



## An Evaluation of Health Effects and Nutrient Content of Pistachios and Other Tree Nuts

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Information	Abstract
<p><b>Article Type:</b> Original Article</p>	<p><b>Introduction:</b> Since tree nuts can be substantial part of low-fat high-fiber diets, they can effectively reduce the risk of cardiovascular disease and cancers. Cardiovascular disease and diabetes are among leading causes of death in the country.</p> <p><b>Methods:</b> The present study was conducted in Rafsanjan County. The participants' age ranged from 41 to 89. Besides, their mean age was 63, and their gender was almost evenly distributed. The body mass index (BMI) averaged 30 in the participants. Answers to the questionnaires were calculated in terms of percentage on a 5-point scale. In addition, statistical software SPSS V18.0 was used for data analysis.</p> <p><b>Results:</b> From among all 85 participants, 83.6% had previously experienced at least one case of cardiovascular disease, heart attack, angina, stroke, hypertension, high cholesterol, or diabetes. Accordingly, the rates of the heart attack, angina, stroke, hypertension, high cholesterol, and diabetes were 27.1, 11.8, 15.3, 61.2, 56.5, and 34.1%, respectively. Almost 33% of the respondents believed consumption of tree nuts would increase their weight. Approximately, 44% of the participants believed there was too much salt in tree nuts. About 42% of the respondents were aware of the beneficial effects of tree nuts and peanuts on diabetes. The majority of the respondents (51.8%) were unaware that daily consumption of tree nuts would lower the cholesterol level and prevent heart disease. On average, 61% of the participants gave wrong answers to scientific questions about the amount of nutrients in tree nuts and peanuts. More than 50% of the participants claimed they were on a healthy diet (56.5%). However, only 35.5% of them consumed tree nuts one to two times a week. The participants mostly consumed salted (55.3%) or roasted (74.1%) tree nuts.</p> <p><b>Conclusion:</b> In general, the public does not have deep knowledge of tree nuts, their health benefits, and nutrients. According to the results of the present study, informing people over the age of 40 may reduce incidence of CVD or diabetes and the resulting mortality rate among them.</p>
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## 1. Introduction

Tree nuts are rich in vitamins and minerals. Besides, their oil is cholesterol-free and more of a type of unsaturated fats with a double bond necessary for the human body [1, 2]. Consumption of pistachio kernels has been proven to significantly affect human health, thereby preventing various diseases, especially cardiovascular disease, cancers, and diabetes [3-6].

Daily consumption of small amounts of tree nuts can provide a wide range of vitamins, minerals, and dietary fiber necessary for the human body. This is because tree nuts can be good part of a low-fat high-fiber diet. Therefore, they are effective in reducing the risk of suffering from cancers, congenital defects, and cardiovascular disease [7]. Hyperlipidemia is one of the most critical risk factors for atherosclerosis in cardiovascular disease. Nuts, including almond kernels, are rich in unsaturated lipids and antioxidants, with some reports indicating their protective effect on the cardiovascular system [8-10]. Cardiovascular disease (CVD) is one of the leading causes of death [11]. The risk of developing CVD increases with age. Besides, women have a higher mortality rate than men. Despite medical advances, cardiovascular disease still accounts for about 34% of all deaths [12].

Epidemiological evidence shows that regular consumption of nuts may be effective in preventing cardiovascular disease. Although most research on beneficial properties of tree nuts focuses on the amount of monounsaturated fatty acids (MUFAs) [13-15], evidence shows that various phytochemicals in their skin

constitute a significant part of beneficial nutrients [16, 17]. Phenolic compounds in the skin of walnuts and almonds have been shown to inhibit oxidation of low-density lipids (LDL) and cholesterol, being a key step in preventing atherosclerosis [10, 18].

Edward et al conducted an experiment on 10 people with high cholesterol as controls. For three weeks, the people went on a regular diet by replacing 20% of their daily calories with pistachios. After the first three weeks, individuals who went on a pistachio diet were accepted, yet the rest were rejected. At the end of the study, people who had the mentioned diet showed a significant decrease in the total cholesterol and low-density cholesterol (LDL), but a significant increase in high-density cholesterol (HDL) [19].

Many epidemiological studies have linked regular consumption of nuts to a reduced risk of coronary heart disease. The primary mechanism by which nuts protect an individual against cardiovascular disease is the improving of the lipid and apolipoprotein profile. All studies show changes in the lipid profile after the intervention, especially in total cholesterol, high-density lipoproteins, low-density lipoproteins, and triglycerides. Intervention periods lasted from 3 weeks to 12 months, with different doses ranging from 15 to 126g. In conclusion, this study provides evidence on the favorable effects of nut consumption on the serum lipid profile [20].

Qanavati et al (2020) reported that pistachio consumption could positively affect some cardiovascular risk factors [21]. In the same

vein, Ravari et al (2019) stated that given the positive effects of consumption of pistachios on women's health indicators, which were observed at both doses of 15 and 50g, according to conditions and costs, 15g of pistachios per day would be recommended to be added to diet of the elderly [22].

According to the study of Ismaili Nadimi et al (2019), evidence from clinical studies shows that pistachios reduce oxidative and inflammatory stress, heart disease, blood lipids and lipoproteins, as well as obesity. In addition, pistachios can act as a probiotic element. However, they may act as an allergen in some people. Therefore, dietary recommendations encourage consumption of pistachios as part of a healthy diet to reduce the risk of chronic diseases. However, individuals and healthcare professionals should consider possible allergies to the nuts [23].

Brown et al (2017) reported that despite nutritional benefits of tree nuts, their consumption in the society is still low. Research shows that people consume more nuts on their doctors' advice, which turns health professionals into potentially important individuals who promote consumption of nuts. This cross-sectional study was conducted to examine the knowledge of nuts as well as predictors of nut consumption promotion among health professionals in New Zealand. More than one-fifth of general practitioners and nurses believe that eating nuts increases the blood cholesterol level, thereby leading to weight gain. The most common perception indicated that nuts are healthy, rich in proteins, fats, and calories, as well as being filling. Consumption of nuts is recommended for the explained reasons and the selenium content of nuts. However, reasons

suggesting consumption of less nuts include their high calories and fat content, which lead to weight gain, allergy concerns, and costs. If effectiveness of nuts in reducing the risk of diabetes is well understood, all groups of health professionals will be likely to recommend their regular consumption. Education can improve health professionals' knowledge of the effects of eating nuts on blood cholesterol and body weight, among other health benefits. Accordingly, this will improve patient advice, thereby increasing consumption of nuts [24].

Objectives of this study include:

- 1- Understanding the participants' beliefs about health benefits and nutrients of tree nuts
- 2- Understanding the participants' attitudes about consumption of tree nuts
- 3- Evaluating perceived benefits of consumption of tree nuts and barriers to it
- 4- Evaluating the participants' knowledge of nutritional values of tree nuts
- 5- Estimating consumption of tree nuts in people with CVD or diabetes

## 2. Materials and Methods

This study was conducted in Rafsanjan County. The participants' age ranged from 41 to 89 years. Besides, the participants' mean age was 63 years, and their gender was almost evenly distributed. In addition, their body mass index (BMI) averaged 30. Table 1 illustrates the participants' characteristics. Demographic data of the study included age, sex, weight, height, annual income level, and education level. Besides, health information, in this study, included previously diagnosed diseases and the age of diagnosis.

**Table 1.** Participants' characteristics

	General info	No.	%	Validity
	Age (average)	63		
	(Average) BMI	30		
	Sex (male)	44	52	52
	Sex (female)	41	48	48
<b>Annual household income (million Tomans)</b>	< 5	6	7.1	8.0
	< 20	8	9.4	10.7
	< 40	11	12.9	14.7
	< 60	15	17.6	15
	< 80	13.3	11.8	10
	< 100	16.0	14.1	12
	>100	17.3	15.3	13
	Not completed	-	11.8	10
<b>Highest level of education</b>	Below high school	10	11.8	11.8
	High school diploma	21	24.7	24.7
	Student	24	28.2	28.2
	University graduate	30	35.3	35.3

### Understanding the participants' beliefs about health benefits and nutrients of tree nuts

The participants' beliefs were assessed using 9 sentences with three possible answers of right/agree, wrong/disagree, and I do not know.

### Understanding the participants' attitudes about consumption of tree nuts

These attitudes were measured using 10 attitude statements, including five negative and five positive attitudes. Statements were assessed on a five-point scale, which included 1- strongly agree, 2- agree, 3- neither agree nor disagree, 4- disagree, and 5- strongly disagree.

### Evaluating perceived benefits of consumption of tree nuts and barriers to it

Advantages of and barriers to consuming tree nuts were examined using 17 questionnaires, 8 advantages, and 9 questions about consumption barriers. The statements were scored on a five-point scale, including 1- strongly agree, 2- agree, 3- neither agree nor disagree, 4- disagree, and 5- strongly disagree.

### Evaluating the participants' knowledge of nutritional values of tree nuts

The participants' knowledge of nutritional values of tree nuts was assessed using five multiple-choice questions with the choices of four to eight answers. Accordingly, the relevant percentage was calculated for each question.

### Estimating consumption of tree nuts in people with CVD and diabetes

For each person, 5 options, including never, less than once a month, 1 to 2 times a month, once a week, and 1 to 2 times a week were considered to select among which the amount of tree nut consumption, and the distribution was calculated [25, 26].

### Information analysis method

The percentage of each option, including correct/agree, incorrect/disagree, and I do not know, was calculated for variables of belief. Besides, responses were calculated as percentages on a five-point scale for the variables of benefits, barriers, and attitudes. Correct percentages were calculated for the knowledge questions, and the distribution was calculated for different ways of consuming tree nuts. Next, statistical analysis was performed using SPSS V18.0 [25].

## 3. Results

A total of 100 responses were collected, with 15 responses of which deleted for non-compliance. Therefore, the inclusion criteria were the remaining 85 surveys that were analyzed (85%).

### Diagnosis of the disease or risk factors

From among 85 participants, 83.6% of them had previously reported at least one case of heart disease, a heart attack, angina, a stroke, high blood pressure, high cholesterol, or diabetes. Among them, 27.1% had a heart attack, 11.8% had angina, 15.3% had a stroke, 61.2% had hypertension, 56.5% had high cholesterol, and 34.1% had diabetes. Table 3 shows diagnosis details. In addition, 54.2% of the participants had at least one type of heart disease, heart attack, angina, and a stroke; besides, 30.6% of them had at least two types of the diseases, 14.1% had at least three types of the diseases, and 2.4% reported to have all four types.

**Table 2.** Participants' record of CVD or diabetes (%)

Disease	Yes (%)	No (%)	I do not know (%)	No data (%)
Heart disease	47.1	35.3	0	17.6
Heart attack	27.1	44.7	1.2	27.1
Angina	11.8	52.9	1.2	34.1
Stroke	15.3	47.1	1.2	36.5
Hypertension	61.2	21.2	1.2	16.5
High cholesterol	56.5	25.9	1.2	16.5
Diabetes	34.1	40.0	0	25.9

### Beliefs

As Table 3 shows, about two-thirds of the participants believed that tree nuts have calories (64.7%), fats (68.2%), and dietary fiber (69.4%). Approximately, 32% were unaware of

hypocholesterolemic effects of tree nuts, and an additional 21% disagreed that tree nuts might have such effects.

A bit more than a third of the respondents were concerned that regular consumption of tree nuts would reduce the risk of a heart attack

(38.8%), and about 17% disagreed that tree nuts might be able to have such side effects. Besides, about 44% of the participants believed tree nuts would contain too much salt, while 10% were not sure about their salt content. In addition, around 42% of the respondents were aware of the beneficial effects of tree nuts and peanuts on

diabetes. The majority (51.8%) were unaware that the FDA had scientifically validated this health claim, indicating that the daily consumption of tree nuts would lower cholesterol levels and prevent heart disease.

**Table 3.** Beliefs about the nutrient contents and health benefits of tree nuts (%)

Statement	Correct / agree (%)	Incorrect /disagree	Do not know	No data (%)
Tree nuts are rich in calories.	64.7	21.2	12.9	1.2
Tree nuts are rich in fats.	68.2	20.0	10.6	1.2
Tree nuts are rich in dietary fiber.	69.4	5.9	22.4	2.4
Tree nuts are rich in salt.	43.5	43.5	10.6	2.4
Consumption of tree nuts helps lower cholesterol.	41.2	21.2	32.9	4.7
Consumption of tree nuts reduces the risk of a heart attack.	41.2	17.6	38.8	2.4
Consumption of tree nuts reduces the risk of diabetes.	34.1	20.0	42.4	3.5

**Attitudes**

At least a third of the participants strongly disagreed with all five negative attitudes. As Table 4 shows, about one-third of the participants strongly agreed, agreed, or were indifferent to the sentence, "I should not eat tree nuts on most weekdays because I may gain weight". At least half of the participants strongly

agreed or strongly disagreed with all five positive points. Besides, one-third of the participants did not agree or disagreed with the statements, "I should eat tree nuts on most weekdays because they make me feel full," and "I should eat tree nuts on most weekdays because they are good sources of omega-3 (28.2% and 38.8%, respectively)".

**Table 4.** Distribution of statements of attitudes about consumption of tree nuts on weekdays

Positive/Negative Attitude Questionnaire	1 Strongly agree	2 Agree	3 Indifferent	4 Disagree	5 Strongly disagree
On most weekdays, I should not eat tree nuts because they are rich in fat.	8.2	11.8	23.5	21.2	35.3
On most weekdays, I should not eat tree nuts because they are rich in salt.	8.2	15.3	23.5	21.2	31.8
On most weekdays, I should not eat tree nuts because they raise my cholesterol level.	6.9	10.8	28.2	23.5	30.6
On most weekdays, I should not eat tree nuts because they make me gain weight.	4.7	12.9	16.5	36.5	29.4
On most weekdays, I should not eat tree nuts because they cause allergies.	7.1	4.7	21.2	20.0	47.1
On most weekdays, I have to eat tree nuts because they make me healthy.	49.2	23.7	12.9	7.1	7.1
On most weekdays, I have to eat tree nuts because they are rich in nutrients.	49.1	26.0	16.7	5.9	2.4
On most weekdays, I have to eat tree nuts because they are rich in proteins.	50.2	30.4	11.0	4.8	3.5
On most weekdays, I have to eat tree nuts because they are filling.	22.8	27.9	28.2	10.6	10.6
On most weekdays, I have to eat tree nuts because they are good sources of omega-3s.	30.2	24.4	38.9	4.0	2.5

### Benefits of/barriers to consumption of tree nuts

The majority of the participants were indifferent to 17 benefits and barriers enumerated. Accordingly, about 54% of the participants strongly agreed or disagreed with the statement, "Eating tree nuts on most weekdays helps me eat more fiber". Besides, the

majority (53%) of the participants strongly disagreed or disagreed with the statements "Eating tree nuts on most weekdays causes me to overeat fats" and "Eating tree nuts on most weekdays causes me to receive more calories than the calorie limit". About 63.5% of the respondents stated that they strongly agreed or disagreed with the statement "My doctor advised

me to do this on most weekdays". Table 5 presents further results.

### 3. Knowledge

On average, 61% of the participants answered wrong when asked questions about the

nutritional content of tree nuts and peanuts. The question, "Peanuts and walnuts are a good source of the following fats?" was the only exception to which 65.9% of the participants gave the right answer. Table 6 shows the percentage of the respondents who gave correct answers to all five scientific questions.

**Table 5.** Distribution of statements about benefits of/barriers to eating tree nuts on most weekdays

Benefits of/barriers to consumption	1 Strongly agree	2 Agree	3 Indifferent	4 Disagree	5 Strongly disagree
Consumption of tree nuts on most weekdays helps me feel better.	13.9	16.7	47.1	12.9	9.4
Consumption of tree nuts on most weekdays helps me take more care of my body.	21.0	23.7	36.5	9.4	9.4
Consumption of tree nuts on most weekdays helps me receive more nutrients.	26.7	29.8	30.6	8.2	4.7
Consumption of tree nuts on most weekdays helps me stay healthier.	26.8	27.3	32.0	7.1	5.9
Consumption of tree nuts gives me the energy I need on most weekdays.	16.6	30.4	40.0	7.1	5.9
Consumption of tree nuts on most weekdays helps me receive more fiber.	30.4	28.1	30.0	7/7	3.5
Consumption of tree nuts on most weekdays helps me look younger.	3.4	9.6	25.9	37.6	23.5
I consume tree nuts on most weekdays as recommended by my doctor.	16.3	12.8	42.8	12.9	15.3
Consumption of tree nuts on most weekdays costs me a lot.	9.2	16.7	27.1	23.5	23.5
Consumption of tree nuts on most weekdays causes me to become overweight.	13.9	12.8	20.4	39.6	22.4
Consumption of tree nuts on most weekdays causes me to consume too many calories.	21.0	13.9	18.6	25.9	20.5
I will eat tree nuts over a few days a week if they are available in grocery stores.	18.6	11.6	30.4	16.5	22.4
I will eat tree nuts more than a few days a week if they are affordable.	24.5	21.0	27.5	9.4	17.6



I will eat tree nuts more than a few days a week if they taste better.	9.2	8.1	28.1	28.5	26.2
I will eat tree nuts more than a few days a week if they are low in fat.	23.4	12.8	24.5	17.6	21.2
I will eat tree nuts more than a few days a week if they have fewer calories.	26.9	12.8	27.5	14.1	18.8
I eat tree nuts more than a few days a week because my doctor advised me to do so.	44.5	21.0	22.8	2.4	9.4

**Table 6.** Correctly answered questions about the nutritional content of tree nuts

Questions	Correct responses (%)
What kind of fats do tree nuts, such as almonds, walnuts, pistachios, hazelnuts, etc., mainly contain?	14.0
Which fats do walnuts mainly contain?	6.0
Are peanuts and walnuts a good source of fats?	66.0
Which of the following tree nuts has the highest content of omega-3 fatty acids?	26.0
Which of the following tree nuts has the highest amount of selenium?	22.5

**Tree nut consumption**

A bit more than half of the participants believed they were on a healthy diet (56.5%). However, only 35.5% of them reported they

would consume tree nuts 1 to 2 times a week. Table 8 shows that the participants were more likely to consume salted (55.3%) or roasted tree nuts (74.1%) than other types of tree nuts.

**Table 7.** Percentage of tree nut intake

Tree nut intake	Responses (%)
Never	6.0
Less than once a month	16.0
One to 2 times a month	22.5
Once a week	20.0
One to 2 times a week	35.5

Table 8 . tree nut consumption

Tree nut consumption	Yes (%)	No (%)
I usually eat raw nuts.	34.0	66.0
I usually eat salted nuts.	56.3	43.7
I usually eat roasted nuts.	75.1	24.9
I usually eat nuts as nut butter.	9.0	91.0
I usually do not eat any of the above.	2.5	97.5
I like raw nuts the most.	23.4	76.7
I like salted nuts the most.	42.2	57.8
I like roasted nuts the most.	64.5	35.5
I prefer to eat nuts in the form of herb butter.	13.1	86.9
I no longer like to eat any of the above.	3.4	96.7
Most of the time, I prefer to eat peanuts.	49.0	51.0
Most of the time, I prefer to eat almonds.	46.9	52.9
Most of the time, I prefer to eat pistachios.	74.1	24.7
Most of the time, I prefer to eat walnuts	62.6	37.5
Most of the time, I prefer to eat hazelnuts.	94.3	5.7

#### 4. Discussion

Research shows that regular consumption of tree nuts can reduce the risk of chronic diseases. Men over the age of 35-44 and women in their mid-50s are at a high risk of CVD [12]. In addition, they are more likely to develop diabetes. Therefore, they must be aware of the benefits of tree nut consumption and understand the importance of following recommendations on doing so.

The current study showed that the public knows little about the nutritional content and health benefits of tree nuts. Other studies have suggested similar results. For example, two-thirds of the participants did not believe that tree nuts have hypocholesterolemic effects, and only slightly more than one-third of them knew that tree nuts would not affect weight [25]. Pawlak et al (2009) showed similar results in evaluating

beliefs, benefits, barriers, attitudes, and knowledge of tree nut consumption. Besides, most nutritionists were aware of the hypocholesterolemic effects of tree nuts.

The present research revealed that almost a third of the participants were unaware that tree nuts can lower cholesterol levels, and 21% of them believed they do not have such effects. Similar results were observed when people with a history of CVD were asked about such effects. However, this belief is inconsistent with recent studies. An analysis conducted by Banel and Hu (2009) showed that tree nut consumption reduces blood lipids [27]. About 40% of the respondents were unaware and approximately 20% of them believed that tree nut consumption prevents diabetes and heart attacks. From among 29 people with a history of diabetes, 37.9% were unaware of this fact, and 10.3% believed that frequent tree nut consumption could help reduce

the risk of developing diabetes. In addition, 41.3% were unaware of the impact of tree nut consumption on CVD, and 13% did not believe that tree nut consumption would positively affect the risk of a heart attack. In fact, people with a history of the disease mentioned in Table 2 are more familiar with the benefits of regular tree nut consumption.

About a third of the participants strongly disagreed, agreed, or were indifferent to the statement, "I should not consume nuts on most weekdays because I am gaining weight". According to Giuseppe et al (2008), participants who ate nuts weighed less than those who did not do so. More people with a history of diabetes (44.8%) showed that most of them (34.2%) were accustomed to consuming nuts being low in fat on weekdays. The high body mass index (BMI) and obesity status increase risk factors for CVD and diabetes. This study showed that about one-third of the participants were unaware of or have misconceptions about effects of tree nuts on weight. Such misconceptions could prevent these people from consuming tree nuts. In addition, 65.9% of the participants knew that peanuts and walnuts are good sources of omega-3 fatty acids. Besides, half of them either agreed or strongly agreed with the statement, "I should eat tree nuts on most weekdays because they are good sources of omega-3 fats" [28].

About a third of the participants agreed or disagreed with many of the questions about benefits of tree nuts, which indicates they were not aware of the benefits of tree nuts. Participants who had been diagnosed with cardiovascular disease answered the questions similarly. However, awareness of the relationship between tree nut intake and the risk of diabetes was higher in the individuals.

Besides, people with diabetes were more aware of the benefits of tree nuts in preventing diabetes.

According to the results, consumption of tree nuts was relatively low among the participants. Most of the people were aware of the high content of fats and calories in nuts. However, they were not aware of beneficial effects of tree nuts on cardiovascular disease and diabetes. People are often cautious about consumption of calories and fats, which could justify low tree nut consumption. In addition, research shows that the fiber content in tree nuts reduces CVD and the risk of diabetes [29]. Thus, a possible way of increasing tree nut consumption is to inform the public of the fiber content of tree nuts.

Only 27% of the participants strongly agreed or agreed with their doctors recommending them to eat tree nuts on most weekdays. Although most participants strongly agreed or disagreed with it, they would consume more tree nuts if their doctors advised them to do so. Most of the people with diabetes (65.5%) strongly agreed that they would eat nuts if their doctor recommended it.

St. Michael's Hospital and the University of Toronto conducted a study on the effects of a doctor's diet on lowering the cholesterol level. Accordingly, participants who followed their doctor's advice reduced their cholesterol level by 13%, while those who did not receive their doctor's recommendations reduced their cholesterol level by only 3%. Against this background, diet recommendations made by doctors could be useful in improving health, which approves our suggestion. However, the extent to which doctors know the effects of nuts on cardiovascular disease and diabetes is not fully understood. Further research is required to

assess the knowledge and recommendations of physicians in this regard [25].

After doctors' advice, cost-effectiveness of tree nuts was identified as the second most significant barrier to their consumption. Less than half and one-third of the participants reported that the price and nutrient content (calories and fats) of tree nuts, respectively, prevented them from consuming them. People with diabetes strongly agreed or disagreed (37.9%) with consuming tree nuts because they would buy tree nuts if they were available in the stores they referred to. Besides, people with diabetes stated that the flavor and fat content of tree nuts were barriers to consuming them (24.1% and 44.8%, respectively). The participants' level of knowledge of the nutritional content of nuts was very low. On average, 61% of the participants answered questions incorrectly. Only about one-eighth of the participants were aware of the predominant fat and MUFAs in nuts, and about one-fifth of them were aware of the selenium content in tree nuts. About 68% of the respondents believed that nuts are rich in fats. Besides, 56% of the participants believed they should not eat tree nuts because they are rich in fats. However, tree nuts contain beneficial types of fats, such as MUFAs and PUFA, with SFAs being low in them [30, 31]. Higher volumes of nuts with beneficial MUFAs and PUFAs can replace those with foods rich in SFAs.

People who had previously been diagnosed with one or more types of CVD gave the wrong answer as well. On average, 61% of the participants responded incorrectly. Diagnosis of people who already suffered from diabetes was a bit more accurate. In this regard, an average of 55% of the participants answered incorrectly.

This indicates that the participants were not fully aware of beneficial nutritional properties of tree nuts. However, people with diabetes might have received some nutrition education. Only about a third of the participants reported to have consumed tree nuts 1 to 2 times a week. Most of the consumers were unlikely to consume tree nuts on a regular basis. Therefore, most of the participants did not follow the 1.5-ounce offer on most weekdays. Besides, just over half of the participants believed they were on a healthy diet. Beliefs about the doctors' advice, cost-effectiveness, as well as fat and calorie content of tree nuts could have played a leading role in the low intake of tree nuts in this population. Education and consultation of physicians and other healthcare professionals with knowledge of health effects of repeated consumption of tree nuts on controlling CVD and diabetes can lead to increased consumption of tree nuts. The current study was conducted to assess attitudes, barriers, benefits, and knowledge of the consumption of tree nuts among people at the risk of CVD or diabetes. People over the age of 40 need to be aware of the benefits of tree nuts because they are at a higher risk of CVD and diabetes [12]. Unfortunately, this study provides evidence that people over the age of 40 know little about health benefits of consuming tree nuts.

Powell et al (2009) found out that participants were mostly unaware of current scientific findings about health benefits of tree nuts. In general, few studies have been conducted on this subject [25].

## 5. Conclusion

People over the age of 40 are at an increased risk of CVD or diabetes. CVD and diabetes are

among the leading causes of death in the country. Increasing knowledge of people over the age of 40 about tree nut consumption can reduce the incidence of CVD, diabetes, and mortalities. In general, continued consumption of tree nuts is inversely associated with cardiovascular disease, diabetes, and mortalities. Most people are unaware of the fact that tree nuts can help decrease the risk of a heart attack or diabetes; however, one-third of people believe

that eating tree nuts helps them gain weight. The level of awareness of health benefits and nutrients of tree nuts is very low. Since people refer to physicians for advices, they can play an essential role in informing them of the health benefits of continued consumption of tree nuts. When doctors recommend a diet containing tree nuts, patients usually accept their recommendation.

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