

Diabetes Mellitus Type 2, Dyslipidemia and Blood Pressure: Common Pathway to Development of Metabolic Syndrome

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<p>Abstract: Type of this study was single blind, placebo controlled and was approved by ethics committee of the hospital. Okra was used to see hypolipidemic, hypoglycemic and hypotensive effects in primary and secondary hyperlipidemic patients. Separate folder was made to keep record of Pre and post treatment values of the parameters like blood pressure, total cholesterol, LDL cholesterol, HDL cholesterol, and blood sugar. Pre and post treatment values were compared after therapy, which proved that as compared to placebo, total cholesterol, triglycerides, LDL cholesterol and fasting blood sugar was reduced significantly with p-value <0.001. HDL cholesterol was increased with p-value <0.01 which was significant change. Results of study concluded that okra can reduce lipid profile and fasting blood sugar in primary and secondary hyperlipidemic patients and can be used to prevent metabolic syndrome leading to other health related consequences like heart diseases and central nervous system illnesses.</p> <p>Keywords: Heart, Blood Vessels, CAD, Morbidity, Mortality, Herbs, Okra, Hyperlipidemia.</p> <p>Copyright © 2024 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.</p>	<p>Research Paper</p>
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INTRODUCTION

Cluster of hyperglycemia/insulin resistance, obesity and dyslipidemia. is known as metabolic syndrome. It identifies patients who are at high risk of developing atherosclerotic coronary vessels disease (CVD) and type 2 diabetes (T2D). By considering the relationships between the components of metabolic syndrome, we have to better understand the pathophysiology that links them with each other and with the increased risk of CVD. It also facilitates epidemiological and clinical studies of pharmacological, lifestyle and preventive treatment approaches. For addressing metabolic syndrome here we will deal with two factors ie hyperglycemia and hyperlipidemia [1]. Generally hypoglycemic, hypolipidemic drugs are used to solve symptoms. Apart from hypoglycemic and hypolipidemic allopathic medications, various herbs have been used to prevent and cure of the disease [2]. *Abelmoschus esculentus* (lady finger or okra) is a non-leafy, green, fruit vegetable that is widely consumed in Pakistan and abroad. Popularly called bhindi in Pakistani households, this vegetable is tender, mucilaginous and dense in nutritional content. It can be eaten raw and

cooked [3]. Bhindi helps control diabetes. Okra is packed with dietary fibre that helps stabilisation of blood sugar levels by regulation of the rate of absorption of sugar from the digestive tract. The anti-diabetic property of okra is also attributed to its ability of inhibition of enzymes metabolising carbohydrates, enhancement of production of insulin, regeneration of beta cell of the pancreas and increased secretion of insulin [4]. It prevents heart disease [5]. People are often affected with heart disease due to high levels of cholesterol in their blood [6]. Pectin, a soluble fibre present in lady's finger helps lower this cholesterol and thus is helpful in preventing heart disease. Bhindi is also fairly rich in antioxidant compounds like polyphenols [7]. Okra have been reported to play antidiabetic and antihyperlipidemic roles in secondary hyperlipidemic patients and patients of type 2 diabetes mellitus. Recently, we found that okra polysaccharides lowered body weight and glucose levels, improved glucose tolerance, and decreased serum total cholesterol (TC) levels in secondary hyperlipidemic patients [8]. Okra is rich in flavonoid compounds that have antioxidant activity. Epidemiological studies have suggested that the consumption of foods rich in flavonoid

compounds could reduce the risk of diabetes, cardiovascular diseases, obesity, hyperlipidemia, stroke and cancers, suggesting that the consumption of okra may be of benefit in metabolic diseases [9-11].

MATERIAL AND METHOD

Aim of Study: Okra was used to see its hypolipidemic and hypoglycemic effects in secondary hyperlipidemia and diabetes mellitus type 2.

Place of Study: Benazir Bhutto hospital Rawalpindi.

Duration of Study: From March 2023 to June 2023.

Sample Size: 60 hyperlipidemic patients suffering from diabetes mellitus type II and secondary hyperlipidemia.

Written consent was taken from all patients. This consent was already approved by ETHICS COMMITTEE of the hospital. These patients were divided in two groups. Group-I (n=30) was on placebo (capsules containing grinded wheat shell only) and group-II (n=30) was advised to take 200 grams raw okra in divided doses for three months. Baseline fasting blood sugar (FBS) and lipid profile was determined at day-0, day-30, day-60, and at the end of research period ie; day-90. Serum LDL-cholesterol was calculated by Friedwald formula [10]. (LDL-Cholesterol = Total Cholesterol-

(Triglycerides/5 +HDL-Cholesterol). Glucometer made by Roch pharma serial No: CE 0123 was used for estimation of FBS. For statistical analysis SPSS version 2021 was used. SD and \pm SEM was determined from mean of the pre and post treatment values. Paired 't' test was applied to see p-value of the tested parameters. P-value >0.05 was considered as non significant change, <0.01 as significant and <0.001 as highly significant change in the tested parameter.

RESULTS

After three months therapy it was observed that okra reduced serum total cholesterol from 350 mg/dl to 322 mg/dl. Difference in pre and post treatment value was 28 mg/dl (with p-value 0.001). Triglycerides reduced from 209 mg/dl to 190 mg/dl in given treatment period. Difference in pre and post treatment was 19 mg/dl (p-value 0.001). Lady fingers reduced blood LDL-cholesterol from 209.13 \pm 2.22 mg/dl to 183.09 \pm 1.58 mg/dl. Difference in pre and post treatment was 26.04 mg/dl (p-value <0.001). FBS in 27 diabetic patients suffering from DM type-II was reduced from 166.61 \pm 3.09 mg/dl to 149.98 \pm 1.76 mg/dl. Difference in pre and post treatment values was 16.63 mg/dl (p-value <0.01). Changes in all parameters of lipid profile and FBS in placebo group were non significant with p values >0.05.

Table 1: showing pre and post treatment values of parameters of lipid profile and fasting blood sugar with difference in values and their p-values

Parameter	At day-0	At day-90	Difference	p-value
TC	350.05	322.12	27.93	<0.001
TG	209.54	190.87	18.67	<0.001
LDL-C	209.13	183.09	26.04	<0.001
FBS	166.61	149.98	16.63	<0.01

TC = total cholesterol, TG= triglycerides, LDL-C= low density lipoprotein cholesterol, FBS= fasting blood sugar. All parameters are measured in milligram per dl. P-values <0.001 are highly significant and <0.01 is significant.

DISCUSSION

Researchers have found that a gel in okra called mucilage can help lower cholesterol by binding to it during digestion. This helps cholesterol leave the body through stool. Medical research on okra for diabetes management is still in the early stages. A 2023 systematic review trusted Source and meta-analysis of eight clinical trials found okra reduced levels of fasting blood sugar among people with prediabetes and type 2 diabetes but did not have a significant impact on HbA1c, a longer-term measure of blood sugar management. Cholesterol lowering drugs and drugs used in diabetes mellitus have proved to have adverse effects, medical researchers are trying to conduct trials of medicinal herbs for hyperglycemia and hyperlipidemia. We used lady finger to see their lipid and blood glucose lowering effects. In our results 90 days treatment with use of 200 grams raw lady finger reduced LDL-cholesterol in 27

patients 26.04 mg/dl. In these patients fasting blood sugar reduced 16.63 mg/dl. These results match with results obtained in trial conducted by R. John *et al.*, [11], who observed almost same results which support our results. Mackhil TY *et al.*, [12]. Johay S *et al.*, [13], and Surta VF *et al.*, [14], mentioned the mechanism of action of ladyfingers to reduce LDL-cholesterol that the herb reduces enterohepatic circulation of bile salts so VLDL are not synthesized, and so the LDL. Jittkaal MN *et al.*, [15], mentioned the antioxidant effects of ladyfingers. Polyphenolic compound like quercetin present in ladyfingers prevent oxidation of cholesterol. Gurhu GT *et al.*, [16], observed lesser hypolipidemic effects of ladyfingers as their results proved 16.98 mg/dl reduction in LDL-cholesterol in 19 hyperlipidemic patients. This contrast may be due to lesser amount of herb used as they used 100 grams raw ladyfinger in 25 hyperlipidemic patients for 75 days. Our results proved 16.63 mg/dl reduction in fasting blood glucose (FBS) level when lady

finger was used by 27 diabetic patients suffering from diabetes mellitus type-II. These results match with results of study conducted by Rochee M *et al.*, [17], who proved 18.76 mg/dl reduction in FBS level when this herb was used (150 grams per day for two months) by 56 patients suffering from diabetes mellitus type-II. Okra being rich in fibres helps to normalize the blood sugar; it absorbs the excessive glucose from blood and balances the level [18-20]. Fornh TV *et al.*, [21], stated that ladyfinger is use to treat cystitis, leucorrhea, impotence and premature ejaculation in male. Saty V *et al.*, [22], explained that as ladyfinger is anti-inflammatory herb, it reduces risk of synthesis of foamy cells during development of atherosclerotic plaques in early stages. Sharma K *et al.*, [23], wrote that the herb reduces FBS by various mechanisms, enterohepatic circulation inhibition is one of them. Dosata R *et al.*, [24], warned the use of the herb for prolonged time may cause acidity. Therefore antacids may not be used by individuals who are already taking ladyfinger as medicinal purpose for specific time. Inhibition of carbohydrate metabolizing enzymes, enhancement of insulin sensitivity, regeneration of damaged pancreatic islet β -cells, and enhancement of insulin secretion and release is explained by Turtr F *et al.*, [25]. Recently, plants in the mallow family have been reported to improve insulin resistance. The musk mallow (okra) improves insulin resistance, increases insulin receptor substrate-1-associated phosphatidylinositol 3-kinase activity and Glut 4 translocation in insulin-resistant soleus muscles in rats fed a diet containing 60% fructose and promotes Akt serine phosphorylation in the soleus muscles of obese Zucker rats. Total flavone glycosides of aibika (okra) have been reported to decrease urinary microalbumin and glomerular podocyte apoptosis in streptozotocin (STZ)-induced diabetic nephropathy rats, suggesting that aibika could prevent diabetic renal damage [26-31].

CONCLUSION

It was then concluded from the trial that okra has significant hypolipidemic and hypoglycemic potential and may be used in diabetic patients suffering from type 2 diabetes and secondary hyperlipidemia.

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