Effects of sunflower seeds on fasting blood glucose in diabetes mellitus type 2 patients

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ABSTRACT

The present study was conducted with the aim to assess and analyse the effect of sunflower seeds on the Fasting Blood Glucose (FBS) in patients with Diabetes Mellitus Type 2. 60 patients were enrolled in the study (33 males and 27 females) divided into the case and the control group. Various anthropometric measurements (Height, Weight, Blood pressure) and biochemical parameters (Cholesterol, Triglycerides, Low Density Lipoprotein [LDL], High Density Lipoprotein [HDL], and Fasting Blood Glucose [FBS]) for these patients were recorded for 6 months pre and post supplementation of the sunflower seeds. The patients taking sunflower seeds showed a positive and a faster decrease in their FBS level as compared to the control group. The blood glucose levels in the case group reduced from 186.2 mg/dl to 109.9 mg/dl whereas in control group it reduced from 163.3 mg/dl to 119.2 mg/dl respectively. Sunflower seeds can be recommended as a household and natural remedy to render control over the blood sugar levels in patients with diabetes type-2. Also it leads to a good increase in HDL (good cholesterol) levels which help maintain the heart health.

Keywords: Sunflower Seeds, Diabetes Mellitus, Fasting Blood Glucose, Cholesterol, Triglycerides

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INTRODUCTION

Diabetes mellitus type 2 also known as adult-onset diabetes or noninsulin-dependent diabetes mellitus (NIDDM), is a widely occurring metabolic disorder these days that most commonly is characterized by hyperglycemia (high blood sugar) in the context of relative lack of insulin or insulin resistance. On the contrary, in type 1 diabetes, there is an absolute lack or absence of insulin due to breakdown of β cells in the islet of langerhans of the pancreas [1]. Its symptoms include excess thirst (polydipsia), frequent urination (polyuria), urination at night (nocturia) and constant hunger (polyphagia). About 90% of cases of diabetes accounts for type 2 diabetes cases, with the remaining 10% cases comprising of diabetes mellitus type 1 and gestational diabetes. Obesity is one of the primary causes of type 2 diabetes, especially in people who are genetically predisposed to this metabolic disorder [2].

In 2010 about 285 million people approximately were diagnosed with diabetes as compared to around 30 million in the year 1985. Long-term complications from Hyperglycemia may include strokes, diabetic retinopathy (problems in eyesight), diabetic neuropathy, diabetic nephropathy (which can proceed to kidney failure and thus sometimes may also require dialysis), Cardiac Diseases. Also poor blood flow in the limbs occur which may lead to amputation. Apart from all these an acute complication known as ketoacidosis (this is more prevalent in Diabetes type 1) may also occur which is considered to be quite fatal. [3]

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Crunchy, Nutty and sweet, sunflower seeds prove to be an incredible source of calories, minerals, vitamins and essential fatty acids. The seeds are most commonly utilized in the extraction of edible oil at a commercial scale throughout the world. The seeds of sunflower can be consumed as a delicious snack. [4]

Sunflower plant is an erect, herbaceous, tall annual plant belonging to the family of Asteraceae of the genus, *Helianthus*. The botanical name of the sunflower seeds is *Helianthus annuus*. The seeds first originated in the Middle American region. It is from this place that it escalated as an important commercial crop all over the world. [4]

Delicious and crunchy sunflower seeds are widely appraised as great health food. They are high in calories and also an impressive source of health benefiting nutrients, vitamins, minerals, and antioxidants. A good amount of their calories come from the fatty acids. The seeds are specifically rich in PUFA i.e. poly-unsaturated fatty acid mainly linoleic acid, which contribute around 50% fatty acids in them. Oleic acid, a mono-unsaturated fatty acid (MUFA) is also found in good amounts in the seeds. Research studies suggest daily diet schedule with good amounts of MUFA prevent cardiac disorders and stroke by maintaining a healthy lipid profile. [5]

Sunflower seeds like other nuts are also a rich source of proteins with high quality of amino acids such as tryptophan present in it. Tryptophan is essential for growth, especially in children. In addition to this, these seeds contain health promoting poly-phenol compounds such as quinic acid, caffeic acid and chlorogenic acid. These contain certain natural anti-oxidants in it that help discard harmful oxidant molecules (in simpler terms toxins) from the body [5] [6].

Sunflower kernels are one of the richest sources of B-complex vitamins. Very precisely these are very good sources of niacin, folic acid, thiamin (vitamin B1), pyridoxine (vitamin B6), pantothenic acid, and riboflavin. [6]The seeds are also incredibly rich sources of many essential minerals. Iron, Zinc, Manganese, Copper, Selenium and Calcium are especially concentrated in sunflower. Many of these minerals play a vital role in hormone production, enzyme synthesis, red blood cell production, bone mineralization, as well as regulation of metabolic, cardiac and skeletal muscle activities [7]

In this study, the effects of sunflower seeds were studied on the blood glucose levels of patients with diabetes type 2. The blood glucose evaluation includes – Fasting Blood Glucose (FBS)

EXPERIMENTAL SECTION

The sample of about 60 people (33 males and 23 females) was selected from the state of Punjab, with age ranging from 45-55yrs (sample patients selected under the knowledge of the administration). The sample was divided into two groups- control and case group (30 people in each group); where the control group was only given the required diet counseling whereas the case group was fed on 2 gm sunflower seeds per day along with the required diet counseling [8].

The pre- supplementation data in both the cases was collected with the help of a dietary survey, anthropometric measurements, biochemical testing which comprised of their diet history, diabetes history, height chart, BMI, FBS [8][11].

The sunflower seeds slightly roasted for about 2 minutes were fed to the control group for a period of 6 months. The pre and post supplementation data was recorded and the various biochemical parameters were checked at each month's end. The data collected was put to statistical analysis using SPSS software and unpaired t-test to find out the result. [8]
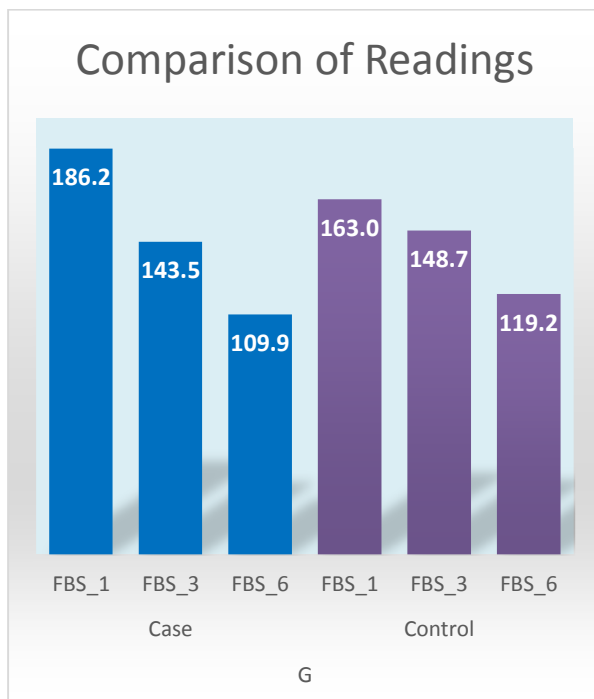
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Fig. 1: The comparison between the control and case group showing the mean of the values of FBS per visit

Fig. 2: The comparison between case and control group showing the mean of the values of LDL per visit
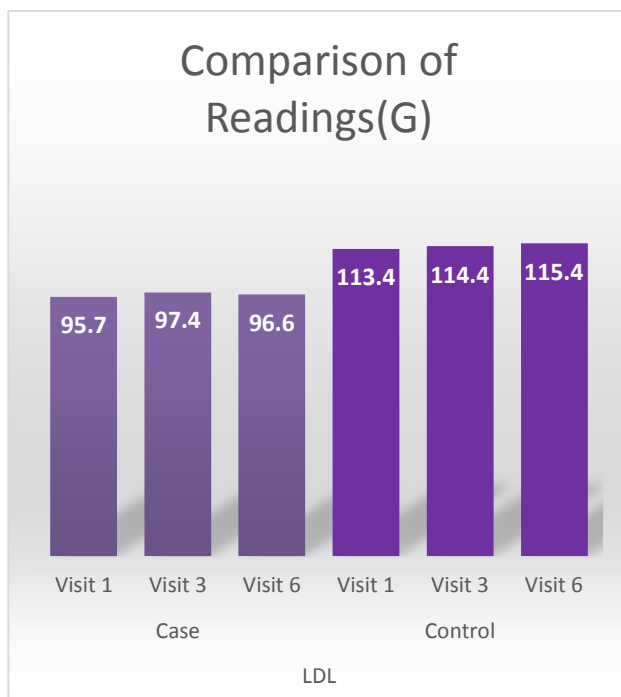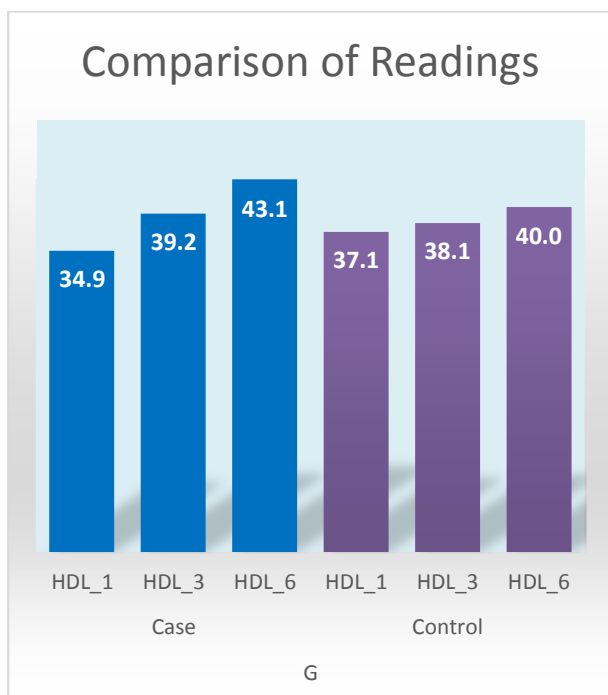
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Fig. 3: The comparison between case and control group showing the mean of the values of HDL per visit
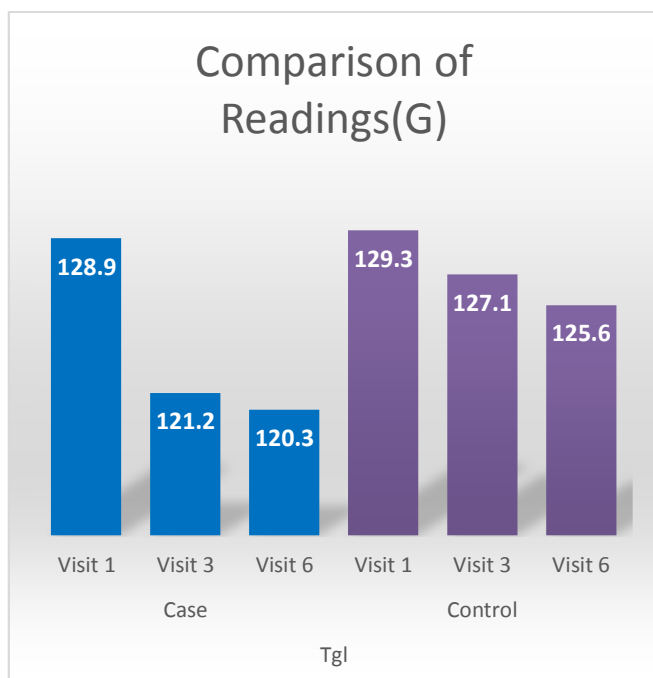

Fig. 4: The comparison between Case and control group showing the mean of the values of Triglycerides (Tgl) per visit
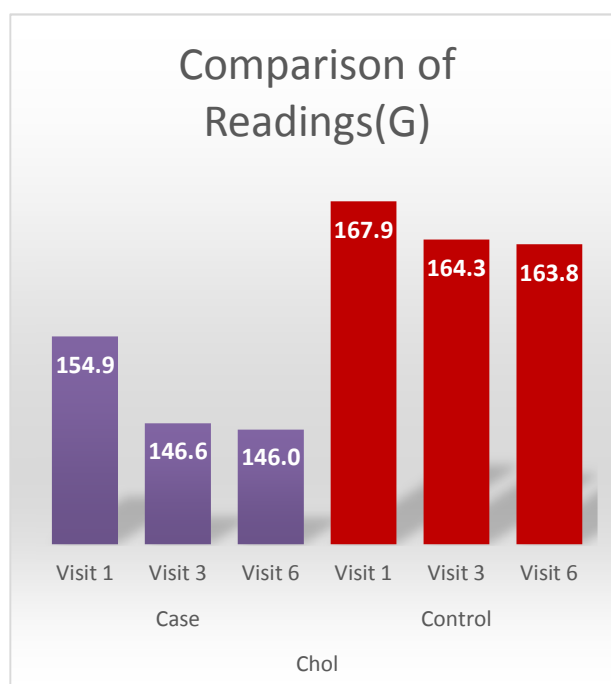
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Fig. 5: The comparison between case and control group showing the mean values of Cholesterol (Chol) per visit

Closely observing the graphs it gives a view how the case group (the ones being fed with sunflower seeds) shows a better decrease in the levels of FBS (Control group 163 mg/dl to 119.2mg/dl; Case group 186.2 mg/dl to 109.9 mg/dl) as shown in Fig: 1. Along with the FBS the values of Cholesterol (Control group 167 mg/dl to 163.8 mg/dl; Case group 154.9 mg/dl to 146 mg/dl) showed in Fig: 5 and triglycerides (Control group 129.3 mg/dl to 125.6 mg/dl; Case group 128.9 mg/dl to 120.3 mg/dl) also show a positive and better decrease than the control group as shown in Fig: 4. Apart from FBS, Cholesterol (Chol) and Triglycerides (Tgl) HDL (the good cholesterol) also show a good increase in the case group than the control group (Control group 37.1 mg/dl to 40 mg/dl; Case group 34.9 mg/dl to 43.1 mg/dl) can be seen in Fig: 3.

RESULTS

Applying the simple paired t-test using SPSS Software the following results were achieved.

Table 1, 2: The case and control group with the relative readings

Group	Experiment		Experiment		Experiment		Experiment		Experiment	
Case	**Chol**		**Tgl**		**LDL**		**HDL**		**FBS**	
Pre/Post	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Mean	154.90	146.03	128.93	120.33	95.70	96.63	34.9	43.1	186.2	109.9
S.D.	25.769	16.395	31.488	17.173	16.348	16.325	6.133	9.070	29.362	5.495
Paired T test	3.733		2.806		0.499		2.612		11.195	
P value	0.001*		0.009*		0.622**		0.014*		0.000*	
Table Value at 0.05 df 29	2.05		2.05		2.05		2.05		2.05	
Result	**Significant**		**Significant**		**Not Significant**		**Significant**		**Significant**	
Group	**Control**		**Control**		**Control**		**Control**		**Control**	
Control	**Chol**		**Tgl**		**LDL**		**HDL**		**FBS**	
Pre/Post	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Mean	167.93	163.83	129.33	125.60	113.37	115.37	37.1	40	163	119.20
S.D.	20.139	13.277	13.817	9.775	14.993	11.034	4.041	1.086	30.393	6.578
Paired T test	2.194		3.123		1.711		6.931		12.830	
P value	0.036*		0.004*		0.098**		0.000*		0.000*	
Table Value at 0.05 df 29	2.05		2.05		2.05		2.05		2.05	
Result	**Significant**		**Significant**		**Not Significant**		**Significant**		**Significant**	

*NOTE: S.D= Standard Deviation, *- Significant, **- Non Significant, n=60 (30 case, 30 control)*
Chol: Cholesterol, Tgl: Triglycerides, LDL: Low Density Lipoprotein, HDL: High Density Lipoprotein

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In table 1 (Case group) for cholesterol the p-value comes out to be 0.001 (< 0.05), for triglycerides it comes out to be 0.009 (< 0.05), for HDL 0.014 (< 0.05), for FBS 0.00 (<0.05) making these values significant, whereas in case of LDL the p-value comes out to be 0.622 (> 0.05) hence making it insignificant.

In table 2 (Control group) for cholesterol the p-value comes out to be 0.036 (< 0.05), for triglycerides it comes out to be 0.004 (< 0.05), for HDL 0.00 (< 0.05), for FBS 0.00 (<0.05) making these values significant, whereas in case of LDL the p-value comes out to be 0.098 (> 0.05) hence making it insignificant.

DISCUSSION

As per the results the sunflower seeds have proved to show a positive and a better effect in reducing the FBS levels in patients with Diabetes type-2 along with a good increase in HDL (good cholesterol). Just half a spoon of sunflower seeds every day provides the recommended level of proteins, vitamins, minerals and phenolic anti-oxidants. Further, as already discussed sunflower seeds are rich in chlorogenic acid. The chlorogenic acid helps in controlling the blood sugar levels by reducing or limiting the glycogen breakdown which takes place in the liver. Hence, leads to a good control of the blood sugar levels in the patients with Diabetes type -2 [6]

Amongst other studies, Flax seeds were used to find out their effectiveness to control the blood sugar levels. Brining to use a randomized crossover design, nine glucose intolerant obese people were told to consume 40 g ground flaxseed every day for around 12 weeks (84 days) with a 4-week washout period. The study's results weakly supported the decrease in insulin resistance due to the antioxidant activity of flaxseed. [9]

The effect of fenugreek was studied on the RBS (Random Blood Sugar) or the postprandial glucose and insulin levels following the MTT (Meal Tolerance Test) in non-insulin dependent diabetics (NIDDM). The powdered fenugreek seed around (15gm) was soaked in water and given. It was significantly found to reduce the respective postprandial glucose levels. The fenugreek was also found to lower the plasma insulin level in NIDDM but without a statistical difference. Fenugreek did not show a very good effect on lipid levels 3 hrs post the MTT. Fenugreek proved to propagate a potential benefit in the treatment of NIDDM. [10]

In the above studies, flax seeds do not show a good effect whereas fenugreek seeds do show a good effect but only on the blood glucose levels but does not show good effect in consideration to the heart health. Also, fenugreek seeds used in the study is about 15gm per day which is much higher that the quantity of sunflower seeds shown in the present study (2gm).

Sunflower seeds have about 3 grams of fiber and 5 grams of protein in an ounce of kernels apart from the other benefits [7]. Thus, a small amount of sunflower seeds taken on a regular basis say being added on top of salads, in the vegetable mixtures, in oats or other cereals or can be taken as it is as a health snack (in moderation). This would help the masses in better control of their blood sugar levels and maintain their heart health too by maintaining the level of HDL in the blood.

CONCLUSION

The crunchy, nutty and delicious sunflower seeds are highly considered to be a great health food. They are energy dense seeds; 100 g seeds provide about 584 calories. Along with this, they are phenomenal source of health benefiting antioxidants, minerals, vitamins and nutrients. Sunflower Seeds with a mild nutty taste and a wide range of the above mentioned nutrients can serve as a filling as well as a nutritious food. With respect to the gathered results in the study, sunflower seeds can be recommended as a great household and a natural remedy to render control over the blood sugar levels in patients with diabetes type-2. Also it leads to a good increase in HDL (good cholesterol) levels which help maintain the heart health in people.

REFERENCES

[1] K Kumar, S Vinay, N Fausto, AK Abbas, C Cotran, S Ramzi. Robbins and Cotran Pathologic Basis of Disease, 7th edition, Pa.: Saunders Publishers, Philadelphia, **2005**, 87-101.
[2] S Smyth; A Heron, *Nature Medicine.,* **2006**, 12 (1), 75-80
[3] OA Fasanmade; IA Odeniyi; AO Ogbera, *African J. of medicine and medical sciences.,* **2008**; 37 (2), 99-105.

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[4] AH Ensminger, ME Ensminger, JE Kondale, JRK Robson. Foods & Nutrition Encyclopedia, 2nd edition, Pegus Press Publishers, California, **1983**, 285-91.

[5] KM Phillips; DM Ruggio; KM Ashraf, *The J. of Agriculture and Food Chemistry.,* **2005**; 30, 9436-45.

[6] MV Krimer, PS Madarev, Z Vastag, V Preedy, V Patel, W Ronald, Nuts and Seeds in Health and Disease Prevention, 1st edition, Elsevier Publications, **2011,** 28-36.

[7] C Wood, S Rebecca. The Whole Foods Encyclopaedia, 1st edition, NY: Prentice-Hall Press, New York, **1988,** 113-9

[8] N Kssaian; L Azadbakht; B Forghani; M Amini, *International J. on Vitamin and Nutrition Research.,* **2009**; 79, 34-39.

[9] R Yeong; B Ardith, *Nutrition Journal.,* **2011**, 10, 1475-79.

[10] Z Madar; R Abel; S Samish; J Arad, *European J. of Clinical Nutrition.,* **1988**, 42(1), 51- 54

[11] DJ Jenkins; CW Kendall; EG McKeown; RG Josse; J Silverberg, *The J. of American Medical Association.,* **2008**, 300, 2742–53.