Full Length Research Paper

Effect of diabetan on blood glucose, glycosylated hemoglobin, lipid profile, liver and kidney function tests of diabetic patients: A clinical, double blind, randomized trial

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Considering the side effects of insulin and oral hypoglycemic agents, this study was performed with the aim of investigating the hypoglycemic effect of Diabetan (glycogol) tablet, which is a blend of *Salvia officinalis*, *Trigonella foenum* and ginseng. A double-blind clinical trial was carried out on type-2 diabetic patients who were referred to the Endocrine and Metabolism Clinic of Shahrekord University of Medical Sciences. Eighty type 2 diabetic patients who had not reached the ideal control of the disease were randomly divided into case and control groups. The case group received Diabetan and the control group received placebo tablets three times a day for three months. Glycosylated hemoglobin (HbA1c), lipid profile, liver and kidney function tests were carried out at the beginning and at the end of the trial. The fasting blood sugar (FBS) and 2 h postprandial (2hpp) glucose were also checked at the beginning and every 2 weeks, for three months and were compared in two mentioned groups. The 2hpp blood sugar and cholesterol levels decreased significantly in Diabetan treated patients as compared to the control group ($P < 0.05$). There were no significant changes in glycosylated hemoglobin and FBS between the two groups. Results showed that Diabetan tablets might be beneficial in diabetic patients to reduce 2hpp and cholesterol. However, higher doses might be needed to decrease fasting blood glucose and glycosylated hemoglobin.

Key words: Glycogol tablet, *Salvia officinalis*, *Trigonella foenum*, ginseng.

INTRODUCTION

Diabetes mellitus is considered as the most common endocrine disease; its prevalence which is being increased in human population (American Diabetes Association, 1997). The metabolic aspect of diabetes is characterized by moderate to severe hyperglycemia and impaired metabolism of nutrients, including proteins, carbohydrates and lipids (Yanardag et al., 2002). The side effects of taking insulin and oral hyperglycemic agents have brought about a growing interest among this group of patients for using natural products having anti-diabetic activity (Holman and Turner, 1991). Herbs are rich sources of natural antioxidants, and are used in

traditional medicine for the control and treatment of many diseases. The reducing effect of a large number of these plants on blood glucose has been confirmed in animal models and clinical studies (Kazemi et al., 2010; Asgari et al., 2011; Asgari et al., 2012). Studies on animals have shown that more than 400 plant species have hypoglycemic activity and several laboratories are isolating edible herbal hypoglycemic compounds. Among the herbal drugs whose effect on blood sugar reduction has been proved in several human and animal studies are *Salvia officinalis*, *Trigonella foenum* and Ginseng (Asgari et al., 2012; Nikraves and Jalili, 2003; Vuksan et al., 2000). Antioxidant properties of or *S. officinalis* L (Sage) leaves are known (Asgari et al., 2012). Moreover, the hypoglycemic effect of the alcoholic extract of *T. foenum* seeds has been confirmed in laboratory animals

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(Puri et al., 2002; Roghani et al., 2005) and the hypoglycemic effect of its extract has been studied in a limited number of healthy volunteers (Abdel-Barry et al., 2000). In this study, the combination of *S. officinalis* (45 mg), *T. foenum* seeds (50 mg) and *Ginseng* (60 mg) was prepared as glycol tablet and the effect of this compound on blood glucose, glycosylated hemoglobin (HbA1c), lipid profile, liver and kidney function tests were investigated.

METHODOLOGY

This study was a double-blind randomized clinical trial on type-2 diabetic patients referred to the Endocrine and Metabolism Clinic of Shahrekord University of MEDICAL Sciences. Eighty diabetic type-2 patients referred to the clinic who did not have any complications of diabetes (based on description of their medical situation, physical examination, and paraclinical findings) including retinopathy, nephropathy and cardiovascular diseases, and those who had not achieved ideal control of diabetes and were willing to participate in the study, were selected and divided into 2 groups of 40 patients.

Selection of subjects for the medical treatment or placebo control was carried out by convenience random method. The project was done with due consideration to the ethics and obtaining permission from the ethics committee of Shahrekord University of Medical Sciences and obtaining the written consent of participants. Glycol tablets were given to the first group and the second group took a placebo similar to that of glycol (3 times a day).

Patients continued receiving their anti-diabetic drugs and other oral medications. First, a questionnaire containing information on age, sex, weight, blood pressure, family history of diabetes and duration of the disease was completed. The treatment period was three months and at the beginning and the end of the study, the HbA1c and lipid profile as well as liver and kidney function tests were taken. At the beginning of the study and every 2 weeks, fasting blood sugar (FBS) and postprandial sugar were checked. Moreover, indicators relating to medication tolerance and the drugs' side effects were evaluated.

Patients were instructed to follow their type of diet and daily activities during the course of the study. These factors were controlled at the two-week visits as well. Moreover, the symptoms of hypoglycemia and the tasks needed for its treatment were taught. After the end of the 3-month period, patients repeated the tests taken at their arrival into the study and the results were analyzed using statistical tests (paired and independent t-tests and repeated measures test).

RESULTS

Eighty patients were evaluated in this study and were divided into 2 groups; one received the drug and the other received placebo. Nineteen patients were men and 51 were women. Five patients of each group were excluded due to uncontrolled high blood sugar, need for insulin injection, hospitalization and lack of proper cooperation. On the other hand, two patients in the drug group showed mild gastrointestinal complications without stopping the drug use.

Table 1 illustrates the mean and standard deviation (SD) of variables including age, body mass index (BMI) and duration of the disease in drug and control groups, in

Table 1. Mean and SD of variables age, BMI and duration of the disease in the groups under study.

Variable	Group	
	Medication	Placebo
Age (Year)	53.20±10.43	51.68±9.87
BMI (kg/m ²)	27.77±4.02	29.53±4.24
Duration of the disease	69.92±62.33	74.37±57.74

None of the above cases were significant ($P>0.05$).

which none of them has significant difference. HbA1c value were 7.94 ± 0.64 and 7.79 ± 0.60 , respectively in drug and placebo groups at the beginning of the study ($P>0.05$) and were 7.43 ± 0.75 and 7.51 ± 0.70 ($P>0.05$), respectively, at the end of the study. Table 2 shows the comparison between the mean concentration of FBS and 2-h postprandial blood glucose (2hpp) at the beginning and every two weeks up to three months. The results show a significant decrease in 2hpp in the medication group as compared to the placebo group. The mean of total cholesterol did not reveal any significant difference at the beginning of the study; however, at the end of study, it was lower in medication group and also lower than its initial value ($P<0.05$). Table 3 compares the mean triglyceride, total cholesterol, low density lipoprotein (LDL) and high density lipoprotein (HDL) in the studied groups before and after intervention. Table 4 compares the mean indices of renal function (BUN and creatinine) and liver function (alanine aminotransferase and aspartate aminotransferase) in the medication and placebo groups before and after intervention that showed no significant difference.

DISCUSSION

This investigation was aimed to study the hypoglycemic effect of glycol tablet, which is a blend of *S. officinalis*, *T. foenum* and ginseng. The effects of glycol on lipid profile, liver and kidney function tests were also evaluated in diabetic patients.

In this study, although the fasting blood glucose in drug group was 25 mg/dl less than in control group; however, the difference was not significant ($P>0.05$). 2hpp had significant difference in the 12th week of the study ($P<0.05$). The lack of significant reduction in fasting blood glucose by medication may be attributed to the drug's ineffectiveness on gluconeogenesis and insulin secretion and significant reduction in 2hpp by medication in the twelfth week due to lower insulin resistance.

As mentioned, there was no significant change in glycosylated hemoglobin. Since HbA1c has a considerable correlation with postprandial glucose, the lack of significant result in HbA1c can be attributed to the mean postprandial blood glucose during the treatment

Table 2. Comparison between the mean concentration of fasting blood sugar (FBS) and 2 h postprandial blood glucose (2 hpp) on arrival and every two weeks to three months.

Blood factor		Time (Week)						
		On arrival	2 nd	4 rd	6 th	8 th	10 th	12 th
FBS (mg/dl)	Medication	144.25±43.62	140.71±30.26	145.34±32.96	140.45±28.18	133.34±38.56	129.25±35.53	115.00±45.88
	Placebo	142.88±34.66	138.57±29.80	137.02±32.48	133.25±28.00	140.00±31.46	141.51±34.53	143.37±39.50
BS2hpp (mg/dl)	Medication	221.97±58.43	194.22±50.96	196.20±51.44	182.66±39.55	181.37±36.97	185.86±22.04	174.49±21.01*
	Placebo	214.65±42.83	196.62±45.27	198.80±48.13	194.17±42.74	201.00±41.35	191.85±43.44	207.71±49.25

Comparison between the mean concentration of FBS and BS2hpp was not significant during different weeks, but *in 12th week BS2hpp in medication group was less than placebo group (P<0.05).

Table 3. The comparison between the mean triglyceride, total cholesterol, low density lipoprotein and high density lipoprotein in the studied groups before and after intervention.

Blood factor	Statistical index			
	Medication (Mean±SD)		Placebo (Mean±SD)	
	Before intervention	After intervention	Before intervention	After intervention
Triglyceride	175.14±91.80	180.42±178.51	168.54±84.12	149.74±63.39
Total cholesterol	192.68±35.83	101.57±39.04*	190.68±29.47	181.62±36.30
Low density lipoprotein	110.37±28.67	101.57±31.47	105.31±23.44	102.91±25.63
High density lipoprotein	41.42±8.35	42.20±7.63	43.31±7.98	44.02±9.16

*P<0.05, in comparison with the initiation of the study and placebo group

Table 4. The comparison between the mean indices of renal function (blood urea nitrogen and creatinine) and liver function (alanine aminotransferase and aspartate aminotransferase) in the medication and placebo groups before and after intervention.

Blood factor	Statistical index			
	Medication (Mean±SD)		Placebo (Mean±SD)	
	Before intervention	After intervention	Before intervention	After intervention
Blood urea nitrogen	17.91±6.56	17.28±5.64	15.74±6.93	16.20±5.53
Creatinine	0.88±0.18	0.92±0.14	0.82±0.16	0.86±0.16
Alanine aminotransferase	24.17±9.55	24.85±7.77	24.14±6.95	24.37±6.07
Aspartate aminotransferase	22.02±8.17	21.11±6.24	19.45±5.17	20.71±4.62

None of the above cases were significant (P>0.05).

which has not been at the desirable level, but the reduction in 2hpp at the last week may indicate the fact that if the medication continues, there will be probability of reduction in HbA1c as well.

The results showed that the mean total cholesterol at the end of the study had significant difference in the medication group as compared to the placebo group. Mean triglyceride, LDL and HDL in the studied groups had no significant difference before and after the intervention (P>0.05). The reduction in total cholesterol in the medication group can be an indicator of beneficial effect of this drug on patients who have hyperlipidemia. In addition, glycygol tablets contain *T. foenum* and this

herb, in turn contains large amount of tannin and saponin that are able to reduce the intestinal absorption of lipids and maybe part of the effect of glycygol on cholesterol that takes place in this way (Sauvaire et al., 1991). Fortunately, the drug and placebo have had no adverse and unwanted effect on liver and kidneys that shows the drug's safety.

Considering the mentioned issues, it is possible that not achieving a significant result in the reduction of fasting blood glucose and HbA1c has been due to patients' disloyalty to diets, insufficient and irregular use of the medication and the low level of effective substances in glycygol tablets. However, one should note

their unwanted side effects, while using high dosages of herbs (Khajehdehi, 2012; Gheissari et al., 2012; Ardalan et al., 2012). It is recommended that further researches should be conducted, regarding the mechanism of glycogol effect on blood glucose reduction in diabetic patients, as a considerable help for patients in order to reduce the use of chemical medications.

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