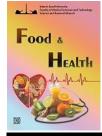# Food & Health

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Consumption of omega-3 supplements to prevent Alzheimer's disease based on Health Belief Model in the elderly

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ABSTRACT

Alzheimer's disease (AD) is the most common of dementia characterized by the gradual decrease of mental ability and behavioral disorders. AD threatens the health of 5%-10% of people over 65 years old. Studies have also suggested the consumption containing omega-3 fatty acids (EPA, DHA) may be a strategy to prevent the disease. The current study aimed at determining the predictors of the omega-3 supplementation to prevent AD based on constructs of Health Belief Model in the elderly. In the current cross-sectional study, 333 elderly patients referring to health centers in Tehran from 2015 to 2016 were selected by the stratified random sampling method. The inclusion criteria were age over 60 years old without AD and signing the informed consent form. Data were collected by a questionnaire developed based on Health Belief Model constructs after determining its validity and reliability. The collected data were analyzed by using SPSS-18 software and statistical tests, including logistic regression analysis, Chi-square, and independent-samples t-tests. The highest calculated mean belonged to the perceived susceptibility construct (%40.4) followed by knowledge (%30.6). The mean omega-3 consumption among the samples was (%27.6.) The lowest mean belonged to the perceived barriers construct indicating that the construct cannot be an obstacle to consume omega-3 supplementation. According to the results of the current study and the mean omega-3 consumption at low and the moderate levels of knowledge in the elderly, it was suggested to design and implement educational interventions based on the Health Belief Model for the elderly in order to prevent AD.

1. Introduction

The number of old people is increasing faster than other age groups worldwide, this increase is also observed in Iran similar to other countries (1). The world's aging population is estimated to reach over one billion in 2025 and two billion in 2050(2). With the continued increase in the aging population in Iran, it will increase to 10.5 percent in 2025 and 21.7 percent in 2050. Age increase is a risk factor, which predisposes the elderly to one or more chronic diseases (3). The number of older adults with dementia will increase around the world. Dementia is the most common cause of psychopathological damage to elderly Alzheimer's disease (AD) (4). According to globally released statistics, it is estimated that more than 500,000 people in Iran are affected by AD (5).AD is the leading neurodegenerative disease of aging a major and cause of disability and caregiver burden (6). Diet, specifically omega-3, may beneficially modify risk factors in the etiology of dementia and is beneficial to cognition in older adults with a clinical diagnosis of dementia, specifically Alzheimer's

disease (AD) (7, 8). The minimum effect of omega-3, 6, and 9 supplements is the low-density cholesterol (LDL) decrease, high-density cholesterol (HDL) increase, and symptoms improvement. In addition, many physicians attempt to discover new methods to combat AD; for example, the right diet alongside doing mental and physical exercises as preventive methods (9, 10). The results of previous studies showed a relationship between fish consumption and decreased dementia due to the effect of omega-3 fatty acids (EPA, DHA) (2). The results of some studies in Iran indicate the per capita consumption of fish as 7.5-9 kg annually. Fish odor, taste, fear of its small bones, and inability to prepare and cook it, as well as high costs, are reported as the main factors for its low consumption in Iran (11). Many studies recommended the application of nutritional supplements, especially the ones supplementing omega-3, for the elderly (12, 13). In addition, dietary supplements have also been widely studied. For example, omega3 has been shown by many studies to slow down cognitive decline However, the results of such studies showed low and very-low intake of fish

and omega-3 supplementation (11). Individuals at risk for Alzheimer's disease make decisions about dietary and lifestyle on a daily basis and need to act on the best evidence available to them, even when scientific consensus may not have been achieved Studies have also suggested that dietary and lifestyle factors may influence risk, raising the possibility that preventive strategies may be effective (14). Limited studies in Iran are conducted on the determinants of omega-3 fatty acids intake, the impact of training relied on educational patterns and primary prevention of AD. The impact of health education patterns to identify the healthy behavior determinants and the modification of high-risk behaviors are proven in many studies (14). Epidemiological and animal studies have suggested that dietary fish or fish oil rich may have effects on behavioral symptoms in Alzheimer's disease (15). Behavioral change theories provide a helpful basis for the design of interventions to change lifestyle and health behaviors through the understanding of structural and psychological determinants of behaviors within a health behavior change model, successful interventions designed to address dementia risk behaviors include addressing attitudes and beliefs surrounding health and lifestyle behaviors and dementia risk in the population (16)]. Among health education theories and patterns, the Health Belief Model is very comprehensive and more involved to prevent diseases; it is also based on personal motivations to adopt behavior (17). In the current study, the Health Belief Model (HBM) is used as a conceptual model to develop a measurement of motivation for behavioral and lifestyle change for dementia risk reduction for middle-aged and older Australians. HBM is one of the most commonly used theories explaining health-related behaviors and health promotion (16). Based on the Health Belief Model, people tend to change their behaviors as soon as they perceive that they are seriously ill, otherwise they are less likely to turn to healthy behaviors (18). The constructs of the Health Belief Model include sensitivity, severity, benefits, and barriers perceived, self-efficacy, and cues to action (19). Based on this model, the person should believe that he is prone to AD [perceived susceptibility), perceive the depth of this risk and understand its serious effects on his own and others' lives (perceived severity), and consequently, perceive the benefit of adopting a particular behavior (perceived benefits) in order to overcome the inhibitory factors to adopt the behaviors such as cost, time, etc. (perceived barrier) in order to ultimately attempt to adopt preventive behaviors (20). To the authors` best knowledge, there are limited studies on the use of omega-3 supplementation to prevent AD. The current study aimed at determining the use of omega-3 supplements predictors factors for prevention AD, based on the constructs of the Health Belief Model. The authors hope to take effective steps in the educational planning of AD preventive behaviors for medical education planners and practitioners.

2. Materials and methods

The current study is an analytic cross-sectional study that was conducted with the population included the elderly referring to the health centers of Tehran city. The study Samples were selected using a multistage random sampling method. Of the university centers which were under the coverage of Shahid Beheshti, Tehran, and Iran Medical Science Universities. They were selected randomly from total of six centers (every two centers were affiliated with each of the universities listed above). The sample size was estimated at 310 subjects (α=0.05, d=0.14, SD=1.23), and considering 10% dropouts it was set to 340 individuals. The inclusion criteria were age 60 years and above, a medical record in one of the health centers, a lack of AD, willingness to participate in the study, and signing the informed consent form. In order to reach the subjects, we referred to the selected centers to make a list of names, addresses and phone numbers of the elderly clients having medical records there. With the help of the healthcare links, we invited via phone contacts the elderly eligible to participate in the study. Eventually, 333 of the elderly entered the study. The data collection tool was developed in two parts according to the study objectives and based on the constructs of Health Belief Model: The first part included demographic characteristics with 10 items; and the second part was assigned to the Health Belief Model constructs: the knowledge including 18 questions, perceived susceptibility including seven statements, the perceived severity including 11 statements, perceived benefits including 12 statements, perceived barriers including 7 statements, self-efficacy including 8 statements, and the behavior including 10 statements. The questionnaire items were derived from reliable literature. Face validity was measured by a panel with eight specialists including nutritionists, elderly specialists, health education practitioners, and health psychologists led by the author. To assess the content validity, 10 specialists with relevant knowledge and blind to the study helped. The content validity ratio and content validity index were higher than 0.75 in the majority of constructs assessed in the questionnaire. The total CVR and CVI of the questionnaire were 0.72 and 0.89, respectively. The internal consistency of the evaluated constructs was calculated using Cronbach's alpha coefficient including knowledge 92.7%, perceived susceptibility 78.5%, perceived severity 84.1%, perceived benefits %94, perceived barriers 75%, self-efficacy 80.6%, and total Cranach's alpha coefficient 89%. Data were analyzed with SPSS-18, with descriptive statistics (mean $\pm$ standard deviation) and analytical tests including Pearson correlation coefficient (to determine the relationship between the Health Belief Model constructs and omega-3 supplementation), chi-square, independent t-test, and logistic regression analysis were used.

3. Results and discussion

Totally, 333 elderly subjects participated in the study of which 200 (60.1%) subjects were female and 133 (39.9%) male, most of them (n=201, 60%) were within the age range of 60-69 years old. The mean±SD age of the subjects was 64.5 ± 4.3 years; 101 (30.3%) subjects had high school education and 248 (74.5%) were married. From the 333 elderly participants, 126 (37.8%) had a history of omega-3

supplementation, while 206 (62.2%) did not take omega-3 supplements. Of the 126 elderly subjects with a history of omega-3 supplementation, only 48 (38%) received it based on prescription (Table1).

Table 1. Demographic characteristics of the study participants.

Construct	β	Wald	P-value	OR	95% CI for exponential (B)
Knowledge	0.020	10.763	p<0.001	1.021	1.033- 1.008
Perceived sensitivity	0.022	2.037	P=0.03	1.022	1.53- 0.992
Perceived severity	0.016	0.876	P=0.35	1.017	1.052- 0.982
Perceived Benefit	0.008	0.367	P=0.54	0.992	1.018- 0.966
perceived barriers	-0.006	0.593	P=0.44	0.994	1.010- 0.977
Perceived self-efficacy	0.019	2.451	P=0.02	1.031	1.022- 1.004
Behavior	0.032	14.023	p<0.001	1.033	1.050- 1.016

In order to determine the correlation between HBM constructs with practice, the Pearson correlation coefficient was used. The result shows that among the score of knowledge, perceived susceptibility, perceived severity, perceived benefit and self-efficacy with a score of practice had a direct significant relationship (p<0.001) and with perceived barrier had an indirect significant relationship (p=0.005) (Table 2)

Table 2. Mean, standard deviation, the scope of achievable scores, and mean percentages of maximum scores and Pearson correlation coefficient among the score of models constructs with practice score.

Construct	Mean ± SD	Score range	Mean percentage of the maximum score	r	P-value
Knowledge	35.6±3.2	18-54	64.7	0.602	p<0.001
Perceived sensitivity	27.4±2.5	5-35	78	0.205	p<0.001
Perceived severity	40.4±4.1	11-55	73.2	0.312	p<0.001
Perceived Benefit	42.3±2.25	12-60	70.1	0.367	p<0.001
perceived barriers	17.5±3.15	7-35	55.5	-0.164	P=0.005
Perceived self-efficacy	28.2±1.5	8-40	70.2	0.616	p<0.001

Based on the obtained results, there was a significant relationship between age, and each of the models constructs such as knowledge, perceived benefits, perceived barriers, self-efficacy, as well as the behavior of omega-3 supplementation. There was a significant relationship between gender and two model constructs of perceived self-efficacy and omega-3 supplementation behavior at a confidence level of 95%, but it was insignificant between age and other constructs. However, the results showed that female subjects got most of the good points in all the model constructs. Also, there was a significant correlation between the level of education, and the model constructs of knowledge, perceived benefits, perceived barriers, self-efficacy, and omega-3 supplementation behavior. Although the results of the current study showed no significant difference between the two constructs of perceived sensitivity and perceived severity, the variations between the educational level and the two later constructs were significant. The illiterate subjects received the lowest score in most of the constructs of the Health Belief Model. Based on the findings of the current study, the majority of the subjects with elementary education (48%) introduced physicians and healthcare personnel as the instructors for omega-3 supplementation, while it was internet search for the ones with high school and higher education, which included 27% of the total participants. The findings also showed that the married subjects, compared with the single ones, got good points in most of the constructs of the Health Belief Model. However, there was a significant difference in knowledge, perceived sensitivity, and perceived barriers constructs.

Table 3. Logistic regression analysis of omega3 supplementary consumption predictors

Construct	β	Wald	P-value	OR	95% CI for exponential (B)
Knowledge	0.020	10.763	p<0.001	1.021	1.033- 1.008
Perceived sensitivity	0.022	2.037	P=0.03	1.022	1.53- 0.992
Perceived severity	0.016	0.876	P=0.35	1.017	1.052- 0.982
Perceived Benefit	0.008	0.367	P=0.54	0.992	1.018- 0.966
perceived barriers	-0.006	0.593	P=0.44	0.994	1.010- 0.977
Perceived self-efficacy	0.019	2.451	P=0.02	1.031	1.022- 1.004
Behavior	0.032	14.023	p<0.001	1.033	1.050- 1.016

Logistic regression analysis was employed to assess the predictive value of omega-3 supplementation behavior by Health Beliefs Model. Although most of the constructs of the Health Belief Model had a significant relationship with omega-3 supplementation behavior, the knowledge, and perceived severity constructs had the highest predictive value

for omega-3 supplementation. In the current study, based on the result of logistic regression analysis to determine the effect of independent variables on the elderly behaviors, only knowledge was estimated as the predictor for omega-3 supplementation. The present study was conducted based on prior studies indicating relationships of omega-3 fatty acids consumption with improved memory and reduced risk of the elderly AD. The purpose of this study was to determine to consume omega-3 supplements based on HBM constructs in the prevention of AD among the elderly. In our study, %37.8 of the elderly had a history of omega-3 consumption, while the majority (%69.8) agreed with the statement "one way to prevent AD is omega-3 supplementation". Despite the fact that in this study, %70.3 of the elderly, with the statement "not intake fish can cause memory impairment", were agreed, however only %15.5 of them "fish consume twice a week" was declared. Also, more than half of the participants said that "I have allergies to fish feeds therefor I don't consume fish". The statistics show that aquaculture consumes in Iran is less than half the global average. Consume of aquaculture and fishery products in the food basket of Iranian households is low compare to other consume meat (11). In the study of Hosseini and et al., 2016 the fish average per capita was 9.5 kg per person, which was 19.2 kg world per capita in 2012 and even less per capita consumption of low-income countries with lower food poverty (10.9 kg in 2010) (21). Meanwhile, Matlabi et al. concluded in a study that factors such as odor, taste, fear of small bones, inability to prepare and cook fish, as well as a low mean score in the perceived benefits, reduced Iran per capita fish consumption (11). Many studies showed the effect of nutritional sources rich in fish fatty acids (FFA; DHA) on the reduction of AD risk. Such FFAs are vital to optimal brain function and reduce amyloid (22, 23). Data from cross-sectional and cohort studies indicate that the reduction in dietary intake of DHA is associated with the development of early dementia and AD. In a review study by Jicka et al. (24), there was a positive relationship in prospective studies between foods rich in omega-3 and improved cognitive-mental status. The results of the current study showed a significant correlation between the Health Believe Model's constructs of perceived sensitivity, perceived severity, perceived benefits, and knowledge with omega-3 supplementation behavior in the elderly. The results of a study by Karimi et al. (19), also showed a significant correlation between perceived sensitivity, perceived severity, perceived benefits, and self-efficacy with nutritional behaviors of pregnant females, and adverse and significant correlations with perceived barriers that were consistent with the result of the current study. In the current study, knowledge, perceived severity, and perceived benefits, as strong predictors, showed the highest correlation with the omega-3 supplementation behavior in the elderly. Although the role of perceived self-efficacy in the increasing health behaviors is confirmed in several reliable studies, the current study by obtaining 70.2% of the maximum score of self-efficacies showed a poor correlation with the omega-3 supplementation intake. Morovati et al. (25), declared the role of self-efficacy construct in predicting the self-care behavior

of patients with diabetes. In the current study, the elderly received 55.2% of the maximum scores of the omega-3 supplementation behavior. The current study result was different from that of the study by Mazloumi et al. (20), reporting only 30.5% of the maximum score obtained by their studied subjects, but consistent with those of the studies by Karimi et al. (19). In addition, out of 126 elderly subjects with a history of omega-3 consumption, only 48 (38%) received omega-3 supplementation based on prescription; however, in the analysis of results, lack of easy access to physicians and health professionals to counsel and prescribe omega-3 supplementation were reported as perceived barriers. The perceived barriers construct in the current study also showed a negative and significant relationship with the intake of omega-3 supplementation. This construct in the Health Belief Model is considered as a barrier to health behaviors; there are some barriers such as cost, time, facilities, and access to services that are also assessed by people (17). Despite the body's need for omega-3 fatty acids and their impact on the prevention from AD, the per capita consumption of fish in Iran is very low. Studies have also suggested that dietary and lifestyle factors may influence risk, raising the possibility that preventive strategies may be effective (26, 27). In spite of different therapies, the results of AD treatment are not promising yet. Many studies reported a reduced risk of AD and other cognitive impairments following the consumption of seafood is rich in omega-3 FA. Many studies reported the effect of omega-3 on reduced production and effects of the β-amyloid precursor protein. Kinds of seafood containing omega-3 seem to be effective in reducing the progression of the disease (12). Therefore, in addition to recommending omega-3 supplementation under the surveillance and counsel of health care professionals and physicians to prevent AD, it is essential that health education practitioners design and implement an education intervention by understanding the factors affecting AD preventive behaviors using the health belief model Based on the results of the current study, knowledge and perceived severity were estimated as predictors for the intake of omega-3 supplementation. As the knowledge and perceived severity increased, the use of omega-3 supplementation also increased. One of the reasons that researchers mainly tend to evaluate the knowledge construct is that knowledge raising affects attitude and behavior. In a study by Hazavei et al. (28), the same result showed the association of mean knowledge with the nutritional behavior in the elderly.

4. Conclusion

In the present study by identifying factors related to the behavior of omega-3 supplement consumption based on Health Belief Model [HBM] constructs, as a basic and needs assessment one, can take an important step in educational interventions to improve the life quality of elderly. Statistics on the growth of the aging population of Iran and the prediction of the prevalence of AD among them require urgent safe, effective and accessible approaches to prevent disease. It is concluded that optimism regarding perceptions and

knowledge of health risks, and health benefits should be taken into account when developing interventions aimed at consumer health. Therefore, health education planners and practitioners should give high priority to the elderly AD prevention plan among preferences of national education and research planning.

Acknowledgments

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