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CHIA SEEDS: Novel Considerations in Therapeutics

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Abstract: In this study we evaluated and compared hypolipidemic efficacy of chia seeds and niacin. The study was conducted at National hospital, Lahore Pakistan from August 2019 to December 2019. Ninty hyperlipidemic patients were selected from cardiology and medical wards of the hospital. They were divided in three groups, one on placebo, another on chia seeds and third one on Niacin. After one and half month, significant changes (p value ranging from <0.05 to <0.001) were observed in their FBS, LDL and HDL-cholesterol. Conclusion of the study was to recommend use of chia seeds and Niacin for prevention and treatment of diabetes mellitus type 2 and secondary hyperlipidemia with good patient compliance.

Keywords: Niacin, hyperlipidemia, metabolic syndrome, cure, chia seeds.

Research Paper

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INTRODUCTION

Plants have contributed valuable multitarget drugs that have been crucial in the management of several diseases, including chronic diseases such as diabetes, cancer, hypertension, hyperlipidemia and neurological and hepatic afflictions. Therefore, the relevance of reviewing information on plants that could be a potential source of multitarget drugs for the treatment of DM is imperative. Among these plants, we find that the plant popularly known as chia is highlighted, not only because of its reported multitarget action but also due to its being a highly nutrient-dense food that provides maximal health benefits to humans [1-3]. As part of beverages and as a component of food dishes, chia seeds have been employed from ancient times to the present and currently, in Mexico, a fresh beverage is prepared with chia seeds, water, and sugar, while, in some central and southern regions, these seeds are also mixed with cucumber and lime. As a component of food dishes, in pre-Columbian times, chia seeds were mixed with corn kernels to obtain a flour known as chianpinolli, which was employed to prepare tortillas and tamales [4]. With respect to traditional medicinal uses, among the most frequent of these in terms of chia, we find those for the treatment of skin conditions, gastrointestinal diseases, and ophthalmologic affectations [5]. Nevertheless, over the last decades, chia has been constantly studied around the world because of its nutritional contents and benefits to human health. Chia has been recognized as an excellent source of omega-3 fatty acids, of antioxidants, and for its high concentration of dietary fiber [6, 7]. Chia seeds are characterized by their oil content, which is approximately 25–40%, comprising around 60% of omega-3 alpha-linolenic acid (ALA) and 20% of omega-6 linolenic acid. The protein composition of chia seeds falls within a range of 15–25%, fats 30–33%, carbohydrates between 26 and 41%, fiber 18–30%, and ash approximately 4–5%, while minerals, vitamins, and antioxidants (such as chlorogenic acid, caffeic acid, myricetin, quercetin, and kaempferol) are present in elevated amounts [8]. Currently, chia has become very popular worldwide, forming part of daily menus, and is found in salads, bakery products, beverages, sausages, flours, pasta, and sweets. The number and variety of health benefits that the consumption of chia seeds has exhibited can permit the

consideration of chia as "the seed for the first 21st century" [9]. Regarding chia seeds, soluble fiber rises the volume and bulkiness of feces that regulates blood sugar level, body weight, and cholesterol level, and the health of the colon also acts as antiaging. Wet chia seeds are sticky in nature, due to mucilage and digestible fiber. These are useful in controlling blood sugar after eating, and provide satiety [10]. One of the distinctive features of chia seeds is their high levels of omega-3 fatty acids good for cardiac health. Omega-3 alpha-linolenic acids (ALA) are about 75% and 20% omega-6 fatty acids present in chia seeds. It is an effortless way to boost mental health by just consuming chia seeds [11]. The soluble fibre content in chia seeds contributes to managing cholesterol levels. Soluble fiber binds with cholesterol in the digestive system, preventing its absorption into the bloodstream and helping lower LDL cholesterol levels, often referred to as bad cholesterol [12].

MATERIAL & METHOD

The study was conducted at National Hospital Lahore Pakistan from August 2019 to December 2019. Ninty patients were selected for study. Consent was taken from all participants. Inclusion criteria was primary and secondary hyperlipidemic and diabetic patients suffering from type 2 diabtes. Exclusion criteria was patients suffering from any kidney, liver and thyroid related disease. Name, age, gender, occupation, residential address, phone/contact number, previous medical history, disease in family history, drug history were recorded in specific Performa. Three groups I, II, and III were made (30 patients in each group). Group-I was allocated for placebo, to take placebo capsule once daily, after breakfast for six weeks. Group-II was advised to take 2 tea spoons of chia seeds after breakfast for the period of six weeks. Group-III was on Niacin 2 grams in divided doses, after breakfast, lunch and dinner for 6 weeks. Their base line LDL-cholesterol and HDL-cholesterol and fasting blood sugar level was estimated at the start of research work. Their serum was taken at follow up visits, fortnightly for lipid profile and FBS. In statistical analysis data were expressed as the mean±SD and 't' test was applied to determine statistical significance in results. A p-value > 0.05 was considered as non-significance and P-value < 0.001 was considered as highly significant change in the differences. Serum LDL-cholesterol was calculated by formula (LDL-Cholesterol=Total Cholesterol-(Triglycerides/5 +HDL-Cholesterol). Serum HDL-cholesterol was determined by using kit Cat. # 3022899 by Eli Tech Diagnostic, France.

RESULTS

Results of all parameters of participated patients were analyzed bio statistically. In placebo group, LDL-cholesterol decreased from 189.15±3.90 mg/dl to 186.75±2.08 mg/dl, change in the parameter is 2.40 mg/dl. This difference in pretreatment and post treatment value is non-significant, ie; P-value > 0.05. HDL-cholesterol in placebo group increased from 36.11±2.11mg/dl to 37.17±1.51mg/dl. The difference in parameter was 1.06mg/dl. Statistically this change in parameter was nonsignificant, ie; P-value > 0.05. In Nigella sativa group, out of 30 hyperlipidemic patients, 27 patients completed over all study period. LDL-cholesterol in this group decreased from 202.45±1.54mg/dl to 189.52±2.21mg/dl. The difference in pre treatment and post treatment mean values is 12.93 mg/dl. Statistically this change in two mean values is highly significant, with p-value < 0.001. HDL-cholesterol in this group increased from 38.81±3.90 42.19±3.32mg/dl. Change in two mean values was 3.38mg/dl. Statistically this change is significant, with probability value <0.01. In group III, 28 patients completed the research. LDL-cholesterol in this group decreased from 212.65±2.32 to 185.61±3.43 mg/dl in six weeks treatment. Change in pre and post treatment mean values is 27.04mg/dl. Statistically this change is highly significant, i.e., P-value < 0.001. HDL-cholesterol increased from 39.19±2.01 to 43.00±3.07 mg/dl in six weeks. Change in two parallel values is 3.49mg/dl, which is significant with P-value <0.01. FBS in chia seeds group reduced from 264.87 mg/dl to 210.33 mg/dl in treatment period. It was highly significant change with p-value <0.001. While FBS in Niacin drug group reduced from 270.11 mg/dl to 219.01 mg/dl. Change in this parameter was 51.10 mg/dl which was highly significant with p-value <0.001.

Table 1: Showing pre and post treatment values of lipid profile, changes in values and their statistical significance

No. of patients	Day-0 values	Day-45 values	Change in basic values	Statistical significance
Placebo (30 pts)	LDL=189.15±3.90	LDL=186.75±2.08	2.40	> 0.05
	HDL=36.11±2.11	HDL=37.17±1.51	1.06	> 0.05
	FBS= 245.87±1.98	FBS= 243.55±1.95	2.32	>0.05
Chia seeds (27 pts)	LDL=202.45±1.54	LDL=189.52±2.21	12.93	< 0.001
	HDL=38.81±3.90	HDL=42.19±3.32	3.38	< 0.01
	FBS= 264.87±1.96	FBS= 210.33±2.22	54.54	<0.001
Niacin (28 pts)	LDL=212.65±2.32	LDL=185.61±3.43	27.04	< 0.001
	HDL=39.19±2.01	HDL=43.00±3.07	3.49	< 0.01
	FBS= 270.11±1.94	FBS= 219.01±30	51.10	<0.001

KEY: FBS (fasting blood sugar), HDL (high density lipoprotein cholesterol) and LDL (low density lipoprotein cholesterol) are measured in mg/dl, n stands for sample size, p-value >0.05 indicate non-significant, <0.01 indicate significant and <0.001 indicate highly significant change in basic values

DISCUSSION

The metabolic syndrome is defined most commonly as the combination of hyperlipidemia, insulin resistance, and obesity. Hypertension is sometimes included in the diagnoses of the metabolic syndrome. The metabolic syndrome increases the risk of cardiovascular disease, myocardial infarction, stroke, and mortality. To decrease risk of myocardial infarction we focused on hyperglycemia and hyperlipidemia. In our results treatment with chia seeds decreased LDL-cholesterol 12.93 mg/dl by six weeks of treatment. HDL-cholesterol increased 3.38 mg/dl by taking this drug for six weeks. The change in both parameters were significant. In placebo group, LDL-C reduction was 2.40 mg/dl and increase in HDL-C was 1.06 mg/dl with P-value >0.05, which proves non-significant change in results. These results match with Akhondian *et al*., [13] who did prove that Chia seeds are very effective hypolipidemic. He tested the drug on 120 hyperlipidemic and diabetic patients by using Chia seeds for one month. Their results were highly significant when compared with placebo-controlled group. Our results also match with results of Gillani AH *et al*., [14] who proved LDL-Cholesterol reduction from 201.61±3.11 mg/dl to 187.16±2.10 mg/dl in fourty hyperlipidemic patients. Their HDL-C increase was 3.98 mg/dl which also matches with our results. Results of our study are in contrast with results of research work conducted by AH BH and Blunden G [15]. They explained that some active ingredients of Chia seeds are hypolipidemic but their hypolipidemic effects are very narrow spectrum. Their results showed only 2.11 mg/dl change in LDL-C and 0.92 mg/dl increase in HDL-C of 38 rats. Difference in results may be genetic variants of human and rats. Brown BG *et al*., [16] also described phenomenon of genetic variation in pharmacological effects of chia seeds. Burits M & Bucar F [17] have also mentioned wide variety effects of Chia seeds with different genetic make ups. Our results also match with results of research work of Dehkordi FR & Kamkhah AF [18] and El-Dakhakhany M [19]. Same mechanism of action of Chia seeds is described by El-Din K *et al*., [20]. In our research Niacin reduced LDL-Cholesterol from 212.65±1.19 mg/dl to 185.61±1.65 mg/dl in six weeks. This reduction in LDL-C was 27.04 mg/dl, which is highly significant change, when analyzed statistically. These results match with results of research work conducted by Afilalo J *et al*., [21] who proved almost same change in LDL-C in 32 hyperlipidemic patients who were cases of secondary hyperlipidemia and used Niacin 2 grams daily for two months. Their LDL-C reduction was 25.55 mg/dl. Their HDL-C increase was 6.65 mg/dl in 2 months. In our results HDL-C increase was 3.81 mg/dl in six weeks use of Niacin. Our results also match with results of research conducted by Whitney EJ *et al*., [22] who proved 27.77 mg/dl reduction in LDL-C in 19 hyperlipidemic patients. Ginsberg HN *et al*., [23] also support our results, as they proved 4.00 mg/dl increase in HDL-C when two grams of Niacin was used in 34 hyperlipidemic patients for six weeks. Our results do not match with results of research conducted by Boden WE *et al*., [24] who proved that 2.5 grams Niacin decreased 10.99 mg/dl LDL-Cholesterol. HDL-C increase was only 1.11 mg/dl. These differences may be considered due to lack of physical exercise and no restriction of use of lipids in their diet. Taylor AJ *et al*., [25] used Niacin 1.5 grams in 29 hyperlipidemic patients for 3 weeks. Patients reduced their LDL-C from 189.88 ±1.11 mg/dl to 187.87±0.99 mg/dl. Difference in their results and our results is due to less sample size, lesser duration of exposure of patients to drug and small amount of drug given in their patients. In our study FBS in chia seeds group reduced from 264.87 mg/dl to 210.33 mg/dl in treatment period. It was highly significant change with p-value <0.001. These results match with results of study conducted by Kulov E *et al*., [26] who proved 59.96 mg/dl reduction in FBS in 49 diabetic patients when he used chia seeds mixed in hot water taken twice daily for three months. He mentioned the mechanism of reduction of blood glucose by sticky (gummed) nature of chia seeds which adhere with glucose/carbohydrate molecules in GIT causing hypoglycemia. Results of study by Rehyu *et al*., [27] also support our results as they proved 45.84 mg/dl reduction in FBS in 35 diabetic patients when chia seeds were used for three weeks. Drowsee C *et al*., [28] also proved nearly same change in FBS of 22 diabetic patients. In our research FBS in Niacin drug group reduced from 270.11 mg/dl to 219.01 mg/dl. Change in this parameter was 51.10 mg/dl which was highly significant with p-value <0.001. Termou *et al*., [29] proved same change in fasting blood sugar level when they used Niacin 1.5 gram in divided doses for three months in 66 diabetic patients. They described three mechanisms by which chia seeds reduces serum glucose level. (1) Fiber Content: Chia seeds are rich in soluble fiber, which slows down the digestion and absorption of carbohydrates, leading to a more gradual release of glucose into the bloodstream. (2) Alpha-Glucosidase and Alpha-Amylase Inhibition: Chia seeds inhibit these enzymes, which are responsible for breaking down carbohydrates into glucose, thereby reducing the rate of glucose absorption. (3) AMPK Activation: Chia seeds activate AMP-activated protein kinase (AMPK), a key regulator of glucose and lipid metabolism. This activation improves insulin sensitivity and enhances glucose uptake by cells.

CONCLUSION

It was concluded from this study that if specif amount of these seeds are used for specific period, decrease LDL cholesterol, fasting blood sugar and increase HDL cholesterol significantly.

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Conflict of Interest: N/A

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