



## ORIGINAL ARTICLE

## Effects of Eight Weeks of Combined Yoga Exercises, Almond Consumption and Diet on Sexual Function of Diabetic Women

Zahra Akbarian, Tahereh Bagherpour\*, Nematullah Nemati

*Department of Physical Education and Sports Sciences, Damghan Branch, Islamic Azad University, Damghan, Iran*

## ARTICLE INFO

## ABSTRACT

**Keywords:**

Almonds;  
Diabetes;  
Diet,  
Dietary Recall;  
Sexual Function;  
Yoga

Type two diabetes is one of the most common endocrine diseases, and the lesser-known complication of diabetes is sexual dysfunction, which leads to, vaginal dryness in females and erectile problems in males. Therefore, it is necessary to study the influencing factors on the complication reduction of treatment. The main purpose of this present study was to examine the effects of 8 weeks of combined yoga exercises, almond consumption and diet on the sexual function of diabetic females in Damghan city. For this purpose, fifty diabetic women aged between 30 to 50 years old in Damghan were selected and matched based on their age, height, and weight into five groups (number in each groups=10 subject). The subjects randomly named 1.yoga exercises; 2. Almonds consumption; 3. Diet (doing all three items); and 4. Control group. Before and after the intervention period, blood pressure, blood sugar, waist, and hip size were measured and the subjects completed a dietary recall questionnaire. The first group subjects performed 10-minute breathing exercises, 20-minute stretching, and 15-minute concentration of yoga exercises in each session. The second group replaced 1 ounce (equivalent to 28.34 gr) of almonds with a 10% calorie intake per day. The third group implemented any of the diet programs set by the nutritionist, and the fourth group performed all of the above 3 conditions (yoga, almonds consumption & diet). The control group did not implement any of the above. TDEo analyses of the data, descriptive statistics and analysis of variance (ANOVA) were used. The results showed that eight weeks of yoga exercises, almond consumption, and diet significantly affect sexual function among diabetic women. However, no significant effect was observed on the sexual function after the intervention in the control group. Thus yoga exercises, almond consumption, and diet improved sexual function of diabetic women.

### Introduction

Diabetes is a metabolic disease that occurs when blood sugar levels increase (Wien *et al.*, 2010). On the other hand, the cause of high blood sugar is also called hyperglycemia. It is created by a defect in the secretion or function of insulin (Mobaraki, Hejazi, & Ramadanpour, 2018).

Therefore, Insulin is a hormone produced by pancreatic beta cells and is essential for the use or storage of macronutrients (carbohydrates, proteins, and fats) in the body. In this case, diabetes leads to a significant increase in mortality and other diseases which by early diagnosis and treatment

\*Corresponding author: Email address: [bagherpour\\_ta@yahoo.com](mailto:bagherpour_ta@yahoo.com)

Received: 30 November 2020; Received in revised form: 25 August 2021; Accepted: 23 July 2022

DOI: 10.22034/jon.2020.1890928.1079

can prevent disease complication (Habibnia, Attarzadeh Hosseini, 2013). In this way research (Tahmasbi, & Abbasi, 2013) estimates that the total cost of diabetes has increased from \$ 245 billion in 2012 to \$ 327 billion in 2017. Thus, medical nutrition therapy (MNT) for the prevention and treatment of diabetes can significantly reduce the costs and risk of complications or premature death. Most of people have type 2 diabetes are obese (BMI above 30) and among obese people insulin resistance increases and leads to pancreatic beta cell destruction. Basically at the time of diagnosis, the pancreatic beta-cell function is reduced by about 24% to 65% (Darvish Damavandi, 2012). Other risk factors for the disease include genetic and environmental factors, such as a family history of diabetes or a history of gestational diabetes, old age, high blood pressure, dyslipidemia, as well as race and ethnicity (Mobaraki, Hejazi, & Ramadanpour, 2018). Hence, lifestyle modification with proper diet and physical activity is a necessity for delaying the effects of diabetes. Plant-based diet containing whole grains, fruits and vegetables, lean or low-fat protein sources, and low-fat dairy or soy drinks, and the use of nuts (Roosban *et al.*, 2006), along with sports exercise is emphasized as a logical intervention. The effect of these two is stronger in women than men. According to a study from Harvard University, daily consumption of magnesium reduces the risk of advanced diabetes by 33%. The use of magnesium-rich foods such as almonds, pumpkin seeds, spinach, and Swiss beet leaves in the diet is a smart move. Almond is a healthy food consisting of unsaturated fats and low carbohydrates as well as magnesium (Wien *et al.*, 2010; Imani *et al.*, 2021). The other way, physiological changes in many people during middle age, can lead to changes in body composition with reduced muscle mass and

accumulation of excess fat. Thus causes overweight, and obesity, diabetes mellitus, impaired glucose tolerance, increased insulin levels, impaired blood lipid levels, cardiovascular diseases, hypertension, reduced fertility and sexual dysfunction and some other disorders (Yekkeh Fallah, Azimi, &, Sadeghi, 2014). The sexual dysfunction occurs in 25% of patients because uncontrolled diabetes can damage blood vessels and the nervous system, which reduces blood flow and sensation in the genitals. This problem can cause vaginal dryness in women and erection problems in men. Although, certain medications for other diabetes-related problems, such as cardiovascular diseases as well as surgeries in other organs (e.g., bladder, bowel, prostate); can increase the chances of sexual dysfunction in people with diabetes (Chudyk, & Petrella, 2011). It has also been stated in recent studies (Habibnia, & Attarzadeh Hosseini, 2013) that adherence to a healthy diet (moderation in food consumption and having regular physical activity), careful control of blood sugar, blood pressure, and blood lipids can prevent many of these disorders.

Consumption of magnesium-rich food sources such as green leafy vegetables, nuts, and whole grains that have food fiber effectively prevents vascular contraction. A study showed (Juraskova *et al.*, 2013; Jahanbani *et al.*, 2018), the Mediterranean diet with high levels of monounsaturated fatty acid, which is rich in fruits and vegetables, nuts, and a variety of seeds and olive oil, and improved sexual function of women with metabolic syndrome. Moreover, it has been suggested that yoga is effective in treating the sexual disorders of diabetic women. According to studies conducted in Seoul, yoga is a physician in the treatment of female sexual disorders (Habibnia, & Attarzadeh Hosseini, 2013). Yoga training increases self-efficacy which leads to the regulation of the endocrine, catecholamines, and

the internal opioid system. Moreover, Yoga, including a set of physical and respiratory exercises such as Asana, Pranayama, and Shavasana can increase flexibility and muscle strength, improve blood circulation, oxygen uptake, the hormonal system. Calm and relaxation in yoga stimulate the nervous system and improve the feeling of health in the individuals (Woodyard, 2011). Therefore, a combination of almond consumption with yoga exercise can prevent or control hypertension and sexual disorders. Although, many studies have been conducted on erectile dysfunction in diabetic men, sexual dysfunction in women has not been much studied. The purpose of the present study was to investigate the effects of almond consumption, diet and yoga exercises on sexual dysfunction in women with T2DM.

### Materials and Methods

The current study was a cross-sectional study conducted at Damghan among 50 female patients with T2DM whose age range was between 30-50 years old. For this purpose, fifty diabetic women aged between 30 to 50 years old in Damghan city were selected and completed a health questionnaire and medical history form. They matched based on their age, height, and weight into five groups (number in each groups=10 subject).

Before beginning the intervention, Blood sugar, blood lipid, Levels of hemoglobin A<sub>1c</sub>, blood pressure (from the left hand at least two times), abdominal fat, and waist size was measured. Also, a glucometer device was used in different times to monitor the blood sugar of a diabetic patient to prevalent the problems during exercise. As well as, at the pretest and posttest, the subjects completed the Female Sexual Function Index questionnaire (FSFI), which has a 19-item.

The 19-item Female Sexual Function Index (FSFI) is one measure that has been popular worldwide. Originally developed in English (Rosen *et al.*, 2000), the scale has been translated into multiple languages (Chang, Chang, Chen, & Lin, 2009; Fakhri, Pakpour, Burri, Morshedi, & Zeidi, 2012; Filocamo *et al.*, 2013; Ghassamia, Asghari, Shaeiri, & Safarinejad, 2013; Giraldo *et al.*, 2012; Kriston, Gunzler, Rohde, & Berner, 2010; Nowosielski, Wrobel, Sioma-Markowska, & Poreba, 2013; Sidi, Abdullah, Puteh, & Midin, 2007; Sun, Li, Jin, Fan, & Wang, 2011; Takahashi, Inokuchi, Watanabe, Saito, & Kai, 2011). FSFI questions are coded from 0.0 to 5.0. Based on clinical considerations, the scale is considered to have six sexual domains (desire, arousal, lubrication, orgasm, satisfaction, pain), each contributing to the overarching construct of female sexual function (Opperman, Benson, & Milhausen, 2013; Rosen *et al.*, 2000). The maximum score for each domain is 6.0, obtained by summing item responses and multiplying by a correction factor. The total composite sexual function score is a sum of domain scores and ranges from 2.0 (not sexually active and no desire) to 36.0.

The subjects were randomly named 1.yoga exercises, 2. Almonds consumption, 3. diet (doing all three items), and 4. Control group as we explained below.

### Yoga exercises

The yoga training program was performed at 10 a.m. for a eight weeks and each session was 45 minutes. These exercises hold in three phases: 10-minute breathing exercise, 20-minute stretching, and 15-minute yoga concentration.

### Almond consumption

The subjects were asked to replace 1 ounce (equivalent to 28.34 gr) of almonds with a 10%

calorie intake per day (about 4 or 5 p.m.) so that the total daily calorie intake can remain stable.

For this purpose, the body composition, the amount of activity, and the average total calorie intake were calculated over three days by a 24-hour dietary recall questionnaire at the pretest.

**Diet**

The diet program was provided by a nutritionist based on their height, weight, body mass index, activity level and amount, and disease history. Therefore three main meals and the accuracy follow-up of this diet program were carefully checked. The subjects completed the dietary recall questionnaire every 15 days, and the nutritionist compared these questionnaires with the provided diet programs to reduce the error rate of the subjects.

**Diet program, yoga exercises and almond consumption**

The subjects in this group also performed all of these three intervention diet program, yoga exercises and almond consumption, as explained above.

**Control group**

The subjects in this group did not follow any of the above interventions. They were asked to continue the normal life without having any exercising or dieting or consuming new foods. The post exercise have taken after eight weeks of intervention.

**Results**

The data were analyzed using the Statistical Package for Social Science (SPSS) version 24.0 software. Before to the main analysis, the data were screened for accuracy, missing values, outliers, and basic assumptions. Descriptive statistical tests were conducted on participants' characteristics and the main variables (Desire, pain, Arousal, Lubrication, satisfaction and Orgasm.). The basic assumptions of statistical analysis (normality data and homogeneity variance), were completed before to the primary analysis. Their normality of data was established using Kolmogorov-Smirnov test. The Kolmogorov-Smirnov test was used to evaluate whether its probability distribution differs from a hypothesized distribution. Muchly test indicated that in some of the variables, the assumption of the homogeneity of variance was violated. Therefore, the Greenhouse-Geisser value was used for the adjusted degrees of freedom for the within subjects factors for this analysis. When the Muchly test showed homogeneity of variance was not significantly different, the Sphericity Assumed value was used for each of the variable (Tables 1-6). LSD post hoc test was used to locate the different when the two-way measures ANOVA revealed significant differences between groups (Table 7).

The results revealed a significant interaction ( $F = 3.204$ ;  $p = 0.02 < 0.05$ ) between experimental groups in the measurement sessions for desire scores.

**Table 1.** Test of Within-Subjects Effects of Eight Weeks of Combined Yoga Exercises, Almond Consumption & Diet on Desire

| Change sources | Sum of square | df | Mean squares | F     | P     |
|----------------|---------------|----|--------------|-------|-------|
| Between groups | 6.920         | 4  | 1.730        | 3.204 | 0.021 |

**Table 2.** Test of Within-Subjects Effects of Eight Weeks of Combined Yoga Exercises, Almond Consumption & Diet on Arousal.

| Change sources | Sum of square | df | Mean squares | F      | P     |
|----------------|---------------|----|--------------|--------|-------|
| Between groups | 143.720       | 4  | 35.930       | 15.820 | 0.000 |

In this case, the results revealed a significant interaction ( $F = 15.820$ ;  $p = 0.00 < 0.05$ ) between

experimental groups in the measurement sessions for arousal scores.

**Table 3.** Test of Within-Subjects Effects of Eight Weeks of Combined Yoga Exercises, Almond Consumption & Diet on Lubrication.

| Change sources | Sum of square | df | Mean squares | F      | P     |
|----------------|---------------|----|--------------|--------|-------|
| Between groups | 123.720       | 4  | 30.930       | 12.274 | 0.000 |

However, the results revealed a significant interaction ( $F = 12.274$ ;  $p = 0.00 < 0.05$ ) between experimental groups in the measurement sessions

for lubrication scores. In this instance, a post hoc test was performed on lubrication scores and the results are presented.

**Table 4.** Test of Within-Subjects Effects of Eight Weeks of Combined Yoga Exercises, Almond Consumption & Diet on Orgasm.

| Change sources | Sum of square | df | Mean squares | F     | P     |
|----------------|---------------|----|--------------|-------|-------|
| Between groups | 56.880        | 4  | 14.220       | 9.234 | 0.000 |

The results revealed a significant interaction ( $F = 9.234$ ;  $p = 0.00 < 0.05$ ) between experimental groups in the measurement sessions for orgasm

scores. In this instance, a post hoc test was performed on orgasm scores and the results are presented.

**Table 5.** Test of Within-Subjects Effects of Eight Weeks of Combined Yoga Exercises, Almond Consumption & Diet on Satisfaction.

| Change sources | Sum of square | df | Mean squares | F      | P     |
|----------------|---------------|----|--------------|--------|-------|
| Between groups | 131.800       | 4  | 32.950       | 18.374 | 0.000 |

The results revealed a significant interaction ( $F = 18.374$ ;  $p = 0.00 < 0.05$ ) between experimental groups in the measurement sessions for

satisfaction scores. In this instance, a post hoc test was performed on satisfaction scores and the results are presented.

**Table 6.** Test of Within-Subjects Effects of Eight Weeks of Combined Yoga Exercises, Almond Consumption & Diet on Pain.

| Change sources | Sum of square | df | Mean squares | F      | P     |
|----------------|---------------|----|--------------|--------|-------|
| Between groups | 51.320        | 4  | 12.830       | 12.053 | 0.000 |

The results revealed a significant interaction ( $F = 12.053$ ;  $p = 0.00 < 0.05$ ) between experimental groups in the measurement sessions for pain

scores. In this instance, a post hoc test was performed on pain scores and the results are presented.

**Table 7.** Pairwise comparison for Measurement of variables.

| <b>Variables</b>    | <b>Groups</b>   | <b>Groups</b>   | <b>Sig.</b> |
|---------------------|---|---|-------------|
| <b>Desire</b>       | Yoga exercises group                                      | Control group   | 0.00        |
|                     | Almond consumption group                                  | Control group   | 0.03        |
|                     | Diet program, yoga exercises and almond consumption group | Control group   | 0.00        |
| <b>Arousal</b>      | Yoga exercises  | Diet group  | 0.00        |
|                     | Yoga exercises  | Diet program, yoga Exercises and almond consumption group | 0.00        |
|                     | Yoga exercises  | Control group   | 0.00        |
|                     | Almond consumption group                                  | Diet group  | 0.00        |
|                     | Almond consumption group                                  | Diet program, yoga Exercises and almond consumption group | 0.00        |
|                     | Almond consumption group                                  | Control group   | 0.00        |
|                     | Diet group  | Control group   | 0.01        |
|                     | Diet program, yoga Exercises and almond consumption group | Control group   | 0.00        |
| <b>Lubrication</b>  | Yoga exercises group                                      | Diet group  | 0.00        |
|                     | Yoga exercises group                                      | Control group   | 0.00        |
|                     | Almond consumption group                                  | Diet group  | 0.00        |
|                     | Almond consumption group                                  | Control group   | 0.00        |
|                     | Diet group  | Diet program, yoga Exercises and almond consumption group | 0.00        |
|                     | Diet program, yoga Exercises and almond consumption group | Control group   | 0.00        |
| <b>Orgasm</b>       | Yoga exercise group                                       | Diet group  | 0.00        |
|                     | Yoga exercise group                                       | Control group   | 0.00        |
|                     | Almond consumption group                                  | Diet group  | 0.00        |
|                     | Almond consumption group                                  | Control group   | 0.00        |
|                     | Diet group  | Diet program, yoga Exercises and almond consumption group | 0.00        |
|                     | Diet program, yoga Exercises and almond consumption group | Control group   | 0.00        |
| <b>Satisfaction</b> | Yoga exercise group                                       | Diet group  | 0.00        |
|                     | Yoga exercise group                                       | Diet program, yoga Exercises and almond consumption group | 0.00        |
|                     | Yoga exercise group                                       | Control group   | 0.00        |
|                     | Almond consumption group                                  | Diet group  | 0.00        |
|                     | Almond consumption group                                  | Diet program, yoga Exercises and almond consumption group | 0.00        |
|                     | Almond consumption group                                  | Control group   | 0.00        |
|                     | Diet group  | Control group   | 0.00        |
|                     | Diet program, yoga Exercises and almond consumption group | Control group   | 0.00        |
| <b>Pain</b>         | Yoga exercise group                                       | Diet group  | 0.00        |
|                     | Yoga exercise group                                       | Control group   | 0.00        |
|                     | Almond consumption group                                  | Control group   | 0.00        |
|                     | Diet group  | Diet program, yoga Exercises and almond consumption group | 0.00        |
|                     | Diet group  | Control group   | 0.00        |
|                     | Diet program, yoga Exercises and almond consumption group | Control group   | 0.00        |

Table 7 shows that desire scores significantly was differences between the groups. The control group has significant difference with Yoga exercise group, Almond consumption group and Diet program, yoga Exercises and almond consumption group ( $p < 0.00$ ).

Although in measurement of arousal, the control group has significant difference with all of fourth experimental groups ( $p < 0.00$ ) and also the significant differences were discovered between Diet program and combined of Diet program, yoga Exercises and almond consumption group with yoga Exercises and almond consumption group.

Table 6 also show that the participants of the control group evident had significant different in lubrication and orgasm scores compared from their counterparts in the experimental groups ( $p = 0.00 < 0.05$ ) except diet groups. However, the outcomes of the satisfaction and pain measurement revealed that the participants in the control group were shows significantly differences with all experimental groups.

## Discussion

It was assumed that the eight weeks of yoga exercise and almond consumption, diet and combination of the experimental group have a significant difference in the sexual function of diabetics. In the results of the present study, sexual function was significantly different. It can be concluded that yoga exercises, almond consumption, diet and combined program improve sexual function including of orgasm, arousal, lubrication, and pain, which is emphasized the results of Salas-Huevos (2019) on whether almonds can increase sexual desire in men due to the high content of an amino acid called Arginine which improves blood circulation. Therefore, according to two articles in the Journal of Diabetes Control in 2021, patients with T2DM consumed

one ounce of almonds daily, and it cased to reduced blood sugar levels and a 4% decrease in hemoglobin C1 (HbA) and a decreased BMI. Stephen Harold Buhner recommends eating 23 almonds a day to maximize the benefits of male arousal, testosterone production, and health. Although, the present study was consistent with the research results of Taghavi *et al.* (2009) on the sexual function of women with T2DM who observed that they had a lower score than the control group in all aspects of sexual satisfaction. Sultan Ahmadi *et al.* (2013) studied on the sexual function of women with T2DM in Kerman, the results relieved relationship with the quality of life and sexual function in the T2DM group. There was a correlation between age, duration of diabetes, BMI, and level of education with sexual function. It is also consistent with the study conducted by Moradi *et al.* (2016) on the role of consulting on sexual function of women with T2DM, which that sexual consulting is a desirable effect on women's sexual function of women with T2DM.

According to the effect of yoga exercises on the sexual function of the women with T2DM, the study of Yekkeh Fallah *et al.* (2014) on comparison of the effect of two types of exercise on blood sugar and some pills used for people with T2DM, they concluded which one-month yoga exercise and walking were affected in reducing fasting blood sugar in the people with T2DM. Although yoga exercise was more effective in lowering fasting blood sugar, there was no significant decrease in pills taken. It is consistent with a study on the effect of ET on sexual dysfunction in patients with CHF concluded that aerobic exercise is associated with improvement in sexual activity, and even with a study conducted by Nazarpour *et al.* (2016) which showed an increase in the number of times exercise in a week, the chance of a decrease in sexual desire decreases

by 80.2%. However, considering the emphasis on almond consumption in the present study and obtaining positive results in this regard, Juliann *et al.* (2015) published in the Journal of the American College of Nutrition that there is evidence that almond consumption can help increase insulin sensitivity in people with prediabetes. similar conclusion have done by Wien *et al.* (2010) that examined the effect of almond consumption on blood glucose levels for people with T2DM over 12 weeks by consuming one ounce of almonds (about 23 gr) per day, which resulted in a 4% reduction in hemoglobin (HB A1C) and decrease in BMI contribute to the health of a people with diabetes.

Darvish Damavandi *et al.* (2012), in a study on the effect of Indian almond on serum glucose, insulin, and lipoproteins in people with T2DM, found that replacing 10 % daily calories with Indian almond in people with T2DM can prevent HDL cholesterol reduction and reduce serum insulin. Hence, it is likely to play an important role in reducing the risk of cardiovascular disease in diabetic people. Wien *et al.* (2010) showed that nuts like almonds could help maintain healthy levels of blood sugar and cholesterol for both men and women with T2DM after menopause.

Therefore, given the results obtained from the present research, that is, the effect of combined yoga exercises, almond consumption, dietary compliance on sexual satisfaction and sexual satisfaction and increased sexual desire, orgasm, lubrication, and decreased pain in diabetic women, compared to control group, it has no effect on their sexual function. it is emphasized that eight weeks of yoga exercises for 45 minutes including 10-minute breathing exercises, 20-minute stretching and 15-minutes yoga concentration or consumption of 1 ounce (equivalent to 28.34 gr), which is about 23 almonds instead of 10% calorie

intake per day or follow the diet program set by a nutritionist or performing all of the above.

### Acknowledgements

The researchers are grateful to the patients who participated in this study.

### References

- Chudyk A, Petrella RJ (2011) Effects of exercise on cardiovascular risk factors in type 2 diabetes. *Diabetes Care.* 34(5), 1228–1237.
- Darvish Damavandi R, Shidfar F, Rajab A, Mohammadi V, Hoseini S (2012). Effect of cashew nuts on serum glucose, insulin, and lipoproteins in people with type 2 diabetic patients. *Iranian Journal of Endocrinology and Metabolism.* 14(4), 325-334.
- Habibnia P, Attarzadeh Hosseini R (2013) Effect of eight weeks of aerobic exercise on aerobic fitness, lipid profile, insulin resistance and estrogen and progesterone hormones in elderly women. Thesis Registration No.: 215 PHED.
- Imani A, Amani G, Shamili M, Mousavi A, Hamed R, Rasouli M, José Martínez-García P (2021) Diversity and broad sense heritability of phenotypic characteristic in almond cultivars and genotypes. *International Journal of Horticultural Science and Technology.* 8(3), 281-289.
- Jahanbani R, Ghaffari SM, Vahdati K, Salami M, Khalesi MR, Sheibani N, Moosavi-Movahedi AA (2018) Kinetics study of protein hydrolysis and inhibition of angiotensin converting enzyme by peptides hydrolysate extracted from walnut. *International Journal of Peptide Research and Therapeutics.* 24(1), 77-85.
- Juraskova I, Jarvis S, Mok K, Peate M, Meiser B, Cheah BC, Mireskandari S, Friedlander M



- (2013) The acceptability, feasibility, and efficacy (Phase I/II Study) of the overcome (Olive Oil, Vaginal Exercise, and Moisturizer) intervention to improve dyspareunia and alleviate sexual problems in women with breast cancer. *The Journal of Sexual Medicine*. 10(10), 2549-58. DOI: 10.1111/jsm.12156.
- Jorfi M (2015) The study of the relationship between health-promoting lifestyle and sexual function and satisfaction of women of reproductive age in Ahvaz. Thesis Registration. No, 831.
- Mobaraki A, Hejazi M, Ramadanpour MR (2018) Effect of eight weeks aerobic periodic training with increasing intensity on insulin-like growth factor (IGF-1) and insulin resistance in middle-aged women with type 2 diabetes. *Journal Birjand University Medicine Sciences*. 25(4), 317-325. URL: <http://journal.bums.ac.ir/article-1-2364-en.html>.
- Moradi M, Geranmayeh M, Mirmohammadali M, Abbas Mehran (2016) The effect of sexual counseling on sexual function in women with type 2 diabetes mellitus. *Journal of Hayat*. 22(2), 148-158.
- Najafi M, Mirhoseini M, Moghani Lankarani M, Assari S (2006) Correlation between sexual dysfunction and marital dissatisfaction among diabetics. *Iranian Journal of Endocrinology and Metabolism*. 8(2), 175-179.
- Nazarpour S, Simbar MH, Ramezani Tehrani F, Alavi Majd H (2016) Sexual function and exercise in postmenopausal women residing in Chalous and Nowshahr, northern Iran. *Iranian Red Crescent Medical Journal*. 18(5), e30120.
- Roozban MR, Mohamadi N, Vahdati K (2006) Fat content and fatty acid composition of four Iranian pistachio varieties grown in Iran. *Acta Horticulturae*. 726, 573-577.
- Rosen R, Brown C, Heiman J, Leiblum S, Meston C, Shabsigh R, Ferguson D, Agostino RD (2000) The female sexual function index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. *Journal of Sex & Marital Therapy*. 26(2), 191-208.
- Sadoughi SD (2016) Investigation the effect of curcumin on the hormones of pituitary-ovarian axis in alloxan-induced diabetic rats. *Journal of Ardabil University of Medical Sciences*. 16(4), 441-451.
- Salas-Huetos A, Muralidharan J, Galiè S, Salas-Salvadó J, Bulló M (2019) Effect of nut consumption on erectile and sexual function in healthy males: A secondary outcome analysis of the Fertinuts randomized controlled trial. *Nutrients*. 10(10), 2549-2558. doi: 10.3390/nu11061372.
- Sultan Ahmadi J, Kohan M, Ranjbar H (2013) The sexual function of women with T2DM and its relationship with quality of life in women referred to the Kerman Diabetes Center. *Journal of the School of Nursing and Midwifery*. 23(82), 32-39.
- Taghavi M, Fatemi F, Abutorabi R (2009) Sexual function in women with diabetes. *Iranian Journal of Diabetes and Lipid Disorders*. 8(4), 357-362.
- Tahmasbi H, Abbasi E (2013) Sexual function and its relation with depression in referring women to health centers affiliated to Medical Science University of Sari. *Family Health Quarterly Journal*. 3(1), 40-44.
- Wien M, Bleich D, Raghuvanshi M, Gould-Forgierite S, Gomes J, Monahan-Couch L, Oda K (2010) Almond consumption and cardiovascular risk factors in adults with

- prediabetes. *Journal of the American College of Nutrition*. 29(3), 189–197.
- Woodyard C (2011) Exploring the therapeutic effects of yoga and its ability to increase quality of life. *International Journal Yoga*. 4(2), 49–54. doi: 10.4103/0973-6131.85485.
- Yekkeh Fallah L, Azimi H, Sadeghi T (2014) Comparison of the Effects of Two types of exercise on blood glucose levels and anti-diabetics tablets used by people with type ii diabetes. *Iran Journal of Nursing*. 27(87), 79-87 URL: <http://ijn.iums.ac.ir/article-1-1776-en.html>.