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THE EFFECT OF MANGO LEAF ON GLYCATED HEMOGLOBIN IN TYPE II DIABETIC PATIENTS

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Abstract:

Introduction & Objective: Diabetes mellitus is one of the most common disorders of the endocrine gland that affects more than 100 million people a year and lack of control of it leads to cardiac, cardiovascular, kidney and ocular complications. The aim of this study was to determine the effect of mango leaf on the level of HbA1C[1] in type 2 diabetic patients.

Materials and Methods: In this study, 80 patients with type 2 diabetes were studied in two groups of 40. So, for 3 months, the intervention group received mango leaf 0.5 gr/kg/dand the control group received no intervention. At the beginning and the end of the study, HbA1C was also checked and analyzed by t-test.

Results The results of this study showed that the HbA1C level in the intervention group was 8.4 ± 6.1, which reached to 6.9± 1.4after 3 monthsconsumption of mango leaves, and this difference based on the statistical test of paired t-test was significant (p = 0.001). In the control group, the HbA1C level was 8 ± 1.7, which reached 7.8 ± 1.9 after three months and was not significantly different according to the statistical test (p =592).There was a significant difference between the two groups after intervention (p = 0.003) in HbA1C value based on independent t-test.

Conclusion: Reduction of HbA1c levels due to the use of mango leaves, as an auxiliary method for controlling diabetes, is valuable and can be used as an effective diet in the control and treatment of this disease.

Keywords: *Mango leaves, type 2 diabetes, glycated hemoglobin.*

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[1] HbA_1 = Hemoglobin A1c-1

INTRODUCTION AND OBJECTIVE:

Diabetes mellitus is a chronic and non-contagious disease characterized by hyperglycemia after lowering insulin secretion, insulin resistance, or both (1).Diabetes type 1 and type 2 are the most common type of diabetes that requires long-term treatment (2). The prevalence of type 2 diabetes is far more than type 1 (3), affecting almost 6% of the world's population (4) and is estimated to increase to more than 438 million by 2030 (3). Also, the prevalence of type 2 diabetes in Iran has been reported 5.5%, which is significantly higher among urban residents than rural residents (5).

Chronic hyperglycemia in diabetic patients causes a series of tissue damage such as impaired kidney function, heart, eyes, nervous system, and blood vessels that ultimately lead to nephropathy, hyperlipidemia, hypertension, retinopathy, neuropathy and foot ulcers (6). Increasing triglyceride levels, lowering HDL cholesterol (Low-density lipoprotein) and increasing LDL levels (High-density lipoprotein) are one of the most common lipid disorders associated with type 2 diabetes, which increases the incidence of cardiovascular disease in these patients (7). Many studies have also examined psychiatric problems among diabetic patients. Gallersen, Hekimsoy, Bedor and Kaltor found that depression and anxiety are roughly 45% of psychiatric disorders that are found in diabetic patients (8). Ultimately, medical expenses for an individual with diabetes are on average twice as high as those without diabetes (2).

Diabetes treatment generally involves the patient's self-management behaviors, which include insulin injections on a daily basis, drug use, blood glucose monitoring, physical activity modification and dietary habits (9). Although oral glucose-lowering and insulin drugs are the cornerstone of diabetes care, the side effects of drugs, their inability to adequately prevent and control the complications of the disease, and the reduction of drug efficacy over time encourage researchers to investigate new methods and discovery of suitable ways to control the disease and its complications. Inadequate response to some commonly used diabetes treatment has led to the use of complementary and alternative therapies for diabetes in the United States in about 2-6.3 million people (10). Nursing is one of the first professions to facilitate the use of complementary and alternative medicine and this medicine is used as an intervention for many nursing diagnosis (11). Among all types of complementary therapies, medicinal plants are widely used in the world (12) due to their low side effects, availability, relatively low cost and effectiveness (13).

Flavonoidsare very important compounds of most medicinal plants, vegetables and fruits. Flavonoids, such as quercetin, release insulin and potent inhibitors of sorbitol accumulation in the tissues of the body. Sorbitol is the main cause of developing cataract in the eye and side effects such as neurological disorders (10).

The mangoes belong to the genus Mangifera, which consists of about 30 species of tropical fruit trees in the Anacardiaceae family. Some of the chemical compounds present in the mango extract include flavonoids and quercetin. The extract of mango leaves also contains astroids, phytosterols and saponins (14). According to Reda M.Y.Morsi et al., screening of Mangifera leaves contains total phenols, flavonoids, tannins and saponin (15). In medical science, each part of the mango tree has been attributed medicinal properties, including anti-diabetes (14). Also, in the study of Akbar Vahid et al., the anti-blood glucose activity effect of Mangiferaleaf was shown at high doses (16).

Therefore, given the above, the present study aimed to determine the effect of mango leaf on the level of glycosylated hemoglobin in type 2 diabetic patients referred to diabetes clinic of Imam Khomeini Hospital in Zabol city in 2017.

MATERIALS AND METHODS:

In this quasi-experimental study, 80 patients with type 2 diabetes referred to the diabetes clinic of Imam Khomeini Hospital in Zabol in 2017 were randomly divided into two groups of 40 and studied.

The inclusion criteria of study included: consent for participation in the research, being in the age range of 20 to 50 (17), HbA1C equal to or greater than 6.5% (American Association for Diabetes), type 2 diabetes for at least 6 months, ability to talking, not having a mental illness, no smoking or alcohol use, not being pregnant or breastfeeding, not having digestive, liver, kidney or endocrine disruptions (other than diabetes), lack of experience stressful events such as the death of loved ones, marriage, divorce, etc., no history of chemotherapy, no history of acute and chronic infection during the past three months, no history of recent surgery over the past three months, no use of mango leaf supplements, other herbal medicines, or glucose lowering drugs, having the same diet and activity, and exclusion criteria included: Lack of consent to participate in the study with the continued participation in the research, non-compliance with the

recommended diet, the occurrence of complications during study, migration or death of the patient.

After presenting the necessary explanations to the patients and completing the informed written consent form by them, demographic information was obtained by self-made questionnaire which its validity was confirmed by the professors of the faculty of nursing and midwifery of Zabol and its reliability has been measured by Cronbach's alpha coefficient as 76% was gathered. Then, the HbA1c test was performed in two groups. Subsequently, the intervention group received three months (18) of mango leaf powder, which was prepared by the pharmacy group. This powder was measured in g / kg / d5 / 0 by weight of each patient and divided into two equal doses and then packed and one dose in the morning and one in the evening was consumed in a brewed form (16) in such a way that a tablespoon of mango leaves in a glass of boiling water for 15 minutes was brewed and then after straightening was consumed (19) and in the control group during this period no intervention was taken place. Both groups also received the same training on nutrition and activity levels. It should be noted that patients visited the diabetes center for delivery of mango powder packages once in two weeks until the first month and then once in a month. During the intervention period, a telephone call was made every week to follow the treatment, prevent the loss of samples and respond to the questions asked by the patients regarding the intervention, and again the HbA1c was checked after the end of intervention. Meanwhile, if each research unit did not meet the criteria or conditions occur that were effective in controlling their blood glucose, this research unit was removed and the sample that had the condition of the study was replaced.

Data were analyzed by SPSS software version 22 and t statistical methods ($p < 0.05$).

FINDINGS:

Of the 80 patients who were examined: in the intervention group, 13 were male, 27 were female, and in control group 19 were male and 21 were female. There was no significant difference in sex between the studied groups. In the intervention group, the mean age of the patients was 46.3 years and in the control group was 45.7 years and there was no significant difference in age between the two groups. In addition, no complication was reported in the intervention group.

Based on the findings, the mean HbA1C in the intervention group at the beginning of the study was 4.8 ± 1.6 and 6.9 ± 1.9 after 3 months, that this difference was significant based on the paired t-test, while in the control group mean HbA1C at the start of the study was 8 ± 1.7 and after 7 months, it was 7.8 ± 1.9, and this was not significant (Table 1).

Also, based on the findings, HbA1c levelafter 3 months was 6.9 ± 1.4 in the intervention group and 7.8 ± 1.9 in the control group, which there was significantly different between the two groups according toindependent t-test (Table 2).

Table 1: Comparison of HbA1C index in intervention and control groups before and after intervention

Groups	Mean and standard deviation of HbA1C		Result of test
Intervention (Mango leaves)	Before intervention	After intervention	0.001
	8.4±1.6	6.9±1.4	
Control	Before intervention	After intervention	0.529
	7.8±1.9	8±1.7	

Table 2: Comparison of HbA1C index in intervention and control groups after intervention

Groups	Mean and standard deviation of HbA1C after intervention	Result of test
Intervention (Mango leaves)	6.9±1.4	0.003
Control	7.8±1.9	

DISCUSSION:

Based on the findings of this study, it was found that HbA1c in the control group reached from 8.1 ± 1.7 to 7.8 ± 1.9, which was not significant, whereas in the intervention group it reached from 8.4 ± 1.6% to 6.9±1.4 whichbased on paired t test was statistically significant (P = 0.001). Therefore, the consumption of mango leaves in the intervention group was 7 times higher than the control groupreduced HbA1c in 3 months. In 2006, Wahid given to type 2 diabetes patients for 14 days, low doses (doses of 0.5/gr/kg/d in two separate doses) and high doses (1gr/kg/d in two separate doses) in a powdered portion of aqueous extract and alcoholic extract of Mangiferaleaves. A high dose of this amount of mango leaves could significantly decrease the blood glucose levels in these patients (16).

In a study in 2010, Redausinginduced-Streptozocingave diabetic rats doses of 30, 50 and 70 mg of aqueous extract of Mangrove leaves for 42 days. The best result was obtained by 70 mg extract of Mango leaves, followed by extracts of 50 and 30 mg, respectively, which could significantly reduce the glucose levels of these rats (15). In 2012, in a study, Luka gave normal and diabetic induced diabetic rats with alloxan for a period of 21 days 400 mg / kg of the aqueous extract of the Mangifera leaves. The aqueous extract of the leaf of this plant could significantly decrease blood glucose levels in diabetic rats (20). In a study in 2010, Sharma gave diabetic rats for 15 days, 200 and 400 mg/kg doses of Mangifera's aqueous and alcoholic extract. After 15 days, the fasting blood glucose level decreased from 58.9% to 29.5 (aqueous extract) and from 48.1% to 38.8 (ethanol extract) with doses of 200 and 400 mg/kg, respectively (21). In a study in 2015, Hany gave diabetic rats for 30 days, 5 and 10 percent Mango leaf powder enriched with bread 5% and 10%, of enriched mono bread. After intervention, an increase in insulin levels and a decrease in HbA1c and glucose were demonstrated (22).The results of this study and the above mentioned studies indicated that mango leaves with different doses resulted in decreased blood glucose levels.

In the medical sciences, each part of the mango tree has been attributed medicinal properties, including anti-diabetes (14). The leaf of a mango tree contains tannin called anthocyanin which helps to treat diabetes. Also, powder of dried leaves of mango powder is used to treat this disease in a herbal tea form (22).In this study, the positive effects of mango leaves on the improvement of HbA1c levels were observed. Accordingly, it can be said that the supplementation of mango leaves can be useful in controlling and treating diabetes. The mechanism of the effect of this leaf may be due to reasons including increased insulin secretion from beta-pancreatic cells or decreased glucose uptake in the intestine, which requires further research in this regard. A remarkable point in this study was that there were no changes or differences in the level of liver enzymes at all stages of the study and in intra-group andintergroup comparison, and no complications were reported by people consuming mango leaves.

CONCLUSION:

The results of this study indicate the hypoglycemic effects of mango leaf. Therefore, biochemical and pharmacological studies are needed to determine the interferer mechanism and the appropriate dosage on biochemical parameters of blood, liver, kidney and pancreas, so that it can be evaluated and used.

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