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Original Article

Socioeconomic Inequality in Fruit and Vegetable Consumptions in Elderly People: A Cross Sectional Study in North West of Iran

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ABSTRACT

Background and Objectives: High fruit and vegetable (FV) consumption has been shown to protect humans against chronic diseases in elderly people. As several factors can affect FV consumption, the aim of this study was to investigate associations between the socioeconomic status and FV consumption in elderly people.

Materials and Methods: This population-based cross-sectional study was carried out on 238 elderly people, aged over 65 years and living in Marand, northwest of Iran. Consumption of FV was assessed using validated 110-item food frequency questionnaire (FFQ). The participants were selected from seven health care centers.

Results: The mean age of the participants was 71.7 ±4.1 years with 65.5% were males. The adequate daily consumption of FVs (totally 400g or more) was reported in 58% of the participants. Old ages and low educational levels were associated to low consumption of FVs ($P < 0.05$). High incomes and marriage statuses were significantly associated to high consumption of fruits ($P < 0.001$). High consumption of vegetables was seen in people with lower economic status. The logistic regression analysis showed that the chance of FV consumption in participants who owned a house, got married or had a high income was 3.05, 2.02 and 2.39 times greater, respectively.

Conclusions: This study has demonstrated important roles of the socioeconomic factors such as household income level, gender and marital and educational statuses on consumption of FVs. Therefore, our results suggest that, the future policies and interventions to improve the consumption of FVs in elderly people should consider socioeconomic inequalities.

Keywords: Fruit, Vegetable, Elderly People, Socioeconomic, Iran

Introduction

Fruits and vegetables (FVs) are rich sources of micronutrients and considered as important components of healthy diets (1). High consumption of FVs has been shown to be protective against obesity (2) diabetes (3), hypertension (4), stroke (5), cancer (6) and osteoporosis (7). These diseases are mostly prevalent in elderly populations (8, 9). It was estimated in 2003 that inadequate consumption of FVs was attributed to 5.2 million deaths (1). The World Health Organization (WHO) has recommended a minimum intake of 400 g or five servings of FVs per day (10). Evidences suggest that consumption of

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FVs decreases with decreases in age in countries with middle to high gross domestic product (GDP) such as Iran and USA (11–13). Recently, attentions have raised toward the effects of socioeconomic and environmental factors on food choices. Studies have suggested that the low consumption of FVs is strongly associated to socioeconomic status, including male gender, old age, low education, low income and being single, widow or divorced (4, 12, 14–16).

Iran is one of the countries with growing elderly and hence needs proper health policies (17). A population based study on 400 elderly people from 23 nursing houses in Tehran using food frequency questionnaire (FFQ) showed that consumption of FVs was lower than the recommended level (400 g day^{-1}) and associated to age, marital status, educational level and income level (12). In a Brazilian study on 2,066 low-income elderly people in Sao Paulo, 2009, nearly 20% of the people consumed sufficient FVs. Furthermore, consumption was positively linked to income and years of schooling (18). Previous studies have majorly carried out in metropolitans. Limited results are available for the consumption of FVs in small cities and rural regions; therefore, this study was carried out to investigate consumption of FVs and associated factors in elderly people in Marand (an agricultural small city), north west of Iran.

Materials and Methods

The current population-based cross-sectional study was carried out in seven health care centers in Marand, northwest of Iran, from April to August 2017. Inclusion criteria of the volunteers were as follows: 1) age above 65 years; 2) no specific diseases like swallowing or chewing disabilities; and 3) wishes to participate in the study. Sampling was carried out using cluster random sampling. The city was subdivided into seven districts on the basis of homogeneities in geographical characteristics. Each district was assumed as a cluster. The appropriate sample size for each district was calculated based on the population. Health centers in each district were selected randomly. Totally, 238 volunteers were participated in the study. Then, personal and demographic data of the participants were collected. These data included age, gender, marital status, educational level, food expenditure, housing status, smoking status, income level and family size through completing general questionnaires and then validated 110-item semi-quantitative FFQs, which reported number of food consumption per day, week and month (19). Furthermore, participants were asked to report their food intake volumes. Daily FV intake for each participant was estimated based on these data. To collect data, trained interviewers carried out face-to-face interviews. The study was approved by the Ethics Committee of Tabriz University of Medical Sciences, Tabriz, Iran. All participants provided written informed consent prior to the study enrollment

Statistical analysis: Data were statistically analyzed using SPSS Software v.17.0 (SPSS Inc., Chicago, IL, USA). Mean ±SD (standard deviation) and frequency (%) were used to describe quantitative and qualitative variables, respectively. Normality of the continuous variables was assessed using one-sample Kolmogorov-Smirnov test. Independent sample T-test and ANOVA were used to compare mean (SD) of the consumptions between groups. A *P*-value of less than 0.05 was considered as statistically significant. Binary logistic regression was used to investigate relationships between the FV consumption and the socioeconomic variables of the participants, including age, gender, educational, marital, economic and food expenditure statuses. To avoid infinite odds ratios, some categories were merged. For example, marital status was categorized into ‘married’ and ‘single’.

Results

In this study, the mean age of the participants was 71.7 ±4.1 years (65–80 years) and 65.5% of them were males. The mean daily consumption of FVs included 152.7 ±81.58 g day^{-1} and 270.35 ±88.21 g day^{-1}, respectively. Nearly half of the participants (58.8%) reported adequate FV consumption (totally 400 g day^{-1} or further). Mean FV consumptions based on demographic variables are presented in Table 1. Results showed that the FV consumption in higher age groups was lower, compared to that in other groups ($P < 0.001$). Moreover, results showed that FV consumption in literate elderly people was higher than that in illiterate people ($P<0.001$). However, the mean FV consumption was not significantly different between the subgroups of gender, marital status and income level, while high-income subgroup and younger participants consumed more fruits, compared to subgroups of low-income level ($P= 0.05$) and older participants ($P<0.001$), respectively.

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Table 1. Demographic characteristics of the study population (n = 238)

Gender▪	male	156(65.5)
Housing status▪	own house	188(79)
Following a special diet▪	yes	60(25.2)
Supplementation ▪	YES	24(10.1)
Smoking▪	YES	94(39.5)
Marital status▪	married	175(73.5)
Educational status▪	literate	128(53.8)
Income (thousand Tomans)▪	<1500	110(46.2)
Family size▪	< 2	112(47.1)
Food expenditure (thousand Tomans)▪	< 800	152(63.9)
Age (years)▪	65-70	102(42.9)
	71-75	72(30.3)
	76-80	64(26.9)
Fruit consumption (g/day)*		152.77±81.58
Vegetable consumption (g/day)*		270.35±88.21
Fruits and vegetables consumption (g/day)▪	< 400	98 (41.2)
	400 ≤	140 (58.8)

*Described by Mean ±SD; ▪describe by frequency (%)

Significant differences were seen between the subgroups of food expenditure, gender, housing status, marital status and educational level in vegetable consumptions. Participants with higher income and food expenditure significantly consumed lower quantities of vegetables per day, compared to those with lower income (P<0.05). Participants who owned personal houses consumed significantly lower vegetable quantities, compared to those who lived in rented houses (P<0.05). In addition to economic variables, significant differences were seen in vegetable consumption between the age (P < 0.001) and gender (P<0.05) subgroups. Differences in mean consumptions of fruits, vegetables and FVs were not significant between the smoker and non-smoker participants and those from small families and large families (Table 2).

Table 2. Fruit and vegetable consumptions in various study groups

Variable		Fruit consumption	P	Vegetable consumption	P	FV consumption	P
Gender	Male (n=156)	232.8±125.2	0.004*	371.5±112.7	0.02*	604.4±190.1	0.99*
	Female (n=82)	190.5±93		414±190		604.6±176.8	
Housing status	Rental (n=50)	181.8±78.2	0.002*	412.8±63	0.01*	594.7±79.3	0.50*
	Own house (n=188)	227.9±123.1		379.1±137.2		607±204.4	
Following a special diet	Yes (n=60)	235.9±130.7	0.17*	410.5±113.7	0.08*	646.5±147.3	0.04*
	NO (n=178)	212.2±111.1		378.8±129.1		590.2± 194.7	
Smoking	YES (n=94)	228.2±93.6	0.25*	379.9±90.2	0.49*	608.1±146.3	0.78*
	NO (n=144)	211.7±129.2		390.2±144.8		602±207.2	
Marital status	Single (n=63)	185±92.7	0.00*	381.3±85.3	0.65*	566.3±114.8	0.01*
	Married (n=175	230.1±122		387.9±137.9		618.1±203.3	
Educational status	Illiterate (n=110)	184.2±91.5	<0.001*	369.1±151.2	0.06*	553.4±215.3	<0.001*
	Literate (n=128)	247.4±127.6		400.8±97.6		648.3±144.9	
Income (Thousand Tomans)	<1500 (n=110)	189.9 ±78.2	<0.001*	410.5±86.7	0.003*	586.5±137.9	0.15*
	1500≤ (n=128)	242.5±137.1		377.3±141.5		619.8±217.2	
Family size	<2 (n=112)	211.2±97.9	0.37*	392±102.2	0.49*	603.3±150	0.92*
	2≤ (n=126)	244.4±130		380.9±144.1		605.4±212.1	
Food expenditure (Thousand Tomans)	<800 (n=152)	204.1±101.5	0.02*	411.9±95.3	<0.001*	616.1±148	0.25*
	800 ≤ (n=86)	243.1±136.3		340.7±157.6		583.8±236.8	
Age (year)	65-70 (n=102)	266±139.5	<0.001**	392.4±99.4	<0.001**	653.±174.3	<0.001**
	71-75 (n=72)	200.8±78.3		422.7±124.2		623±160.4	
	76-80 (n=64	170.3 ±85.9		235.2±149.2		505.5±192.7	

FVs, fruits and vegetables; *P-values reported based on independent t-test; **P-values reported based on ANOVA test. Data described as mean ±SD

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Table 3 shows the odds ratio of socioeconomic variables for fruit, vegetable and FV consumptions. Logistic regression analysis showed significant relationships between the gender, housing status, marital status, educational level, household income level and age with fruit consumption. The current analysis demonstrated relationships between the housing status and age with vegetable consumption. In fact, lower age in elderly people was a protective factor for vegetable consumption. Possibility of the fruit consumption in men was 2.27 times higher than that in women (OR = 2.27, 95% CI 1.2–5.8). Moreover, married, educated and high income participants had higher odds of fruit consumption. Of all variables, only three variables of housing status, marital status and household income level were significant for FV consumption in participants. Chances of FV consumption in participants who owned houses, married and had high incomes respectively were 3.05, 2.02 and 2.39 times greater than chances of FV consumption in other participants.

Discussion

In the present study, a high frequency of FV consumption was indicated. Nearly 58% of the participants achieved WHO recommendations for daily consumption of FVs. Sabzghabaee et al. found that 38.7 and 36.8% of the Iranian elderly men and women consumed five or more servings of FVs per day, respectively (20). The inconsistency between the current results and similar results from other studies may be linked to time of data collection and city location. Marand is an agricultural regional and FV production is higher in spring. In 1998, 51% of rural and 37% of urban elderly people consumed sufficient FV per day in the United States (13). In the current study, three variables included housing status, household income level and marital status were linked to FV consumption. Furthermore, gender, educational level and age group were associated to consumption of fruits and vegetables. However, no relationships were seen between the highlighted variables and consumption of FVs. In this study, consumption of fruits was higher than consumption of vegetables, which was affected by the economic situation such as income level and housing status.

Table 3. Relationships between the demographic, social and economic factors and consumption of fruits and vegetables

		fruits			vegetables			fruits & vegetables		
		OR	CI 95%	P value	OR	CI 95%	P value	OR	CI 95%	P value
gender	women	ref	-	-	ref	-	-	ref	-	-
	men	2.27	1.2-5.8	0.03	0.8	0.4-2.9	0.66	1.31	0.6-3.2	0.79
Housing status	rental	ref	-	-	ref	-	-	ref	-	-
	Own house	2.76	1.3-6.4	0.02	2.79	1.4-7.4	0.02	3.05	1.6-8.2	<0.001
Following special diet	No	ref	-	-	ref	-	-	ref	-	-
	Yes	1.66	0.7-3.9	0.62	1.33	0.6-3.3	0.74	1.14	0.6-3.0	0.81
Smoking	No	ref	-	-	ref	-	-	ref	-	-
	Yes	1.08	0.6-2.8	0.84	0.92	0.5-2.4	0.87	1.04	0.6-2.5	0.87
Marital status	Single	ref	-	-	ref	-	-	ref	-	-
	Married	2.25	1.1-6.3	0.04	1.86	0.6-3.9	0.15	2.02	0.9-6.0	0.04
Educational status	Illiterate	ref	-	-	ref	-	-	ref	-	-
	Literate	2.64	1.4-6.2	0.02	0.98	0.5-2.7	0.88	1.28	0.6-2.8	0.65
Income (Thousand Tomans)	1200<	ref	-	-	ref	-	-	ref	-	-
	1200≥	3.04	1.6-8.1	<0.001	1.68	0.6-4.0	0.41	2.39	1.3-6.1	0.02
Family size	2>	ref	-	-	ref	-	-	ref	-	-
	2≤	2.11	0.9-4.6	0.48	1.74	0.7-4.0	0.29	2.01	0.9-5.9	0.55
Food expenditure (Thousand Tomans)	800<	ref	-	-	ref	-	-	ref	-	-
	800≥	2.16	0.8-6.2	0.53	1.78	0.6-4.4	0.12	2.07	0.9-6.1	0.31
Age group	76-80y	ref	-	-	ref	-	-	ref	-	-
	71-75y	1.52	0.7-4.3	0.71	2.37	1.2-6.5	0.03	1.64	0.6-3.8	0.31
	65-70y	3.63	1.7-5.2	<0.001	1.56	0.6-3.9	0.55	1.74	0.7-4.0	0.29

FVs, fruits and vegetables; *P*-values reported based on binary logistic regression

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Individual and household income levels are strongest predictors of FV consumption in elderly people (21) since fruit price is higher than vegetable price in Iran. Other studies have shown relationships between the household economic status and dietary patterns with more fruits and vegetables (22–24). An analysis on national survey data of Iranian provinces from 2007 to 2009 showed that a higher socioeconomic statuses were associated to greater consumptions of FVs. Moreover, data revealed that older ages were associated to lower consumptions of fruits (25).

Of the social variables, only marital status was linked to the consumption of FVs. Various studies have shown that marriage is positively linked to consumption of FVs in older men and women (24). For example, Payette and et al. reported that older married adults were most likely to achieve recommended portions of FVs, compared to widowed and divorced elderly people (26). In the current study, marriage significantly increased chances of higher consumptions of fruits, vegetables and FVs. Family support is a possible reason for these findings due to the pivotal role of family supports in healthy diets (12, 14). Furthermore, study findings showed that consumption of FVs decreased with age. Similar findings have been shown in developed and developing countries (12, 13, 27). In the present study, no significant relationships were seen between the gender and consumption of FVs. However, patterns of consumption varied within the different sex groups. Therefore, men consumed higher fruits and women consumed higher vegetables compared to the opposite sex group. As shown in this study, male gender increases the chance of fruit consumption over the median level, compared to female gender. These findings were similar to findings from other studies in Iran (12). Previous studies in other countries reported contradictory findings. Studies reported higher consumptions of FVs by men (15), while others reported higher consumptions of FVs by women (16, 28). These differences might be due to cultural differences between the nations. Studies have demonstrated that the educational level is positively correlated with healthy diets that mostly consist of FVs (21, 29, 30). This is because higher educational levels can increase personal abilities to acquire or understand overall health information and, in particular, the nutritional knowledge necessary to promote good health. In the current study, the mean consumption of fruits and FVs in literate group was more than that in illiterate group. Moreover, literacy significantly increased the odds of consuming fruits at higher levels than the median. However, relationships between the literacy and consumption of FVs were not significant; as shown by other studies (18, 20).

Conclusion

In general, the current study has demonstrated important roles of socioeconomic factors such as household income level and marital status on consumption of FVs. Fruit consumption was associated to age, gender, housing status, marital status, educational level and household income level. Furthermore, high vegetable consumption was associated to housing status as an important socioeconomic parameter. Therefore, results suggest that future policies and interventions to improvement of FV consumption in elderly people should consider socioeconomic inequalities.

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