(1.05-2.33)	0.025	2.03(1.04-2.52)	0.030
High-fat food Consumption				
Low	1.0		1.0	
High	3.34(1.05-10.63)	0.041	2.11(1.01-4.21)	0.045
Self-efficacy	1.10(0.95-1.01)	0.058	1.11(0.95-1.06)	0.112
PIFS	1.11(0.94-1.02)	0.224	1.10(0.94-1.04)	0.742
PEFS	1.10(0.1.01-1.13)	0.044	1.10(1.01-1.115)	0.014
PPFS	1.03(0.98-1.07)	0.278	1.04(1.01-1.10)	0.029

* Unadjusted odds ratio, ** Adjusted odds ratio

presence of mother at home or having unemployed mother had positive effects on adolescents food intake. Mother is traditionally responsible for meal preparation. Mother employment may change or intervene with their practical support like healthy food/ fruit and vegetables preparation, home availability, parental supervision, positive role modeling. this results are consistent with the previous findings [15,21].

Females with low self-efficacy were recognized as high-risk group of lacking daily fruit and vegetables servings consumption. This finding is consistent with previous studies [10,11,16]. In comparison with previous findings, self-efficacy was found to be significantly associated with interest in healthy eating. girls demonstrated more interest in healthy eating. There were no significant associations among self-efficacy and health interests among the 7th graders. However, among 11th graders, self-efficacy was strongly associated with interest in healthy eating [10].

Food, fruit and vegetables intake among adolescents at 11th grade was a psycho-personal as well as a social issue. It was found that family support had a significant contributing role to daily fruit and vegetables consumption among adolescents. In fact, when data were analyzed separately, low perceived emotional support for boys and low practical support for girls were found to be significant predictors of low fruit and vegetables consumption. boys with low perceived emotional family support and girls with low perceived practical family support were at risk of lacking in daily fruit and vegetables intake. Numerous studies have shown the similar result [6,20,21]. This positive association shows that those adolescents who perceived any kind of encouragement from mothers may be those who had more than 3 servings of fruit and vegetables consumption.

Pearson *et al.* [8,37], reported that there was a strong association between parental support and adolescents healthy eating, confirming that practical and emotional

support were the most important type of family support that associated with adolescents' fruit and vegetables consumption. Studies found that family support had strong effects on adherence to daily fruit and vegetables servings consumption dependently and independently via accessibility or exposing to fruit and vegetables at home or at school [15,16].

Limitations: The reliance on self-reported daily fruit and vegetables intake and perceived family support by adolescents are considered as the limitations of the present study. In addition, we did not collect data on father, sibling and peers support. Additional research is needed to determine and compare the predictive values of other potential social support sources including father, siblings and peers to better understand the influences of parental support on adolescents fruit and vegetables consumption and other kinds of healthy behaviors. As this study was designed to perform an interventional program, these brief findings present preliminary step to realize the relationship between mothers' support specific to the limited intake of fruit and vegetables of participants. We can't take any conclusion about causal relationship from results of this cross-sectional study. We suggest that future studies also include parameters of cultural measures.

CONCLUSION

The findings of the current study indicate that male students are at higher risk of getting less fruit and vegetables. However, both girl and boy students did not meet the recommended daily fruit and vegetables servings (more than 3-5 serving per/day). The results also showed that perceived emotional support for boy adolescents and perceived practical family support girls highly affect their healthy eating. Thus, family support is a significant contributing factor for adequate fruit and vegetables consumption. To achieve optimal eating among young adolescents, it seems that family support, especially practical and emotional support, should be an integrated part of any health education/ promotion programs for improving daily fruit and vegetables consumption among adolescents.

Competing Interests: The authors declare that they have no competing interests.

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