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# The effect of a nutrition education intervention on knowledge, attitude, and intake of foods high in fats in women

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**Abstract:**

**BACKGROUND:** Given that many Iranian were interested in the consumption of foods that are high in fats, the present study was done to determine the effect of a nutrition education intervention on knowledge, attitude, and intake of foods high in fat among a sample of women in Tehran.

**MATERIALS AND METHODS:** In this quasi-experimental study, 92 female referrals to the health houses affiliated to Tehran municipal were selected and assigned to either intervention ( $n = 46$ ) or control ( $n = 46$ ) groups. Information (data) regarding women's knowledge, attitude, and practice in terms of foods rich in fat intake was collected by three questionnaires. Then, a nutrition education intervention included four 40–60 min training sessions over 4 weeks was designed and conducted to the study participants in the intervention group. Two groups were followed up 2 months after the intervention. Finally, all data were analyzed by using the independent-samples  $t$ -tests, Student's paired-samples  $t$ -test, and Pearson correlation analysis on the R software (version 6.3.2).

**RESULTS:** The results showed that there were significant reductions in a positive attitude towards food with high fat content and intake of these foods in the intervention group compared with the control group after the intervention ( $P < 0.001$ ). Furthermore, following the intervention, the intervention group reported a significant increase in dietary fat nutrition knowledge than the control group ( $P < 0.001$ ).

**Conclusion:** Developing nutrition education interventions is an effective strategy for reducing the consumption of foods rich in fat in Iranian women.

**Keywords:**

Attitude, diet, health education, high-fat, knowledge

## Background

Dietary fat, as one of the essential macronutrients, is found in most food groups. Foods containing fat generally provide a range of different saturated and unsaturated fatty acids.<sup>[1,2]</sup> Literature showed that a diet high in saturated fatty acids (SFAs) and trans fatty acids (TFAs) were associated with an increased risk of several chronic diseases such as cardiovascular.<sup>[3]</sup> All these fatty acids (except for stearic acid) may raise

the level of total and low-density lipoprotein cholesterol.<sup>[4,5]</sup> Despite the complications of high-fat diet on human health,<sup>[3]</sup> there were high amounts of TFAs in popular foods in some countries<sup>[6]</sup> and many people, especially obese adults prefer foods high in fats.<sup>[7]</sup> The results of a study showed that there was a large amount of hydrogenated fats in Iranian traditional dietary pattern.<sup>[8]</sup> Eating patterns of this country might explain the higher prevalence of some cardiovascular risk factors in this country.<sup>[9]</sup> Globally,

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multiple interventions in terms of decreasing high-fat diet intake have been done;<sup>[10-12]</sup> however, some of the studies were not effective.<sup>[13]</sup> Literature showed that performing interventions to lifestyle change of individuals for decreasing dietary SFAs and TFAs intake, and increasing poly- and monounsaturated fatty acids intake has beneficial effects on their lipid profile and health outcomes.<sup>[14,15]</sup> Literature showed that implementing nutrition education intervention may improve lifestyle of individuals in terms of dietary intakes.<sup>[16,17]</sup> Nutrition education interventions, as a potential tool to promote healthy eating patterns, may reduce fat intake in consumers.<sup>[11,18]</sup> Considering that, when developing nutrition education interventions to reduce the consumption of foods high in fat, emphasis on individuals' fat nutrition knowledge, and their attitudes towards high-fat diet are essential.<sup>[7,19]</sup> Consumers with more nutritional knowledge may consume less unhealthy fats.<sup>[18]</sup> Literature showed that knowledge of consumers regarding fatty acids and high-fat diet was not acceptable.<sup>[20,21]</sup> For example, Valentin *et al.* reported that 39.7% of mothers know about the difference between saturated and unsaturated fats and only 16.4% of them were able to correctly differentiate hydrogenated from interesterified margarine. They concluded that the actual ability of mothers to identify foods by their fat content was low and developing maternal nutrition education programs in this field was necessary.<sup>[20]</sup> Eckel *et al.* showed that Americans' knowledge, especially regarding food sources of SFAs and TFAs was relatively low. They highlighted the need to further consumer education efforts in this issue.<sup>[21]</sup>

Therefore, given the considerable prevalence of dyslipidemia<sup>[22]</sup> and the important impact of dietary behaviors on abnormal blood lipids,<sup>[23]</sup> developing interventions such as nutrition education interventions to reduce high-fat foods in Iran is imperative.<sup>[11]</sup> The present study was conducted to examine the effect of a nutrition education intervention on knowledge, attitude, and intake of foods high in fat among a sample of women in Tehran.

## Materials and Methods

This quasi-experimental study (IRCT code# IRCT20110727007132N19) was performed on 92 women referred to health houses in Tehran, Iran, during October and February 2020. The municipal of Tehran covers 354 health houses in various areas. The list of the health houses in the four regions including North, South, East, and West of Tehran city at the moment of the study was available to the researchers. One health home was randomly selected by simple sampling methods (lottery method) from each region. Then, among woman referred during a day to each health home, 23 women

was selected by simple random sampling method. The first woman to visit of the health house was randomly assigned to the intervention group. The second person was randomly assigned to the control group. The third person was assigned to the intervention group. Similarly, the allocation of the remaining subjects was continued in two groups (intervention group = 46 and control group = 46). In the present study, the inclusion criteria were age between 19 and 65 years, elementary education level, and agreement to participate. The exclusion criteria included a history of chronic diseases that limit high-fatty foods consumption such as diabetes, cardiovascular disease, and current consumption of lipid-lowering medications. The study protocol was approved by the Ethics Committee of Iran University of Medical Sciences (IR.IUMS.REC.1397.1177). The researchers informed the participants about the purpose of the study. Participants completed written consent to participate in the study. None of the participants lost to follow-up. Finally, the data of 92 participants were analyzed [Figure 1].

In this study, four instruments were used to gathering the data. The first instrument was developed and validated by Venter to measuring knowledge of dietary fat. The instrument had two sections. We used the second section that had 18 multiple-choice items to measure dietary fat nutrition knowledge.<sup>[24]</sup> The second instrument (with 15 items) was developed and validated by the Nutrition Working Group African Medical Association (dyslipidemia South) to assessing the intake of high-fat foods.<sup>[25]</sup> The third instrument (with 5 items) was developed and validated by Roefs and Jansen to measure attitudes towards high-fat foods. In the instrument, the items were measured on a seven-point Likert scale [strongly agree to strongly disagree].<sup>[7]</sup> The fourth instrument was a researcher-made instrument for measuring demographic information of the participants. Then, the reliability and validity of the first three instruments were determined. The instruments were initially translated into Persian and re-translated into English. Then, the qualitative face validity of the instrument's items was assessed on 20 women (excluding the studied samples). In this stage, according to their feedbacks, seven items were removed or edited. The validity of the instruments was measured by quantitative and qualitative content validity. Next, a panel of 10 experts in nutrition, cardiovascular, and health education reflected opinions about the content validity ratio (CVR) and content validity index (CVI) of the instrument items. Items with a CVI <0.79 and CVR <0.62 were removed of the instruments.<sup>[26,27]</sup> In this stage, two items of the first instrument and five items of the second instrument were deleted. Furthermore, according to expert insights, some items of the instruments that its consumption in Iranian food culture had not popular were edited and changed

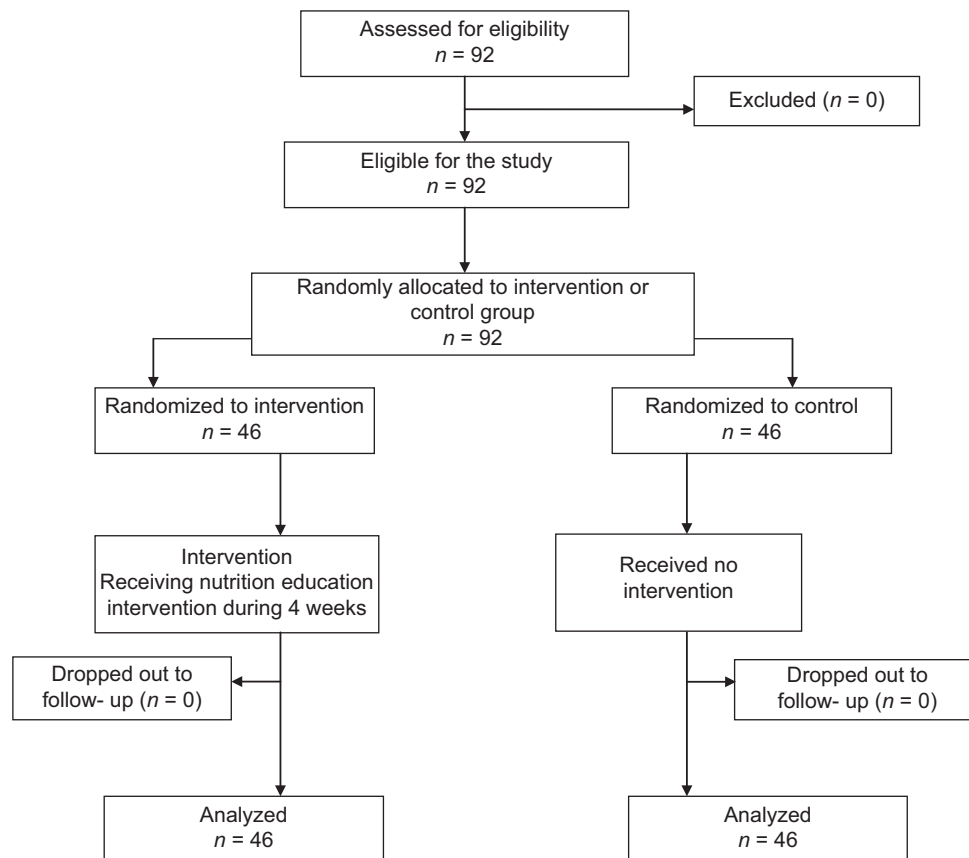


Figure 1: Follow-up of study participants

with popular food items. The test-retest correlation coefficients (with a 2-week interval between the tests) were measured by 20 women to estimate the stability of the first and second instruments. The estimate of test-retest correlation factor  $\geq 0.61$  was considered satisfactory.<sup>[28]</sup> The test-retest correlation coefficient for the first and the second instrument was 0.77 ( $P = 0.002$ ) and 0.95 ( $P = 0.002$ ), respectively. Cronbach's alpha was used to investigate the internal consistency of the third instrument. Cronbach's alpha coefficient  $\geq 0.70$  was considered satisfactory.<sup>[29]</sup> Cronbach's alpha for this instrument was 0.70. At this stage, no items were removed from the instruments. The final instruments had 16 items to measure the participants' knowledge in terms of dietary fat food, 5 items to measure attitude, and 15 items to measure the intake of high-fat foods.

The intervention designed for the intervention group consisted of four 60 min training sessions over four weeks (with an interval 7d between the sessions). The first training session was an introduction to food groups, dietary recommendations of fat intake, the diet-disease relationship, and the role of dietary behaviors, and consumption of foods rich in fat on hyperlipidemia (as a common risk factor to various chronic diseases). The second session focused on the types of fats and amounts of fat in foods, the quality of dietary fat, the types of foods

rich in SFAs and TFAs, what types of fat to consume, and how much is appropriate. The third session was aimed at reducing the positive attitude of participants towards high-fat foods in the intervention group. In this session, participants were divided into small groups ( $n = 7$ ). Each of them discussed their beliefs about dietary fat and low-fat alternatives, acceptance of reduced-fat foods, barriers to reducing dietary fat intake, and ways to overcome them. The fourth session focused on the effects of fat on odor and taste of food and the methods of reducing the amount of foods fat in the process of cooking or preparation without reducing odor and taste of it. In this session, participants shared their experiences in this field with other participants. Meanwhile, a complete list of the methods for reducing the amount of fat in foods was administered to the participants. During the four sessions, through verbal persuasions, women were encouraged to eating low-fat foods. In addition, two pamphlets about the types of fats and methods of reducing food fat without reducing its taste were given to participants. Participants in the control group were not received any education intervention. Two groups were followed up 2 months after the intervention and completed the instruments again.

The data were analyzed using the R software (version 6.3.2). Kolmogorov-Smirnov test was applied to assess the

normality of data. The results showed that knowledge, attitude, and intake of foods high in fats variables scores had normal distribution in the two groups. Differences in the total mean scores of knowledge, attitude, or intake of foods high in fats variables between the two groups before and after the intervention were tested using independent samples *t*-tests. Furthermore, paired samples *t*-test was used to assess the differences in the total mean scores of the participants' knowledge, attitude, or high-fat foods intake variables in each group before and after the intervention. Correlations of high fat foods intake with knowledge and attitude in each group before and after the intervention were analyzed through the Pearson correlation analysis. The data were reported as frequency and mean  $\pm$  standard deviation (SD).  $P < 0.05$  was considered statistically significant in the study.

## Results

The average age of participants in the intervention and control groups was 36.20 (SD = 1.28) and

38.65 years (SD = 1.17), respectively. Before the intervention, no significant differences were found between the two groups for any of the demographic characteristics, knowledge, attitude, and intake of foods high in fats variables. Other demographic characteristics of the two groups are shown in Table 1. The results showed that there were significant reductions in a positive attitude towards high fat foods and intake of foods high in fats variables in the intervention group compared with the control group after the intervention [Table 2]. In addition, following the intervention, the intervention group reported a significant increase in dietary fat nutrition knowledge compared with the control group [Table 2]. The relationship between high fat foods intake and knowledge or attitude towards food with a high fat content in both groups before and after the intervention is shown in Table 3. There was a significant relationship between attitudes towards high fat foods consumption and the intake of high fat foods in the intervention group before and after the intervention.

## Discussion

The present study demonstrated that the effect of a nutrition education intervention on knowledge, attitude, and high fat foods intake among a sample of women in Tehran. The findings showed that the intake of high fat foods among the participants in the intervention group significantly decreased compared with the control group after the intervention. This finding is consistent with those of Kroeze *et al.*<sup>[30]</sup> Manios *et al.*<sup>[31]</sup> and Ahmad *et al.*<sup>[32]</sup> Furthermore, Abood *et al.* showed that implementing nutrition education intervention significantly decreased the intake of fat, saturated fat, and cholesterol to levels consistent with national recommendations among staff employees.<sup>[33]</sup> In line with our results, Pletzke *et al.* reported that nutrition education could decrease purchase foods containing TFAs among consumers.<sup>[34]</sup>

**Table 1: Demographic characteristics of the participants in the intervention (n=46) and the control (n=46) groups**

Variables	Intervention group	Control group
Age, mean $\pm$ SD	36.20 $\pm$ 1.28	38.65 $\pm$ 1.17
Number of children, mean $\pm$ SD	1.15 $\pm$ 0.89	0.93 $\pm$ 1.01
Marital status, n (%)		
Single	11 (23.90)	12 (26.10)
Married	35 (76.10)	34 (73.90)
Education level, n (%)		
$\leq$ Diploma	18 (39.50)	15 (32.60)
Academic degree	28 (60.90)	31 (67.40)
Occupation, n (%)		
Employee	14 (30.40)	20 (43.50)
Self-employed	11 (23.90)	6 (13.00)
Household duties	21 (45.70)	20 (43.50)

SD=Standard deviation

**Table 2: Comparison of knowledge, attitude, and high-fat foods intake variables in the two groups before and after the intervention**

Variables	Intervention group		$P^a$	Control group		$P^a$	$P^b$
	Before the intervention	After the intervention		Before the intervention	After the intervention		
Dietary fat nutrition knowledge	4.33 $\pm$ 2.26	13.28 $\pm$ 1.53	<0.00001*	4.22 $\pm$ 2.44	4.39 $\pm$ 2.62	0.59	<0.00001*
Attitude towards high-fat foods	21.43 $\pm$ 3.23	10.57 $\pm$ 3.35	<0.00001*	21.52 $\pm$ 5.18	20.33 $\pm$ 5.63	0.06	<0.00001*
High-fat foods intake	47.93 $\pm$ 8.85	21.50 $\pm$ 3.99	<0.00001*	43.48 $\pm$ 7.62	42.57 $\pm$ 8.85	0.39	<0.00001*

<sup>a</sup>Result of the student paired-samples *t*-test (within-groups comparison), <sup>b</sup>Result of the independent-samples *t*-tests (between-groups comparison). SD=Standard deviation, \* $P < 0.05$  significant

**Table 3: The relationship between high-fat foods intake and knowledge or attitude toward high-fat foods in both groups before and after the intervention**

Variables	Intervention group (r, P)		Control group (r, P)	
	Before the intervention	After the intervention	Before the intervention	After the intervention
Dietary fat nutrition knowledge	-0.14, 0.32	-0.02, 0.89	0.05, 0.70	-0.27, 0.06
Attitude towards high-fat foods	0.45, 0.001*	0.47, 0.001*	0.16, 0.26	0.35, 0.01*

\* $P < 0.05$  significant



Public health providers in Iran should develop further nutrition education interventions to modifying the food culture of people to selecting the healthier choice.

The results also showed that following the intervention, the mean score of the dietary fat nutrition knowledge in the intervention group considerably increased in the participants of the intervention group than the control group. Kamran *et al.* reported that implementing education program may increase the score of knowledge of rural hypertensive patients in terms of healthy diet in Ardabil, Iran.<sup>[35]</sup> In addition, this finding is consistent with those of Geaney *et al.*<sup>[36]</sup> Francis *et al.*<sup>[37]</sup> Pletzke *et al.*<sup>[34]</sup> and Abood *et al.*<sup>[33]</sup> in other countries. In another study, Park *et al.* found that nutrition education programs increased nutrition knowledge of female students about the fat content of foods and adequate dietary intake.<sup>[38]</sup> Literature showed that many consumers did not know whether fats were good or bad, meaning they did not know what to eat and had not basic information about dietary fat.<sup>[39]</sup> Furthermore, in the present study, there was no significant relationship between knowledge regarding dietary fat nutrition and high fat foods intake in the two groups before and after the intervention. We expected that by increasing the intervention participants' knowledge, their intake of high-fat foods reduced as well. This finding is inconsistent with the results of such studies. For example, Yahia *et al.* reported that students with greater nutritional knowledge consumed less unhealthy fats and cholesterol.<sup>[18]</sup> It was concluded that there was a gap between the knowledge and behavior of the study participants. This finding is in agreement with those mentioned by Packman and Kirk<sup>[40]</sup> and Ranga and Venter.<sup>[19]</sup> For example, Ranga and Venter found that there was no significant association between the students' fat food knowledge and consumption of foods rich in fat.<sup>[19]</sup> Similarly, Oli *et al.* reported that there was a gap between the mothers' knowledge and diet behaviors. They suggested that deeper understanding of the mothers' perceived barriers for performing these behaviors could offer important insights to develop effective efforts for reducing the gap between knowledge and behaviors.<sup>[41]</sup> Given that knowledge alone is not enough to change behavior<sup>[42]</sup>, attention to other variables such as enabling factors, subjective norms, and so on to increasing the effectiveness nutrition education interventions has been recommended.<sup>[43]</sup>

In the study, a significant decrease in the positive attitude towards high fat foods was reported in the intervention group compared with the control group after the nutrition intervention. In line with, Engbers *et al.* found that conducting worksite environmental intervention was effective in changing the attitude of office workers towards eating less fat at work.<sup>[44]</sup> In the study, attitude towards high-fat foods consumption was correlated with

high-fat foods among the participants in the intervention group before and after the intervention. In the other words, increasing the positive attitude consumption of high-fat foods increased as well. In line with, Packman and Kirk showed that male college students with a high fat intake had significantly more negative attitudes towards reducing fat consumption than those who had a lower fat intake.<sup>[40]</sup> Given that attitude towards fat intake might be more important barriers to diet practice change than the level of knowledge of participants,<sup>[40]</sup> health-care providers should consider this variable, as an important target, in encouraging the participants to reduce high-fat intake and eating less fat.

## Conclusion

The results of this study showed that the design of nutrition education intervention could increase participants' knowledge in terms of dietary fat nutrition, and reduce positive attitude towards high-fat foods and intake of foods high in fats in women.

In the study, there were some limitations should be attended to. The limitations of this study were including the use of self-report instruments for measuring the frequency of high-fat intake and short duration of follow-up of participants. Performing similar intervention on other population groups such as males is suggested.

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## Conflicts of interest

There are no conflicts of interest.

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