

EFFECTS OF YEMENI PUMPKIN FRUIT ON THE HUMAN PLASMA GLUCOSE LEVEL, HbA1c & LIPID PROFILE

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Abstract

Pumpkin (CucurbitapepoL) is a widely desirable fruit. There are no more published articles dealing with pumpkin fruits as much as seeds, and its functionality as a medicinal foodstuff. In this study, the effect of pumpkin fruit on diabetes and dyslipidemia was investigated. The study involved 20 participants that received a simple explanation for the aim of the study as an ethical issue. The participants were divided into two groups first group were 10 healthy adults as control, second group were 10 diabetic mellitus and cardiovascular patients such as hypertension, ischemic heart disease and dyslipidemia. Certain biological parameters including Fasting Plasma Glucose (FPG), Glycosylated Hemoglobin (HbA1c), Total Cholesterol (T-Chol), Tri-Glyceride (TG), Low Density Lipoproteins (LDL), and High Density Lipoproteins (HDL) were laboratory investigated. The results showed that the eaten Pumpkin fruits significantly ($P < 0.05$) reduced fasting plasma glucose among the patients group, while increases HDL level in both groups. But, the levels of other investigated parameters were not significantly ($P > 0.05$) affected. In conclusion, the study revealed that, the pumpkin fruit could be a suitable medicine for diabetic mellitus and low HDL patients with significantly levels P value (0.0417, 0.0029) respectively.

Key words: *Pumpkin fruit, Diabetes mellitus, FPG, HbA1c, Lipid profile.*

1. INTRODUCTION:

The chronic metabolic disorders that characterized by hyperglycemia and may result in long-term Microvascular, Macrovascular, and neuropathic complications are known as Diabetes Mellitus (DM), which may be leading to cause renal diseases, blindness among adults, and non-traumatic lower limb amputations[1]. While the prevention and treatment of DM remain a challenge, but as reported in several landmark studies the proper management of blood glucose can be delayed or prevented the DM associated complications[2,3]. Thus, the primary objective in diabetes management is the control of glycemic level[4]. So, the lifestyle modifications, including education, nutrition, and exercises are the shorter way to managing the disease successfully[5].

The expert committee of World Health Organization on diabetes has listed a lot of traditional methods recommendations of diabetes treatment that should be further investigated[1]. Several ancient Indian books like Astang Sanghra, Madhav Nidan, Charak Samhita *etc.* mentioned about 600 plants to have antidiabetic activity. Many plants/plant parts have been tested for antidiabetic activity up to date, especially which are commonly consumed as vegetables, food stuffs and dietary supplements[2]. But the surprise findings were the using of Pumpkin which was successfully promoted the regeneration of damaged pancreatic cells in diabetic rats as published in the Daily Telegraph, a London news source that quoted a research performed by East China Normal University in 2007[6]. In 2009, a Japanese team of scientists compared pumpkin paste to a control group of laboratory rats with Type 2 diabetes in an oral glucose tolerance test. Pumpkin paste was considered to be effective in improving glucose tolerance and insulin resistance[7].

Pumpkins (genus; *Cucurbita*) belong to the family of Cucurbitaceae[8]. This family contains chemicals, including tetra cyclic triterpens, saponins, proteins, fibers, polysaccharides and minerals (iron, zinc, manganese, copper, *etc*) [9]. Pectin, a major component of plant cell walls, it is a water-soluble fiber found abundantly in pumpkin plants[10]. The seeds of this plant, which have been

implicated in providing many health benefits, are rich natural source of fatty acids (including linoleic acid, oleic acid, palmitic acid and stearic acid), phenolic compounds[11], and also, antioxidant vitamins, such as carotenoids and tocopherol[12]. So far, several pharmacological properties have been reported for different species of pumpkin including anti-oxidant, lipid-lowering, hepatoprotective[13], anti-carcinogenic[14,15,16] anti-microbial, and anti-diabetic properties[17]. It has also been reported that pumpkin-seed oil was able to suppress an increase in blood pressure[18], and to decrease the blood lipid level[19]. Many studies showed that pumpkins inhibited α -glucosidase, α -amylase[20,21], that are enzymes important for carbohydrate digestion. So, this study focused on Cucurbitapepo edible fruit's to evaluate its activity on diabetes mellitus and dyslipidemia according to certain biological parameters in comparison with pumpkin's seeds effects.

2. MATERIAL AND METHODS:

2.1 Study designs - ethical issues and questionnaire:

A cross-sectional observational study conducted by recruiting case-series of children young, adults and elderly who have diabetes mellitus and dyslipidemia within the age ranged from 15 to 75 years old. Also, another group as control was added which were 10 healthy participants. Subjects with diabetes and healthy received a simple explanation for the aim of the study as an ethical issue. If they agreed, the subject was interviewed by using of questionnaire which was concentrated on the following indicators namely gender, address, weight, height, medical history, medications, family and social history. Confidentiality of the collected data was achieved by keeping data record securely with the principle investigator. Participants received a pumpkin fruit which obtained from local Yemeni markets, and a list of limited schedule of using which was including preparation pathway (time of boiling 30min), temperature degree of boiling (65-70) $^{\circ}$ C and weight of boiled pumpkin fruit (150g), daily laboratory examinations, avoiding change of their habitats during study and quantity of daily use (150g) eaten as vegetable with breakfast. The limited schedule was followed for three months.

2.2 Sample collection:

The participant's blood samples were investigated in the National Center for Public Health Laboratories (NCPHL) in Sana'a city, Yemen. The blood samples of participants were taken daily after 10 hours of fasting then after breakfast. The specimens were drawn in the laboratory & processed automatically using high standard equipment.

2.3 Analysis of samples:

Collected specimens were prepared and tested for Fast Plasma Glucose (FPG), Glycosylated hemoglobin (HbA1c), Total cholesterol (TC), Tri-glyceride (TG), Low density lipoproteins (LDL), and High density lipoproteins (HDL) by using Cobas Integra 400 plus (Roche, Switzerland), also, all experimental reagents were obtained from (Roche, USA) and used upon the manufacturer procedures. T-student test was used for statistical evaluation. All statistical tests were carried out using the GraphPad Prism software (version 4.0, GraphPad Software, LAJolle, CA). P values < 0.05 were considered as significant.

3. RESULTS:

3.1 Physical analysis of participants:

The first healthy group (control) was consisted of 5 females and 5 males were physically measured and found with age range 15-70 years old, weight and height of participants were ranged 35-60.2 kg and 145-167.9 cm respectively. While the second group (patient) which was consisted of 5 female and 5 male were found with age range 18-55 years old, weight and height were ranged 29.6-66.8 kg and 142-165.5 cm respectively. The analysis of pumpkin effects upon gender, age, weight, and height was observed non- significantly differences upon the previous parameters as presented in Fig-1.

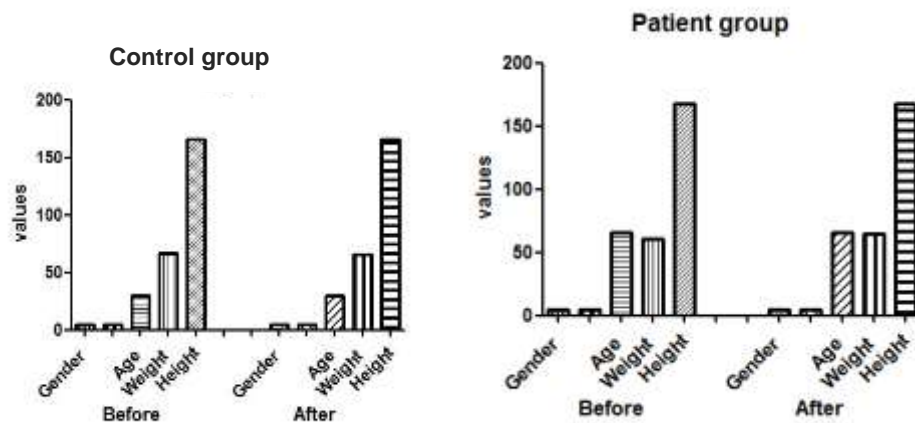


Figure-1: Show the average of participant’s physical data which were the same before starting use of Pumpkin fruit and after in both groups.

3.2 Analysis of chosen blood parameters:

3.2.1 Fasting plasma glucose(FPG): as shown in the Fig-2 (A&B), there is no significantly FPG reduction in healthy participants (second group), while in the patients group (first group) pumpkin reduced the level of plasma glucose significantly after 12 h fasting with $P \leq 0.0025$ in compare with control group.

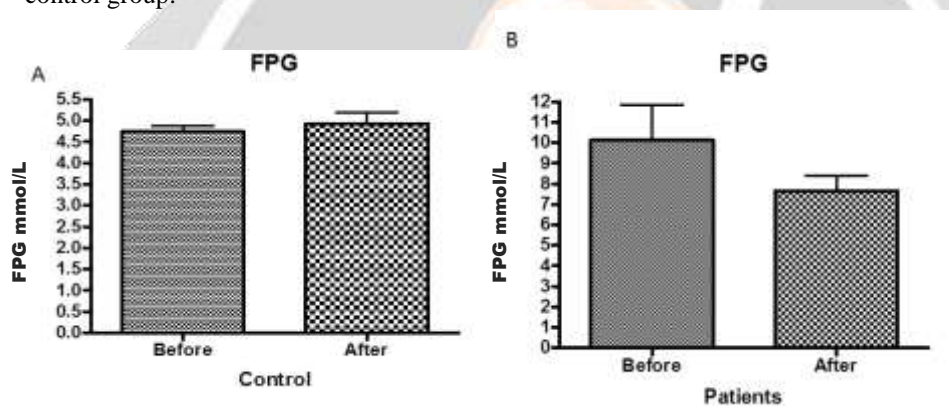


Figure-2: A. The result of FPG test among control group before and after treatment with Pumpkin fruit. B. FPG among patient group before and after treatment. There is a significant reduction in glucose level, $P = 0.0025$

3.2.2 Glycosylated hemoglobin (HbA1c): was found none significantly improved in both tested groups before and after treatment with pumpkin as presented in the Fig-3 (A&B).

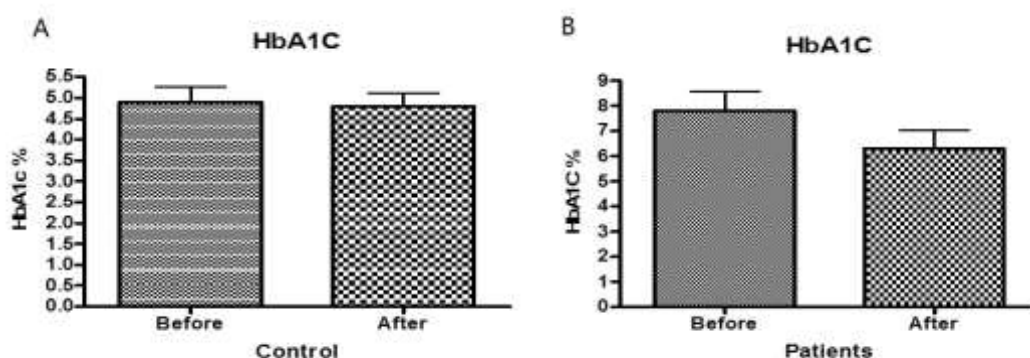


Figure-3: A. Glycosylated hemoglobin % among control group before and after treatment. B. Glycosylated hemoglobin % among patient group before and after treatment.

3.2.3 Total cholesterol (TC), low and high density lipoproteins (LDL& HDL): the observation of differences in total cholesterol and LDL levels were not significant before and after treatment with pumpkin fruit in both tested groups as noted in Fig-4 (A&B) and Fig-5 (A&B) respectively.

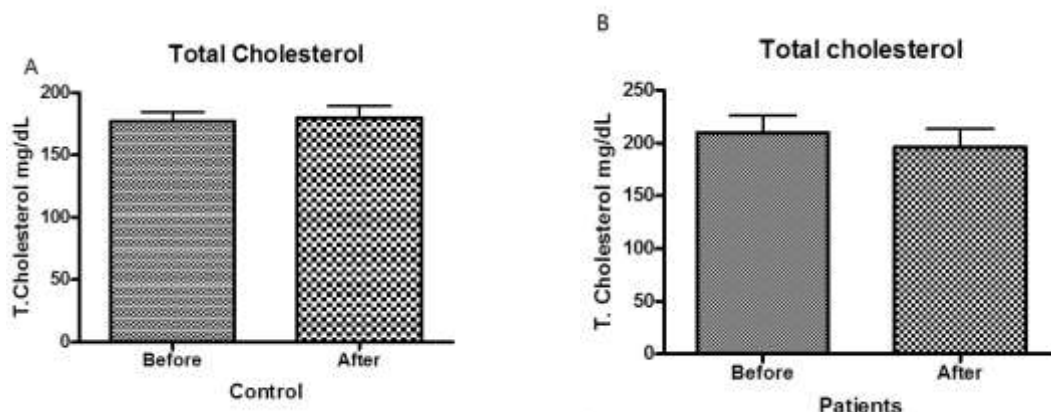


Figure-4: A. Shows the TC mg/dL among control group before and after treatment. B. TC mg/dL among patient group before and after treatment.

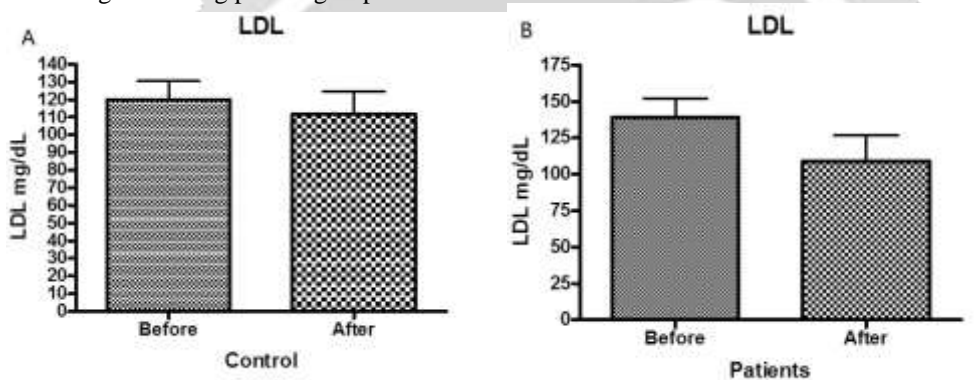


Figure-5: A. Low density lipoprotein mg/dL among control group before and after treatment. B. Low density lipoprotein mg/dL among patient group before and after treatment.

While HDL plasma level differences were shown significant before and after treatment with pumpkin fruit in control (Healthy) and patient group with $P \leq 0.0048$ and 0.0029 respectively as exhibited in Fig-6 (A&B).

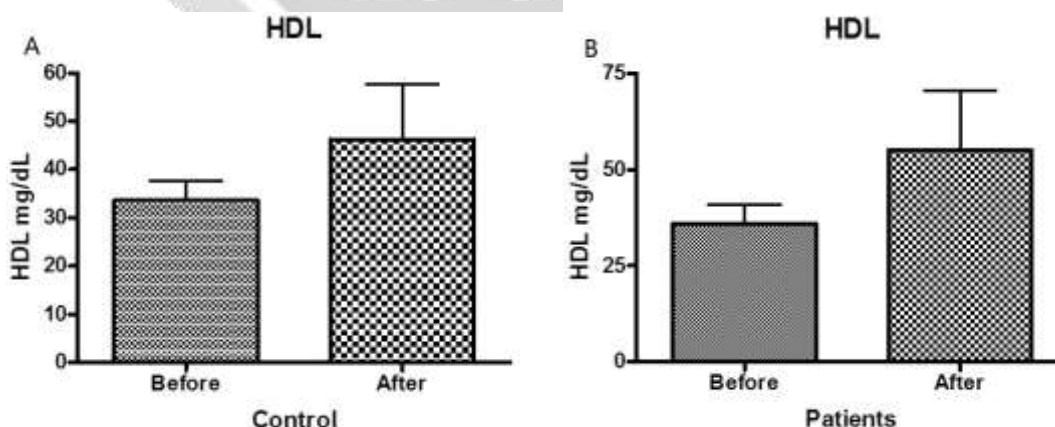


Figure-6: A. High density lipoprotein mg/dL in control group before and after treatment. There is significant increase in HDL levels * P value = 0.0048. B. High density lipoprotein mg/dL in patients group before and after treatment. There is significant increase in HDL levels. *P value = 0.0029.

3.2.4 Tri-glyceride (TG): as presented in Fig-7, there are no significant differences in the TG levels before & after treatment with pumpkin fruit in both groups control Fig-7A & Patient group Fig-7B respectively.

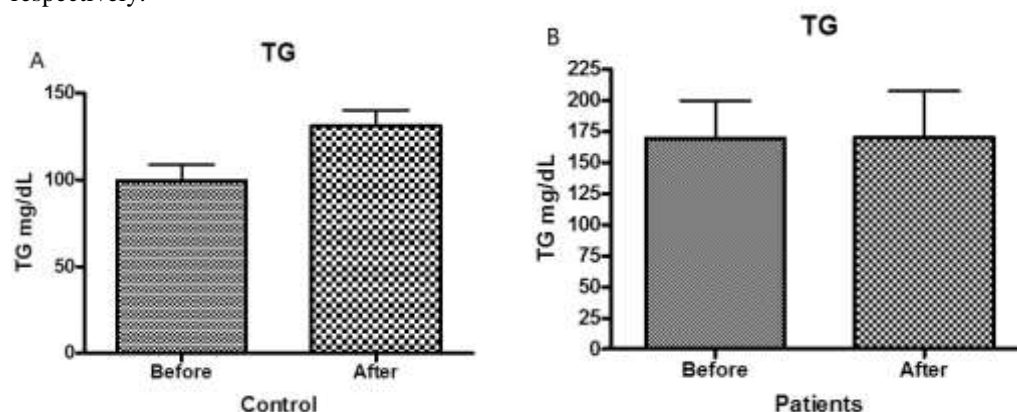


Figure-7: A. Tri-glyceride mg/dL in control group before and after treatment.

B. Tri-glyceride mg/dL in patients group before and after treatment.

4. DISCUSSION:

Virtually, I have explored in this study the vigour effect of *Cucurbitapepo* fruit on glycaemic cases and lipid profile of diabetic type 2 patients. However, the investigated groups were healthy and patient participants to compare and exhibit the significant differences and real effects of used fruit through investigation of FPG, HbA1C and lipids profile under fixed condition on both participants groups. Obviously, the differences of physical examinations of both groups were shown before and after the treatment period but it was recorded similar values and it wasn't affected by using of pumpkin fruit which means that it doesn't related to FPG and another investigated parameters changes.

The most interesting results were noted among patients group which exhibited improving of fast plasma glucose levels significantly and increasing of HDL levels significantly also, in both healthy (control) and patient groups, this results suggest that pumpkin contains some compounds have antidiabetic activity which confirm the findings of Luck H, 1963 which reported that the antidiabetic activity of pumpkin is contributed to its action on β -amylase & α -glucosidase which are required for carbo-hydrates breakdown to glucose[22], but in this study I noted that pumpkin fruit reduced the level of glucose in the plasma of patients group significantly.

Furthermore the Cucurbitaceae family that pumpkin fruit belong to contain globulins that have anti-hyperglycaemic activity[23]. So, I suggest that upon the Oral Glucose Tolerance the level of plasma glucose was reduced and the sensitivity to insulin was improved[24]. On the other hand, the Glycosylated hemoglobin (HbA1c) wasn't affected significantly by using of my tested fruit as I presented in the results. While the antioxidant effect of investigated pumpkin was significantly exhibited among both tested groups, the level of HDL which had ameliorated during use of fruit in both groups, this is suggesting that fruit of pumpkin has the same effect of seeds that reported to affect antioxidant enzymes activities and improve the level of HDL and reduced GSH levels significantly[25].

Although, In 1977 Kelly WRhad reported that two tetrasaccharideglyceroglycolipids were obtained from pumpkin seeds, both compounds demonstrated significant glucose-lowering effects in streptozotocin and high-fat-diet-induced diabetic mice[26], so I suggest upon my results that these two tetrasaccharideglyceroglycolipids may be found in the fruit also because similar effects were recorded. However, the levels of total cholesterol LDL weren't affected significantly in both groups which was inscrutable because the increasing of antioxidant enzymes activity reduce the level of TC and LDL but I have found contrary.

Tri-glyceride (TG) also, exhibited non-significant changes; its level wasn't affected by use of pumpkin fruit during investigation of all collected samples as observed in Fig-7. Finally, this results revealed that use of pumpkin fruit could reduce the level of FPG significantly for diabetes type 2 patients as similar as pumpkin seeds effects, also pumpkin fruit was found increase the level of LDL significantly among healthy and patients people, while total cholesterol and HDL levels weren't significantly affected.

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