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A COMPARATIVE STUDY ON THE EFFECT OF PEARS AND PSYLLIUM POWDER ON TRIGLYCERIDE AND HBA1C IN PATIENTS WITH TYPE 2 DIABETES

**Amane Sheikh[1], Hossein Shahdadi[2]*, Mozhgan Rahnama[3],
Abdolghani Abdollahimohammad[3]**

[1]Graduate Student of Nursing, Student Research Committee, Faculty of Nursing and Midwifery, Zabol University of Medical Sciences, Zabol, Iran.
[2] Master of Nursing, Instructor, Faculty of Nursing and Midwifery, Zabol University of Medical Sciences, Zabol, Iran
[3] Assistant Professor, Zabol University of Medical Sciences, Zabol, Iran

Abstract:
Background and Objectives: Type 2 diabetes is one of the most serious chronic diseases, and diabetic people are more likely to be exposed to cardiac, neurological, renal and ocular complications. High level of triglycerides is the most common form of dyslipidemia in type 2 diabetes. Also, Glycosylated hemoglobin (HbA1c) is a glucose marker for diagnosing type 2 diabetes. Therefore, the purpose of this paper was to conduct a comparative study on the effect of pears and Psyllium Powder on triglycerides and HbA1c in patients with type 2 diabetes
Materials and Methods: In this quasi-experimental study, 120 patients were randomly selected from among type II diabetic patients who were under the care of Imam Khomeini Diabetes Clinic in Zabol. They were divided into three groups of control, pear takers, and psyllium powder takers.The purpose of the research was explained and informed consent of the patients were obtained. After measuring fasting blood glucose, triglyceride, and HbA1c,pear grouptook 300 mg of pears per day and psyillium group took 28 g of the fluid twice a day for one month.After the end of the study period, all pre intervention indices were measured again and the data were analyzed.
Results: The mean of HbA1c decreased by 0.96 after taking pears. The mean of triglyceride decreased by 34.9% after taking pears.As a result, eating pears decreases the amount of triglyceride and HbA1c in patients with type 2 diabetes.
The mean of HbA1c decreased by 0.47 after taking psyllium powder. The mean of triglyceride decreased by 42.98 after taking psyllium powder.It can be concluded thatpsyllium powder reduces triglyceride and HbA1c levels in patients with type 2 diabetes.
Conclusion: Pears and psyllium powder have a significant effect on the reduction of triglyceride and HbA1c in patients with type 2 diabetes. However, pears were more effective than psyllium in the reduction of triglyceride and HbA1c in patients with type 2 diabetes.Pears, along with other commonly used treatments, can be used as a complementary therapy for type 2 diabetic patients.
Key words: *Psyllium powder, Triglyceride, Type II diabetes, HbA1c, Pear*

* Corresponding Author:
HosseinShahdadi,
Master of Nursing,
Instructor, Faculty of Nursing and Midwifery,
Zabol University of Medical Sciences,
Zabol, Iran
E-mail: zb5950@gmail.com

QR code

*Please cite this article in press as HosseinShahdadi et al., **A Comparative Study on the Effect of Pears and Psyllium Powder on Triglyceride and HBA1C in Patients with Type 2 Diabetes**, Indo Am. J. P. Sci, 2017; 4(12).*

INTRODUCTION:

Diabetes is a chronic, heterogeneous disease characterized by impaired insulin secretion due to beta cell dysfunction in the pancreas and increased insulin resistance (1). This can lead to many problems, including vascular, ocular, and renal complications. This is a great dilemma for the patient as well as the society (2) and it lowers life expectancy by one third (3 and 4). The prevalence of diabetes is estimated to be 285 million worldwide in 2010, and it is likely to increase to 439 million by 2030 (5), 90-95% of which willsuffer from type 2 diabetes (6).Despite significant advances in diabetes therapies over the past three decades, the outcomes are still far from the optimum level of treatment, and it has a bad effect on the quality of life of the patients (7). Various reasons have been cited for failing to achieve therapeutic goals, including non-observance of the principles of treatment by the patient, and improper drugs prescribed by doctors. [8] Recently, a new index has been proven to rapid detection of insulin resistance. It is Triglyceride and Glucose Index (TyG). This index is easy to apply in clinical settings, because it is based on routine tests, such as fasting triglyceride level and glucose level. So, there is no need for insulin level testing. (9) Triglyceride of blood are derived from carbohydrate sources. The energy in the food is not immediately used by the body, but it is converted into triglyceride and stored in fat cells (10). Triglyceride level usually remains high for a few hours after a meal. Since the most common form of dyslipidemia in type 2 diabetes is high triglyceride level and HDL reduction, it is important to measure post-meal values for investigating hypertriglyceridemia in diabetic patients (11). In this regard, insulin resistance, the pathophysiologic characteristic of the metabolic syndrome and type 2 diabetes, is associated with obesity and cardiovascular complications. One of the consequences of insulin resistance metabolic syndrome is hypertriglyceridemia, which causes changes in other lipid components such as HDL. Therefore, the ratio of triglyceride to HDL-C (triglyceride/HDL-C) may be used as a separate scale (12). Type 2 diabetes is often associated with dyslipidemia, and altered fatty acid composition in the serum and adipose tissue lipids (13). In addition, glycosylated hemoglobin (HbA1c) is a glucose marker for the diagnosis of type 2 diabetes, which is necessary to diagnose and display glycemic control in both type 1 and type 2 diabetes. The result of the HbA1c test; the average glycemic level is at least 100 days and is a measure for the progression of macro and microvascular complications of diabetes. (14, 15 and 16).The relationship between HBA1c and blood glucose has been documented in previous studies and shows the direct relationship between these two factors. However, some studies have not confirmed this relationship (17, 18, and 19). According to the positive role of fiber, it can be suggested to use fruit with fiber content like pears. Studies have confirmed the anti-inflammatory and antimicrobial properties of compounds which are extracted from pears. These are as follows: phenolic compounds in pear juice, chlorogenic acid, epicatechin, catechin, gallic acid, caffeic acid, ferulic acid, pro-cyanidines and routine (20).Type 2 diabetic patients face significant problems.High levels of triglyceride and HbA1c index have a direct relationship with diabetes. Also, high levels of triglyceride affect other lipid components, such as HDL, and it also lowers HDL levels. A report confirms the positive effects of pears on blood lipoprotein levels (21, 22, and 23). The present study sought to investigate the effects of pears on the indexes oftriglyceride and HbA1c in patients with type 2 diabetes.

MATERIALS AND METHODS:

The present study was a quasi-experimental study with pre-test and post-test. A randomized sampling was performed among 120 people with type 2 diabetes who referred to Imam Khomeini Hospital in Zabol. The criteria for entering the study include: age over 40 (24), suffering type 2 diabetes, lack of drug abuse record (25).Exclusion criteria include: known metabolic disorders (hypothyroidism and hyperthyroidism) (25), neuromuscular diseases causing constipation (Parkinsonism and multiple sclerosis, stroke (26), and migration or death (26 and 27). It should be noted that at the time of research implementation, if any of the research samples did not observe the participation terms, it would be excluded from the study, and another sample would randomly be entered into the study.

The instruments for collecting data included a demographic questionnaire, a Dutch biochemical AutoAnalyzerSelectraProM device for conductingtriglyceride, HbA1c, and FBS tests. First, the patients were referred to the lab in order to measure the fasting blood glucose, triglyceride and HBA1c. HBA1C test was performed by Selectra method using a Pishtaz kit with a normal range (4-6). Triglyceride test was performed by Selectra method usingHayan Kit with a normal range (less than 200 mg / dl). After the initial tests and evaluations, for one month (16), the patients of intervention group (A) received pears after serving lunch (300 mg / day).The second intervention group (B) receivedpsyllium powder of 5 grams dissolved with 28 grams of liquid twice a day after lunch (21 and 28).During the course of one month, samples were controlled by telephone. If any of the samples, for some reason, failed to have participation terms, it would be excluded from the study and would

be replaced by another subject. HBA1C and triglyceride were measured after one month of intervention. Then, the results were compared between the three groups. In this study, the normalization of quantitative variables was done using Kalmogorov-

Smirnov test.Then, based on the normal or non-normal distribution of the data, parametric tests (t-test) and nonparametric tests were used. All statistical analyzes were performed using statistical software SPSS22, and p-value less than 0.05 was considered significant.

Table (1): Distribution of quantitative variables using Kalmogorov-Smirnov test

Variable	Statistic	Degrees of freedom	Significance level
FBS	126/0	120	000/0
HbA1c	114/0	120	000/0
2hppBS	206/0	120	000/0
Triglyceride	209/0	120	000/0

The table 1 indicates that the significance level is less than 0.05 in the Kalmogorov-Smirnov test. So, nonparametric tests were used for these variables.

Table (2). Comparison of triglyceride and hemoglobin glycosylated levels between pear group and psyllium powder group before and after intervention by using covariance test

Intervention	Variable	Standard deviation + Mean (Before intervention)	Standard deviation + Mean (after intervention with pears)	Significance level
Pears	HbA1c	7/53±1	**6.57±0.78**	000/0
	Triglyceride	238/8±62/42	203/26±19/51	000/0
Psyllium powder	HbA1c	7/53±0/50	7/06±0/48	000/0
	Triglyceride	238/8±62/42	195/86±16/64	000/0

RESEARCH FINDINGS:
According to the obtained data, the youngest and the oldest subjects of the study were 40 and 63 years old, respectively. Most of the research units were female (50.8%) and the rest were male (49.2%). The studied patients in terms of occupation were in three categories; government employee, self-employed, and unemployed. The highest frequency was in the case of unemployedgroup with 65 people (54.1%). In terms of education, they were divided into three classes; below the diploma, diploma and higher education. The highest frequency was in the diploma class with 45 people (37.5%).

According to the above table 2, significance level less than 0.05 indicates that there is a significant difference between before and after intervention.The Mean of HbA1c was 7.53 before the intervention with pears. The amount reduced by 0.96 after the intervention and reached 6.57. As a result, pear intervention has been effective in reducing HbA1c levels in patients with type 2 diabetes. Also, there was a significant difference between the levels of triglyceride before and after the intervention. The mean of triglyceride before the intervention was 238.8. It reduced by 34.9 and reached 203.90 after the intervention with pears. It is possible to conclude that pear intervention reduces triglyceride levels in patients with type 2 diabetes.

According to the above table, the significance level of psyllium powder which is less than 0.05 indicates that there is a significant difference between the pre intervention and post intervention stages.The mean of HbA1c variable before intervention was 7.53. After intervention it is 7.06 which is decreased by 0.47. As a result, psyllium powder was effective in decreasing HbA1c levels in patients with type 2 diabetes. There was a significant difference between triglyceride levels before and after intervention of psyllium powder.Mean of triglyceride before intervention was 228.8. After intervention with psyllium powder, it is 195.82, which indicates a reduction by 42.98. It can be concluded that the use of psyllium powder decreases triglyceride levels in patients with type 2 diabetes.
Discussion and conclusion

Significant differences in the values of HbA1c and triglyceride in pear, psyllium powder, and control groups indicate the effect of these interventions in the studied indices.

Based on the results, the mean of HbA1c in patients with type 2 diabetes was 7.53 ± 1 before intervention, and after intervention with pear powder, it was 6.57 ± 0.78 (p = 0). This indicates a decrease of 0.98 in HbA1c after using pears. So, pears are effective in reducing HbA1c levels. Also, the mean of HbA1c in

patients with type 2 diabetes before intervention was 7.53 ± 1, and after intervention with psyllium powder, it was 7.06 ± 0.48 (p = 0).This indicates a decrease of 0.47 in the amount of HbA1c after using psyllium powder. So, the use of psyllium powder is effective in reducing HbA1c levels. However,psyllium powder is less effective than pears on the HbA1c level. Although no research has been done on the effect of pears on HbA1c levels, there are some cases that highlight the effects of other substances on HbA1c level.In a study by Rahimi et al in 2016 entitled "The Effect of Bread and Turmeric on the Level of HbA1c, Fasting Blood Glucose and Lipid Profiles in Diabetic Subjects ", they showed that there was a significant decrease in HbA1c levels in the bread and turmericgroup (29). These findings were consistent with the results of this study. Also, Tabatabaiet al studied the effect of erythromycin and metoclopramide on type II diabetic patients. In their study, HbA1c levels increased and, in fact, there was no significant difference between the two groups (P> 0.05) (30).However, this study confirms that the use of pears in patients with type 2 diabetes is effective in reducing HbA1c due to its effects on fiber of the body.

Another finding showed that the mean of triglyceride level before the intervention was 238.8 ± 62.42 and after intervention with pears, it was 203.90 ± 19.51 (P = 0). This shows 34.9% decrease in Triglyceride after intervention with pears. This indicates that pears are effective in reducing triglyceride levels. Also, the mean of triglyceride in patients with type 2 diabetes before the intervention was 238.8 ± 62.42 and after intervention with psyllium powder, it was 591.28 ± 16.64 (p = 0). This shows a 42.9% reduction inTriglyceride after the use of psyllium powder. This indicates that the use of psyllium powder is effective in reducing the level of triglyceride in these patients. In a study conducted byNaqdiBadi et al in 2003, the aim of the study was to investigate the effects ofPlantagoPsyllium on triglyceride, blood glucose and constipation in diabetic patients. The research sample was 125 patients with type 2 diabetes. The patientstook 5 grams of seedlings ofplantagopsyllium three times a day for 6 weeks. The results showed that plantagopsyllium shellis hydrocolloidfiber, and that the fiber has a significant effect on the reduction of cholesterol, lipids, and glucose levels in diabetics.It also treats constipation and reduces the risk of Colon cancer. Also, total cholesterol, LDL-C, and plasma triglyceride levels decreased after 2 weeks of treatment, while HDL-C levels increased (31). The findings of this study were consistent with the results of the present study. Another study by Mahmoodi et al was conducted with the aim of investigating the effects of various concentrations of bitter cucumber powder on

reducing blood glucose, cholesterol and triglyceride in diabetic male rats. The results showed that the use of different concentrations of bitter cucumber powder significantly decreasedblood glucose plasma, cholesterol and triglyceride (p <0.05). Comparedwith other concentrations, 5% concentration of the bitter cucumber was more effective on blood glucose. The concentration of 1% was more effective on cholesterol and 2% concentration was more effectiveon triglyceride (32). The findings of the study are consistent with the results of the current study.

Consequently, pears, due to the fiber that it contains, regulates blood glucose and lowers cholesterol.Also, it is effective in type 2 diabetic people who are sensitive to insulin, because it contains lower carbohydrates and calories. The sugar of pears is cellulose, sorbitol. It does not directly enter the bloodstream, and the absorption process takes time. Pears are energy source and its anti-diabetic effect is due to phenolic compounds that are found in its skin and juice. Since it is a rich source of antioxidants, it reduces glycosylation of hemoglobin, and can be effective in reducing the complications of diabetes. The sugar found in pears is a complex type of sugar, it has less glycemia and is not fattening. It also provides the body with the highest levels of antioxidants.Antioxidant compounds, by controlling cholesterol biosynthesis, reduce the harmful blood lipids. Cholesterol synthesis is regulated by HMG-COA. The reaction of converting HMG-COA to Mevalonate is influenced by HMG-COA reductase and NADPH (Nicatinamideadenine dinucleotide phosphate). It is where cholesterol-lowering drugs of statin family affect. This prevents high blood lipids, and due to the antioxidant power, it prevents cancer and heart disease.

Overall, the findings of this study showed that pears are more effective than psyllium powder in reducing HbA1c levels in patients with type 2 diabetes. It also is effective in reducing triglyceride in these patients. Given the beneficial effects of pears on HbA1c and triglyceride in diabetic patients, it is recommended to use pears on the dietary recommendation of type II diabetic patients in order to reduce their triglyceride and HbA1c levels in the treatment centers.

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