EFFECTS OF GARLIC POWDER ON GLYCEMIC CONTROL IN THE PATIENTS OF TYPE-2 DIABETES MELLITUS

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ABSTRACT
Background: Diabetes Mellitus is one of the most common health hazards in the world, especially in the South Asian region, with 9.2% of the Pakistani population suffering from type-2 diabetes mellitus. This can lead to many complications if glycemic control is not properly monitored. Garlic is one natural product containing sulphur compounds that act as hypoglycemic agents.
Objective: To evaluate the effects of Garlic powder on glycemic index in the patients of type-2diabetes along with allopathic therapy.
Methodology: This RCT includes 80 patients divided into 2 groups. Each group included 40 diagnosed cases of type-2 diabetes. Patients in Group A were taking only oral hypoglycemic drugs, while patients in Group B were receiving formulated capsules of garlic powder along with oral hypoglycemic drugs for six

months. Blood samples were taken at zero level, level-I, and level-II for analysis of fasting and random blood glucose levels and HbA1C.

Results: The outcomes of garlic therapy were observed, and there was significantly ($p < 0.05$) good glycemic control with garlic therapy as compared with allopathic therapy alone.

Conclusion: The results concluded that there was a marvellous role for natural remedies like garlic powder in conjunction with allopathic therapy in the management of type-2 diabetic patients with a satisfactory glycemic index.

Key Words: Type-2 Diabetes Mellitus, Garlic Powder, Glycemic Index.

INTRODUCTION

Diabetes mellitus is one of the leading causes of morbidity at a global level.[1] The global impact of diabetes is increasing day by day. The World Health Organization (W.H.O.) predicts that more than 400 million people will suffer by 2030.[2] Type-2 diabetes affects 80–90% of the diabetic population, with the remaining 15–20% of the population having type-1 diabetes mellitus.[3] Elder age, overweight, lack of physical activity, etc. are the predisposing factors of type-2 diabetes in the diabetic population.[4]

Some research studies have also proved that depression is one of the leading predisposing factors to type-2 diabetes mellitus nowadays.[5] Allopathic drugs are used for the treatment of type-2 diabetes mellitus all over the world. But before 25 years, when allopathic medicine was not popular or discovered properly, the diabetic population used homoeopathic medicines and natural remedies like olive oil, garlic, ginger, etc.[6] Because 60 to 70% of the population in Asian countries like Pakistan has a middle to low socioeconomic status and cannot afford allopathic drugs due to their high cost, and some diabetic patients avoid using allopathic medicine due to its side effects, people continue to rely on natural remedies to manage these morbid diseases.[7]

Garlic is one of the old natural herbs cultivated all over the world in 122 countries, which is used as a vegetable as well as a natural medicine.[8,9] It contains sulphur compounds like allicin and di-allylallicin, which act as antioxidants as well.[10] In the past decades, garlic was used as a drug for the treatment of hypertension, bronchial asthma, colorectal carcinoma, bacterial infections, etc. [11]Some research studies have shown that garlic acts as an antihypertensive and anti-diabetic agent.[11]

METHODOLOGY

This Randomized Control Trial (RCT) was conducted at the University of Sindh and LUMHS with a duration of six months from July 2017 to December 2018. A total of 80 diagnosed cases of Type-2 diabetes have been recruited for this study. All subjects were divided into two groups, A and B, each group containing 40 subjects. Group A received only allopathic therapy (tab. Getformin 2/500mg), while group B received allopathic therapy with a short dose (tab. Glucophage 500mg) along with formulated capsules of garlic powder. Each capsule contained 500mg of garlic powder.

Diagnosed cases of type-2 diabetes mellitus with an age between 40 and 60 years without any diabetic complications were included in this research study, while cases of type-1 diabetes, type-2 diabetes below the age of 40 or above the age of 60 years, pregnant women, diabetic complications, and any history of allergy to garlic were excluded.

For the analysis of parameters under study, blood samples were drawn by venipuncture under sterilised aseptic measurement from all the subjects at three steps during the study research. Fasting blood glucose level (FBS), random blood glucose level (RBS), and HbA1c% were measured at zero (before treatment began), level-I (after three months of treatment), and level-II (after six months of treatment).

FBS and RBS were measured by the glucose oxidase method while HbA1c% was detected by the Microlabfrom Diagnostic & Research Laboratory of LUMHS Jamshoro, Sindh. The data and results were statistically analysed by SPSS version 22 by applying the student *t* test and the chi-square test.

RESULTS

A total of 80 diagnosed cases of type 2 diabetes mellitus were chosen and divided into two groups: group A, which served as the control group, contained 40 cases (26 males and 14 females), and group B, which served as the case study group, also contained 40 cases (28 males and 12 females).The blood samples were taken and analysed before the start of the treatment (zero level), after three months (level-I) of treatment, and after six months of treatment (level-II). Group A patients received only allopathic therapy in the form of a combination of two hypoglycemic drugs, available under the name of Tab. Getformin 2/500mg was given after the meal two times a day, while group B received only one group of hypoglycemic drugs, i.e. metformin, available under the name Tab.Glucophage 500 mg two times a day, along with formulated capsules of garlic powder (500mg) two times a day with a proper diet control chart. The detailed analysis of all parameters like FBS, RBS, and HbA1c% is summarised as follows:

Table no: 01:The Mean values of FBS,RBS & HbA1c% of Control & Case Study Group

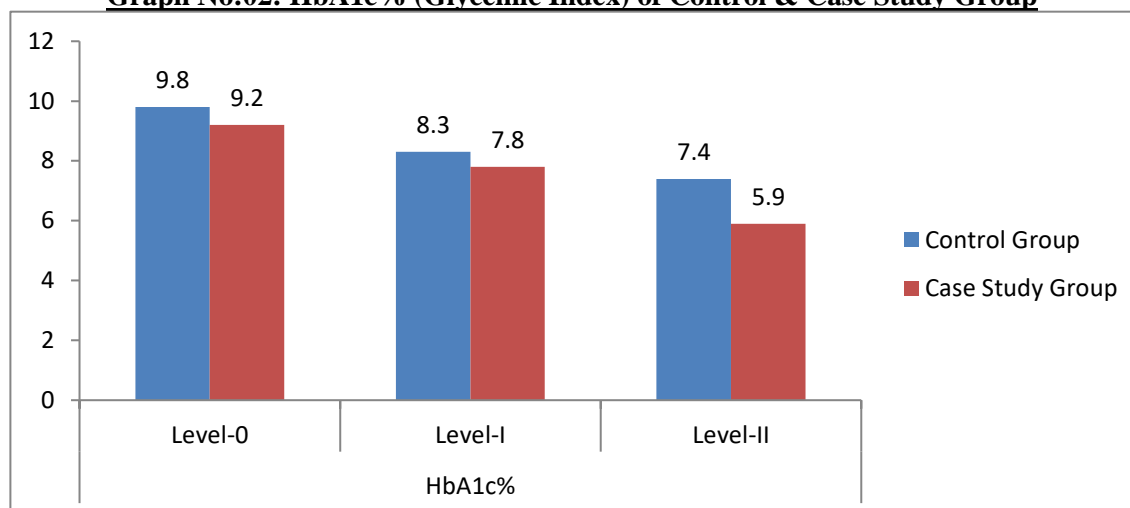|	Group A (Control Group)			Group B (Case Study Group)		
Parameter	**Level - 0**	**Level-I**	**Level-II**	**Level-0**	**Level-I**	**Level-II**
FBS (mg/dl) (70 -110)	182	139	101	184	117	82*
RBS (mg/dl) (110-160)	277	201	174	269	189	147 **
HbA1c% (< 6.5%)	9.8	8.3	7.4	9.2	7.8	5.9 **

The above table shows the difference in Fasting Blood Glucose, Random Blood Glucose and HBA1C of participants in Level 0, I and II. Statistically significant (* = p value < 0.05) decrease is seen at Level 0 and level II in all three parameters. Highly statistically significant (** = p value = < 0.001) decrease is seen in mean RBS from 277 mg/dl to 147 mg/dl and HBA1C level from 9.8 % to 5.9%.

Graph No: 01: FBS & RBS of Control & Case Study Group
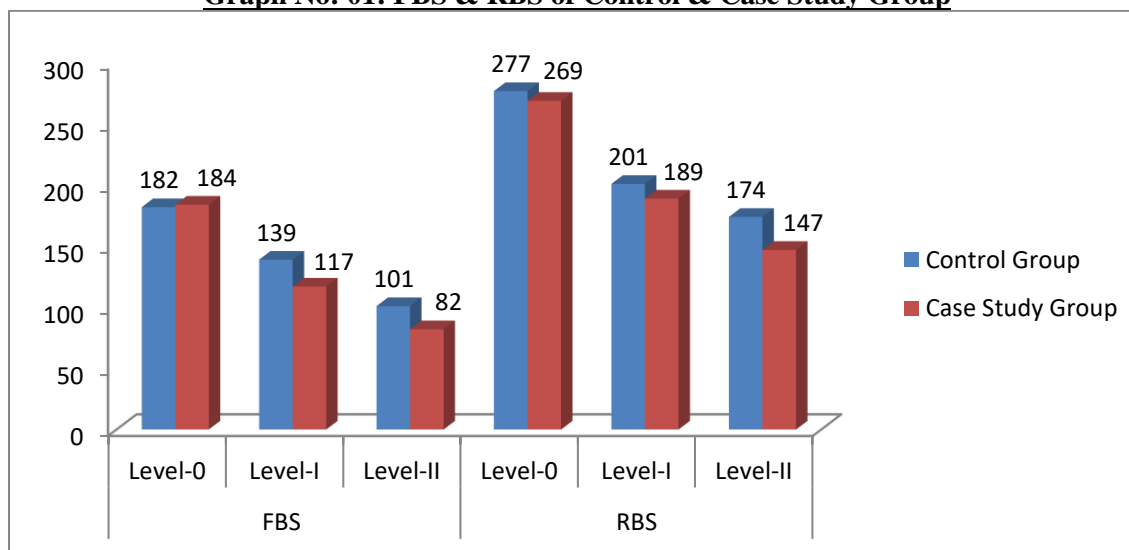
The above graph No. 01 shows the comparison of mean FBS and mean RBS level between study group and control group. From the above data significant difference was observed in study group as compared with control.

Graph No:02: HbA1c% (Glycemic Index) of Control & Case Study Group

The above Graph No. 02 shows the comparison of mean HBA1C level between study group and control group. From the above data significant decrease in mean HBA1C was noted in study group as compared with control.

This RCT research study gave the result that fasting blood glucose levels were significantly ($p < 0.05$) reduced with allopathic therapy along with natural therapy like garlic powder. The same scenario was also observed in random blood sugar and glycemic control, which more significantly ($p = 0.001$) declined in group B as compared to group A.

DISCUSSION

Garlic has been reported as having anti-diabetic, antibacterial, and anti-dyslipidemic properties.[12] The contents of garlic are different in its different formulated forms, like garlic powder, garlic oil, and garlic extraction.[13] The results also vary with different forms of garlic. The alliin and allinase enzyme are the primary compounds present in the garlic bulb. Activation of the allinase enzyme during the chopping and crushing process converts allin to allicin compound powder contains these three compounds.[14] The adenosine compounds are present in raw garlic. Antioxidant compounds like allixin and selenium are present in garlic extract.[15] Garlic oil contains high sulphur compounds like Diallyl, Dimethylallyl etc.[16]

According to various studies, allicin is the primary compound that controls diabetes mellitus.Two important bioactive compounds, allyl-2-propenethiosulfinate or diallylthiosulfinate, are derivatives of allicin, which has anti-diabetic effects in a type-1 diabetes rat model study.[17] Allicin also increases the quick release of insulin from beta cells in the pancreas, resulting in a quick response in the reduction of FBS and control of glycemic control.

Different RCTs were done on the effects of garlic on FBS, RBS, and glycemic control. Like Sobinen IA et al (2008)[18,] they did an RCT for 4 weeks but found no impact on FBS and glycemic control. Like Ashraf A et al (2011)[19,] they did an RCT for 12 weeks but did not get significant results. While our findings are in favour of Ebadi et al. (2007)[20], they reported a positive significant relationship between garlic tablets and glycemic control. They were given garlic 400 mg powder three times a day along with metformin for 12 weeks, and our results also match those of Khedmian et al. (2016)[21.] He studied 50 patients with type-2 diabetes and observed the glycemic control and lipid profile.

It should be noted that all RCTs were conducted with combination therapy, not monotherapy, and that one placebo study was conducted for a very short period of time, only three weeks, so the results were not statistically significant.

The limitation in this study is that this RCT was also done with a combination of allopathic therapies. In the future, there is a need to research the effects of garlic on glycemic control with monotherapy agents compared with allopathic therapy, and also, there is a need to calculate and give the proper dosage of garlic powder with proper duration of study.

CONCLUSION

This study concluded that garlic has significant effects on glycemic control along with allopathic therapy as compared to allopathic therapy alone in patients with type-2 diabetes mellitus.

CONFLICT OF INTEREST

There is no any conflict of interest.

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