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Dietary Fiber Intake and Related Factors in Community-Based Iranian's Elderly

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Abstract

Background: There are considerable documents suggesting that inadequate fiber intake (FI) is a key risk factor for various chronic diseases. The aim of this study was to investigate Dietary FI in the Persian elderly.

Methods: This descriptive-analytic study was performed to investigate FI in a sample of the elderly who received free services from healthcare centers in Karaj, Iran. For sampling method: at first, the names of 36 centers were written on small pieces of paper and poured into a container, then another person was asked to randomly select the names of 10 centers, then referring to each of the centers and preparing a list of elderly people, the study subjects were selected, The study was conducted between September 2018, and April 2019Several questionnaires were used to collect data regarding DF: characteristics, daily FI , knowledge, SE (self-efficacy), perceived benefits, and barriers towards FI as well as stage of readiness of FI. t-test and ANOVA were used to compare independent mean values. Data were checked for normality before analysis by using Kolmogorov-Smirnov (K-S) test to check data normality.

Results: Totally of 400 elderly individuals entered the study with the average amount of fiber per day. The data analysis indicated they did not know the recommended intake of at least 25 gr each day. feeling less hungry and fiber's price was the most frequent perceived benefits and barriers towards FI , respectively. Gastrointestinal diseases ($P < 0.001$), smoking ($P < 0.001$), and perceived barriers ($P < 0.001$), were statistically significant independent positive predictors of FI.

Conclusion: The findings of the current study indicated that FI among elderly people in Iran was very low and varied a great by gender, education, marital status, income level, employment status, smoking, stage of change, and gastrointestinal disease.

Keywords: Fiber Intake, Older Adults, Elderly, Iran

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Introduction

Chronic constipation is a common problem in the elderly (1) which is more prevalent among elderly individuals compared to younger adults (2). The c onstipation rate is 26% for females and 16% for males aged 65 years old or above (3). Constipation is considered a life-threatening disease among elderly people, and it has a considerable impact on health expenses as well as quality of life (2). There is substantial evidence indicating that lifestyle education, including exercise and recommendations on increasing fluid and FI, could mitigate constipation (4) Several studies have reported that DF has been associated with reduced obesity (5), diabetes (6), and cardiovascular disease (7). Furthermore, previous studies have shown that DF can promote longevity (8) lowering blood glucose and lipids due to

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↑What is "already known" in this topic:
Fiber is useful for preventing constipation and health, preventing many chronic diseases, and improving quality of life.

→What this article adds:
Fiber consumption among the Iranian elderly is low and varied with education and income, employment status, smoking and gastrointestinal diseases. perceived barriers could lead to lower consumption of fiber. Thus, it seems that in order to raise fiber consumption among the Iranian elderly, Knowledge is increasing, and considering some barriers like price, it should receive more attention. We should develop health education programs and nutritional interventions for Iranian older adults.

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strong anti-inflammatory effects and beneficial metabolic effects (9) In spite of these benefits, individuals do not appropriately follow the minimum recommended intake of DF per day (9).

DF, as defined by the European Food Safety Authority (EFSA), is Indigestible carbohydrate in addition to lignin. EFSA also prepared a long list of substances that constitute DF (9). The Medicine Institute suggested a 30 g per day fiber recommendation for male elderly and 21 g per day for female counterparts (10). Whole grain cereals fruits and vegetables (FV) are the preferred sources of non-starch polysaccharides (NSP). The recommended consumption of FV and of wholegrain foods is likely to provide >20 g per day of NSP (>25 g per day of total dietary fiber) (11).

The chief food sources of DF include wholegrain cereals, legumes, and FV, who's compromised to DF has been reported as 50%, 30–40%, and 16%, respectively (12).

Health professionals need to understand behavior change models that explain variations in lifestyle behaviors in order to develop effective prevention behavior change interventions (13).

The transtheoretical model (TTM) is one the most important theories in nutrition change behavior. This model included 6 stages named pre-contemplation, contemplation, preparation, action, maintenance, and termination. Due to TTM, behavior change goes through the aforementioned stages. A literature review has indicated the TTM is an effective model in promoting FV consumption (14). Research have shown factors that influence DF intake among the elderly population worldwide, but little is known about DF frequency, as well as determinants among elderly individuals in Iran. The only study reporting on the exact amount of FI among the elderly in Iran comes from a comparative investigation among elderly Iranians living in Sweden and Iran. This study reported that the average FI was 10gr/day in both genders among elderly Iranians living in Iran (15).

Overall, several factors contribute to low DF intake, such as low family income, low education level, younger age, insufficient PA, and having fewer than four daily meals (16, 17).

The current study was performed to investigate factors that accompanied DF intake in elderly persons in Iran. We especially were concerned with examining the effect of the following determinants: age, gender, education, marital status, employment and income, body mass index (BMI), smoking status (non-smoker, former smokers and current smokers), stages of change, constipation, having gastrointestinal disease or not, knowledge regarding FI, SE, as well as advantages and inhibitors.

Methods

Design and data collection

This was a descriptive-analytical research in a random (selected sample of old people who received services from health centers in Karaj, Iran. For this purpose, first, the names of 36 centers were written on small pieces of paper and poured into a container, then another person was asked to randomly select the names of 10 centers, then by referring to each of the centers and preparing a list of elderly people, the study subjects were selected. The study was conducted between September 2018 and April 2019. Karaj has 36 health centers in which free health recommendations and prevention services are offered to clients. From all listed health centers, a random sample was selected. The sample size was estimated based on a single-proportion design. It was assumed that at best, 50% of the elderly would intake adequate dietary fiber. Then, a study with a sample of 385 elderly would have 80% power to detect a difference of 5% (45-55%) at the 0.05 significant level. The sample size actually obtained for this study was 385. By considering 10% dropout from the study, we consider 450 as a sample size. Of these, those who did not agree to take part in the study and those who were suffering from serious diseases or underwent a surgical operation (up to 3 months before the date of data collection) or patients with bowel cancer were excluded from the study (n = 50).

To collect data, a trained interviewer, (Second author - MS student) performed face-to-face interviews. Each interview lasted for approximately 50 minutes in a private room in the health center.

Instruments

Several tools were applied to collect data in the present study. Cronbach's alpha coefficient was used for the reliability assessment. For this purpose, we used a sub-sample of 20 participants. The study tools are explained as follows:

1. Demographic and anthropometrics survey: This part included three parts: demographic traits age, sex, education, occupation, monthly income, marital status, and having a gastrointestinal disease or not.

2. Anthropometrics section: The same calibrated digital was used for weight assessment, while the participants were minimally clothed without shoes. Tap measure was used to measure height while the participants were standing without shoes. BMI is calculated in terms of kg/m^2.

3. Income: was assessed by asking individuals about monthly family income based on Iranian currency. Then, the subjects were divided into various groups according to their income and Iranian country situation.

Stages of change regarding fiber intake action (SOC)

This section of the study tool included five statements by which the participants were categorized into different stages of change: pre-contemplation, contemplation, preparation, action, and maintenance. The participants were asked to choose the statement that best fitted their status by selecting from multiple-choice options (18). Choices for the questions were (1) "I currently do not eat enough fiber-rich foods, and I am not thinking about starting"; (2) "I presently do not eat enough fiber-rich foods now but I am thinking about starting"; (3) "I presently do not eat enough high fiber foods but I plan to do so within the next month"; (4) "I presently eat enough high fiber foods but I have only begun to do so in the last 6 months"; and (5) "I presently eat enough high fiber foods and I have done so for longer than 6 months". Since DF is a subjective concept, we described the concept with the food's rich fiber using the appropriate food models and pictures as well as recommended

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amounts before choosing the stage. The internal consistency of the questionnaire was assessed using Cronbach's alpha coefficient and found to be 0.80.

Self-efficacy (SE) rating instrument

Ma et al. (19) questionnaire was used to develop SE fiber consumption as well as focus group discussions with convenient samples of older adults' individuals. Each item is scored based on a 5- point scale (1: not at all confident 2: not too confident 3: somewhat confident 4: confident 5: very confident) and the questionnaire gives a score ranging from 5 to 25. A higher score represents a greater degree of self-efficacy. The scale showed good validity (as assessed by content validity) and appropriate internal consistency (Cronbach's alpha coefficient, 0.81).

FI Knowledge sale

The knowledge of the study subjects was assessed using a 22-item instrument with items such as "According to WHO, adults should eat an average of 25g of fiber daily"; "Whole foods (pasta, rice, bread, cereals, ...) have lower amounts of fiber than non-integral foods"; "fibers can prevent and treat cardiovascular diseases"; and "fibers can prevent and treat obesity". This part was generated from previous studies along with focus group discussions with convenient samples of elderly individuals (20). The total knowledge score ranged from of 0 to 46. This scale was found to be valid (approved by ten nutrition specialists) and a reliable measure (Cronbach's alpha coefficient, 0.77).

FI Perceived advantages and barriers regarding FI

This section was developed from previous studies (21). The participants were asked about their perceptions regarding their FI intakes. The final perceived benefit questionnaire consists of 9 items. Each item is rated on a 5-point Likert scale ranging from very important to not important at all. The perceived barrier consists of 5 items. Each item is also rated on a 5- point scale ranging from very important to not important at all. The total score for the perceived benefits ranges from 9 to 45 and for perceived barriers from 5 to 25. The Cronbach's alpha coefficient for the benefit scale was 0.75 and for the barrier scale, it was 0.71.

Dietary fiber intakes

A Food frequency questionnaire (FFQ): DF intakes of the study participants were examined using a 106-item semi-quantitative food frequency questionnaire, as described elsewhere in detail (18). The FFQ was administered in combination with a photo album of foods for more reliable data. Daily intakes of fibers for each participant were estimated based on the US Department, modified for Iranian food intake.

A 24-hour recall: The participants were asked to estimate their daily servings of fiber at breakfast, lunch, dinner, and between meals as snacks or desserts in accordance with a nutrition guideline card.

7. Constipation assessment

Constipation in participants was assessed by the Wexner questionnaire (22). It includes 8 items that are graded on a five-point Likert scale except for one, which is graded from 0 to 2. The first item is the frequency of bowel movements, for which a score of 0 means "1-2 times per 1-2 days", a score of 1 indicates "2 times per week", a score of 2 signifies "once per week", a score of 3 suggests "less than once per week", and a score of 4 reflects "less than once per month". Painful evacuation efforts, feeling incomplete evacuation, and abdominal pain are the second, third, and fourth items, respectively, for which scores of 0 to 4 mean "never", "rarely", "sometimes", "usually", and "always", respectively. The fifth item is the time (minutes) spent in the lavatory per attempt, for which the sixth item is the type of assistance for which a score of 0 means "without assistance ", a score of 1 means "stimulative laxatives", and a score of 2 indicates "digital assistance or enema". The seventh item is unsuccessful attempts for evacuation per 24 hours for which scores of 0 to 4 mean "never ", "1-3", "3-6", "6-9", and "more than 9", respectively. The eighth item is the duration of constipation (yrs.) for which scores of 0 to 4 mean "0 (yrs.)", "1-5 (yrs.)", "5-10 (yrs.)", "10-20 (yrs.)", and "more than 20 (yrs.)", respectively. Based on the grading of the questionnaire, scores range from 0 (normal) to 30 (severe constipation), and a score of 15 is the cut-off point. The Wexner questionnaire has already been assessed regarding validity and reliability across the Iranian population (23).

Data analysis

Statistical analysis. For the descriptive analyses, mean ± SD was calculated for the continuous variables and the absolute and relative frequencies for the categorical variables. The chi-square test or Fisher's exact test was used to determine the strength of the association between two categorical variables. SPSS 19.0 software was applied for the statistical analyses. Statistical significance was set at $P < 0.05$.

To compare FI per day among different subgroups of the study sample, independent samples t-test and (ANOVA) were used to compare two or more than two independent mean values, respectively. Data were checked for normality before analysis by using Kolmogorov-Smirnov (K-S) test, which was found to be normal.

Multiple regression analysis (backward) was performed to identify the predictors of the FI per day among older Iranian adults. Independent variables include age, gender, education, marital status, income, BMI, employment status, SOC, smoking, constipation and gastrointestinal disease (having or not). To avoid infinite results, some categories were merged. For example, marital status was categorized into 'married' and 'widowed and divorced

The ethics committee of Alborz University of Medical Sciences approved the study (Ethical code no. IR.ABZUMS.REC.1400.344). Written consent was obtained from the study subjects. All principle of the Helsinki Declaration was considered before and during the study.

[DOI: 10.47176/mjiri.37.75]

Results

In total, 400 elderly individuals (207 men and 193 women) from 36 health centers took part in the study. The mean age of participants was 65.38 (SD = 3.34) years ranging from 60 to 74. The majority of the participants were married (54.5.5%), employed (52.75), with BMI between 25 and 30 (42.25%). The results revealed that FI among participants was very low. Overall, the mean intake of fiber for the entire sample was 9.03 (SD = 2.61) gr/day. FI is very low among the Iranian elderly and varied significantly by gender ($P < 0.001$), education attainment ($P < 0.001$), marital status ($P < 0.001$), income ($P < 0.001$), employment status ($P < 0.001$), SOC ($P < 0.001$), having gastrointestinal disease or not ($P < 0.001$), and between smoker or non-smoker individuals ($P < 0.001$).

However, there were no significant differences between different age groups, constipation ($P = 0.239$), BMI ($P = 0.646$), constipation ($P = 0.260$). shows the characteristics of the study sample and the mean FI per day for the study subgroups.

The data analysis indicated that 84% of participants (n=366) did not know the recommended intake of at least 25 gr each day. Similarly, 45.5% (n = 178) did not know legumes (beans, peas, etc.), cereals, and fruits are foods rich in DF, and 82.5% (n = 353) did not know eating adequate amounts of DF can prevent and treat diseases. However, 89% of participants (n = 356) acknowledged that whole foods (pasta, rice, bread, cereals, etc.) have higher amounts of fiber than non-integral foods, 26.5% (n = 106) and correctly reported fiber can prevent and treat bowel cancer, with 10.3% (n = 41) being aware that fiber can prevent and treat constipation. The Mean and SD of the knowledge and other TTM construct in each stage are presented in Table 1.

The perceived benefits and barriers regarding FI are reported in Table 2. The most frequent perceived benefits and barriers towards FI were feeling less hungry (35%) and being expensive (72.8%), respectively. The Mean and SD of the knowledge and other TTM construct in each stage are presented in Table 3

One sample t-test indicated significant differences between FI and 25 daily consumptions of fiber among the study participants (t = -122.502, $P < 0.001$).

Multiple regression analysis (Backward) was performed to estimate predicted variables to FI. Gastrointestinal diseases, smoking, and perceived barriers were statistically significant independent positive predictors of FI. The model explains 78% of the dissatisfaction score, as indicated by the value of R-square (Table 4).

Table 1. The characteristics of the study sample (n=400)

Variable	No (%)	FI /day Mean (SD)	*P*-value *
Age			0.239
60-65	121 (30.25)	9.52 (2.09)	
66-70	236 (59)	9.36 (2.51)	
>70	43 (10.75. 5)	8.84 (1.39)	
Gender			0.023
Male	207 (51.75)	9. 99 (2.19)	
Female	193 (48.25)	9.62 (2.38)	
Education			<0.001
<12	157 (39.3)	8.49 (2.23)	
12	168 (42)	9.82 (2.26)	
12>	75 (18.8)	10.11 (2.31)	
Marital status			<0.001
Married	218 (54.5)	9.91 (2.51)	
Widowed/divorced	182 (45.5)	8.68(1.79)	
Income			<0.001
Low (<3000000T)	126 (31.5)	8.31 (2.02)	
Intermediate (3-6000000T)	203 (50.75)	9.69 (2.14)	
High (>7000000T)	71 (17.75)	10.25 (2.54)	
Employment status			<0.001
Employed	211 (52.75)	7.68 (1.19)	
Retired	127 (31.75)	10.56 (1.09)	
Housewife	62 (15.5)	12.55 (2.01)	
BMI			0.646
<25	162 (40.5)	9.000 (2.25)	
25-30	169 (42.25)	9.23 (2.22)	
> 30	69 (17.25)	9.36 (2.30)	
Stage of change			<0.001
Pre-contemplation	258 (64.5)	8.16 (2.96)	
Contemplation	40 (10)	9.69 (2.52)	
Preparation	103 (25.75)	10.08 (2.14)	
Smoking			<0.001
Yes	152 (38)	8.66 (1.98)	
No	248 (62)	9.77 (2.38)	
Constipation			0.260
Yes	238 (59.5)	9.45 (2.32)	
No	162 (40.5)	9.19 (2.26)	
Gastrointestinal disease			<0.001
Yes	84 (21)	10.39 (2.39)	
No	316 (79)	9.07 (2.12)	

[DOI: 10.47176/mjiri.37.75]

Table 2. Response rate regardingthe benefits and barriers of FI

Perceived Benefit		N (%)	Perceived Barriers	N (%)
	I feel better when I eat more fruits, vegetables and legumes	28 (7.0)	I am too busy to eat fruits, vegetables, legumes and whole bread	256 (64)
	Eating vegetables and legumes help me to decrease my blood glucose	37 (9.3)	Eating vegetables and legumes helps me to decrease my blood glucose	291 (72.8)
	I prefer to get vitamins from fruits and vegetables than from supplements	35 (8.8)	It is difficult to get enough fruit, vegetable and legumes when I eat out	288 (72)
	Fruit, vegetables and legumes help me feel less hungry	140 (35)	Lack of family awareness of nutrition demands in older adult	259 (64.8)
	Fruits & vegetables help keep me regular (avoid constipation)	44 (11)	I am not in the mood to prepare and cook vegetables and legumes	217 (54.3)
	My family encourage me to eat more fruit, vegetable and legumes	63 (15.8)		
	I eat more fruits and vegetables if my family and friends do	57 (14.2)		
	Eating fruits, vegetables and legumes would help me to maintain my weight	75 (18.8)		
	Doctors or nutritionists recommended me to eat more fruits, vegetables and legumes	55 (13.8)		

Table 3. Mean and SD of the knowledge, benefits, barriers, self – efficacy and FI during stages of change

Variable	SOC	Pre-contemplation	Contemplation	Preparation	*P*-value *
Knowledge		27.00 (3.74)	27.00 (3.06)	28.17 (3.37)	.018
Perceived benefits		26.8911 (3.78987)	26.60 (3.77)	27.93 (3.86)	.043
Perceived Barrier		22.6732 (2.95972)	21.60 (4.35)	21.32 (3.50)	.001
Self-Efficacy		8.2724 (2.94410)	9.88 (4.52)	9.87 (3.67)	<0.001
Fiber Intake		9.0066 (2.25024)	9.69 (2.52)	10.08 (2.14)	<0.001

SOC: Stages of change
*ANOVA
PC: Precontemplation
C: Contemplation
P: Preparation

Table 4. Predictors of FI using the TTM model

Variable	Unstandardized coefficient		Standardized Coefficient	t	*P*-value	95% CI	
	B	SE	B			Lower	Upper
(Constant)	2.364	.569		4.154	<0.001	1.245	3.482
Age	-.263	.101	-.070	-2.606	.010	-.461	-.065
BMI	-.212	.084	-.067	-2.527	.012	-.377	-.047
Marital Status	-.272	.128	-.059	-2.128	.034	-.523	-.021
Education	.384	.085	.123	4.522	<0.001	.217	.551
occupation	2.062	.098	.663	21.006	<0.001	1.869	2.255
smoking	.276	.128	.058	2.147	.032	.023	.528
knowledge_	.127	.019	.200	6.536	<0.001	.089	.165

*Multiple regression analysis (Backward)
R2=%73.42

Discussion

The present study dealt with examining the level of dietary FI and associated factors among community based older adults in Iran. This study revealed that FI among the Iranian elderly is far lower than the daily consumption recommended by The World Health Organization (WHO) (9).

The World Health Organization (WHO) & The Food and Agriculture Organization (FAO) have published results on the issue, revealing that only 5-25% of the population follows current guidelines on dietary FI (11).

The fiber intake among older Iranian adults was lower than the value indicated by other studies (9, 24, 25). A population-based study conducted in the Romanians found the average daily FI as lower than 10 gr/day during the autumn season in 2017 which was closer to the present study (26).

This can be largely related to the economic inflation and severe sanctions on Iran in recent years. According to world bank reports (27), Iran is facing inflation above 40%, which has overshadowed the purchasing power of all people in the country; food prices, especially fruits, and vegetables, are at the top of the price increase, which has shrunken the people's table and reduced their FI .

The current study results indicated males' FI was higher than that of women, but a study in Brazil revealed that among women, the inadequate fiber-rich food intake frequency is lower than among men (17). We speculate that this might be due to cultural differences among nations, and mainly linked to the marginalized and weak role of women in society, as with our society" (28).

Expectedly, this study's findings revealed participants who are in later stages of change of FI were more likely to consume fiber-rich foods. This is consistent with another investigation (18). According to these results, stages of readiness to change eating habits should be considered as an effective component in designing appropriate interventions related to increasing FI. In the early stages, motivational strategies for fiber consumption are more effective than behavioral strategies.

Consistent with Silva et al study (24), there is no significant association between age and FI; in both studies, the

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majority of the participants were in the 60- 74 age range.

In line with other studies (29), the present study found that participants who were more educated and had higher incomes consumed more fiber. It is assumed more education is associated with higher health information seeking and higher income with more purchasing power.

According to a previous study result, "1% decrease in the price of FV would lead to a 2% increase in the participants' consumption of FV, and a 1% rise in family income would increase FV consumption up to 4%"(30). Unlike the current study results, other investigations showed an inverse association between income level, schooling years, and FI (31, 32, 33).

Contrary to other investigations (34, 35), this study's results indicated there are no significant differences between different BMI groups. It might be related to other effective factors in this regard such as physical activity, sleep quality, as well as fat and sweet beverage consumption.

In contrast with other studies, there are no differences between constipated and non-constipated individuals regarding FI (36). The plausible causes for this may be related to other effective factors such as physical activity or water consumption.

The current study results revealed knowledge is one of the predictors of FI.

Thus, we need new and comprehensive educational strategies and approaches to reduce perceived barriers of individuals.

Based on the current study results, the majority of participants did not know the recommended intake of at least 25 gr each day and did not know eating adequate amounts of DF can prevent and treat diseases. Few numbers of our participants believed that more fiber consumption would lead to better feelings and preferred to obtain vitamins from fruits and vegetables than from supplements and FI decreased blood glucose and prevented constipation.

"Knowledge of nutrition and its effects is vital to maintain a healthy lifestyle, and it is a great tool for selecting healthy food" (37). Nutrition knowledge was found to be correlated with the actual food choices (38).

Thus, we need new and comprehensive educational strategies as well as approaches to raise awareness and perceived benefits for individuals. Using up-to-date technologies as an effective and accessible tool can help significantly. Making educational clips related to the benefits of FI, sending text messages, organizing exhibitions of fiber-rich food, and organizing appropriate carnivals to increase FI can be effective in enhancing public awareness and their perceptions related to FI. Digital devices can also help by sending warning signs and reminder messages.

Based on this study's results," being less hungry" was the top perceived benefit. Our results supported previous study results suggesting that DF supplementation reduced the frequency of eating and food consumption (39).

Price was the most important inhibitor for consuming more fiber. The current study results provide further support to studies indicating that food prices are a barrier to consuming fiber-rich food (26, 40).

To improve fiber consumption, we would need enhancement availability to high fiber foods with lower prices. This simple strategy is likely to encourage many people to eat more fiber. Furthermore, a wider choice of fiber-rich food should be available (brown bread and pasta for example), with clear labeling on packaging to indicate these healthier fiber-rich food options (41).

According to our results, smoking is another predictor for FI among older Iranian adults. Consistent with our results, a study in the Japanese population showed smoking status was negatively associated with DF (42).

Padro et al. found that smoking is associated with less healthy dietary choices and higher alcohol consumption in the Portuguese population (43).

Education and occupation are other predictors and are two important determinants of socioeconomic status (44). A negative relationship has been found between socioeconomic status and FI (45). Obviously, education and occupation lead to better conditions and more chances of adequate FI Rashidkhani found positive relationships between age, educational levels, plus total monthly income, and a healthy dietary pattern.

Accordance to the present study findings, marital status was another determinant of fiber FI consumption. Loss of a partner is a negative factor related to dietary habits (46).

Given that all our respondents were given services from health centers, the findings of this study might not be generalized to all elderly Karaj residents and all of the Iranian older adults. This group of elderly might differ from others in terms of socioeconomic status, family cohesiveness, and social support. Further studies are required to examine the mediating factors affecting FI in a larger and more diverse group of elderly in Iran. In addition, it should be noted that our findings on FI were based on self-reported questionnaires and thus might have some measurement error. Economic condition aspects (such as inflation & sanctions) were not investigated in this study; these conditions might influence FI, and as such, it is recommended that these conditions be noticed in later studies. Furthermore, we did not consider the dental situation in our study, and this factor is another limitation of the study.

Conclusion

The findings demonstrated that FI among the Iranian elderly was very low and varied greatly with education and income, employment status, smoking and having gastrointestinal diseases. In addition, the results indicated that perceived barriers could lead to lower consumption of fiber. Thus, it seems that in order to improve FI among elderly Iranians, raising awareness, and perceived barriers such as price, should receive more attention. Indeed, it is essential to plan health education programs and nutritional interventions for this group of the population.

List of abbreviations

FI: Fiber intake
FV: Fruit& Vegetable
SOC: stage of change
SD: standard deviation
ANOVA: Analysis of Variance
BMI: Body Mass index
WHO: word Health organization?

[DOI: 10.47176/mjiri.37.75]

DF: dietary fiber
ICC: intra class correlation coefficient
FAO: Food and Agriculture Organization
TTM: Trans theoretical Model
FFQ: Food frequency questionnaire
SE: Self-efficacy
IR. ABZUMS. REC: Iran Alborz University of medical sciences

Declarations

Ethics approval and consent to participate: The ethics committee of Alborz University of Medical Sciences approved the study (Ethical Code: IR.ABZUMS.REC.1400.344). For audio-taping interview content, the participants' permission was obtained. All the participants were informed about the purpose of the study and if any participant was not willing to participate in the study, he/she was excluded. A written consent form was signed by each participant and it was clear to the participants that they were not going to be 'judged' for their answers. All participations were assured of their privacy.

Consent for publication

Not applicable

Author's Contributions:

MGH`: conducted the study and wrote the manuscript
LS: Designed and wrote the manuscript
The author(s) read and approved the final manuscript

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Data availability

All datasets in this study are available at reasonable request.

Conflict of Interests

The authors declare that they have no competing interests.

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