Original Article

Comparison of Effects of 10% Zinger, 10% Fenugreek and 10% Garlic with Atorvastatin in Hypercholesterolemia Induced Rats

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ABSTRACT

Objective: Comparison of effects on lipid profile and hepatic enzymes by using 10% ginger, 10% fenugreek and 10% garlic against atorvastatin treated animals in hypercholesterolemia induced albino rats.
Study Design: Descriptive comparative experimental study.
Pace and Duration of study: This study was conducted at the Department of Biochemistry, Al-Tibri Medical College, Karachi from January 2016 to December 2016.
Materials and Methods: In the present study thirty six rats having weight of about 150-200 grams were included. The rats were further grouped into six A, B, C, D, E and F with six rats in each group. Group A (control) rats were kept on normal rat diet. Group B rats were kept on hypercholesterolemic diet containing 20% fat and 1% cholesterol. Group C rats were kept on supplemented diet having 10% ginger powder with hypercholesterolemic diet. Group D rats were kept on supplemented diet having 10% Fenugreek seed powder with hypercholesterolemic diet. Group E rats were kept on supplemented diet having 10% garlic with hypercholesterolemic diet. Group F rats were kept on 10mg/kg of atorvastatin in hypercholesterolemic diet.
Results: Significant decrease in triacylglycerol in group C (10% ginger) was noted as compared to group E (10% garlic) and F (Atorvastatin 10mg/kg of diet). Also the values of HDL were significantly higher in group C in comparison to the group D, E and F. However significant decrease in the level of total cholesterol is found in F (Atorovastin) group as compared to C and D group. Also the values of LDL were significantly lowered in group F in comparison to the group C, D and E. Alanine aminotransferase and Aspartate aminotransferase lowered significantly in group C in comparison to the group E. Alkaline phosphatase was also significantly lowered in group C in comparison to D and E group but had shown no significant difference as compared to group F.
Conclusion: Zinger 10% supplementation improved the HDL and triacylglycerol levels as compared to other herbs and atorvastatin treated group. However atorvastatin treated group showed more decreased LDL levels. No significant difference was found in hepatic protection when ginger and others were compared to atorvastatin group.
Key Words: Hepatoprotective, Garlic, Fenugreek, Zinger.

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INTRODUCTION

American Heart Association defines hyperlipidemia as high levels of fat in blood which include cholesterol and triacylglycerols[1]. Hypercholesterolemia is considered as disorder of metabolism that can result in many diseases such as diseases of heart and blood vessels. Long standing elevated hypercholesterolemia leads to accelerated atherosclerosis expressing itself as cardiovascular disease (CVD), Angina pectoris, heart attack and peripheral vascular disease[2].

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Statins are synthetic drugs which functions to decrease the serum cholesterol by inhibition of HMG CoA reductase enzyme, which is involved in the regulation of cholesterol synthesis in the liver[3]. Side effects of statins include damage to muscle tissue causing body aches, deranged LFTs and elevated blood sugar[4]. Harmful effects of synthetic drugs eg; statins have been documented[5]. The medicinal plants and natural drugs are more effective and less toxic substances being focused now a days[6,7]. Different countries use medicinal plants as a source of many potent and powerful drugs[8].

Ginger (Zingiber officinale) is member of the family of plants having cardamom and turmeric as other members. Ginger is grown mostly in Asia and tropical countries.it is used for remedy of multiple conditions including colds, fever and indigestion[9]. Ginger shows remarkable effect of lowering blood lipid in patients with hyperlipidemia[10]. In a study it was shown that Ginger caused hypoglycemic and hypolipidemic effects in streptozotocine induced diabetic rats[11].

Fenugreek is leguminous bean plant, its Latin name is Trigonella fenum greecum[12]. Fenugreek seed and its green leaves are used as food. Beside they have medicinal application. Fenugreek seeds provide natural food fibre and other nutrients required in human body[13]. Fenugreek is among the oldest medicinal plants. Its use has been mentioned in the Hippocrates and ancient Egypt times[14]. Fenugreek has hypocholesterolemic, hypolipidemic (TAG lowering effect) and LDL lowering effect in hypercholesterolemic patients[15]. The hypolipidemic effects of Fenugreek seeds have been ascribed to the presence of saponins and sapogenins[16].

Extract of Garlic (Allium sativum) is another herbal medicine that decreases serum cholesterol levels in humans, inhibits synthesis of cholesterol in the body, supress oxidation of low density lipoproteins, lowers plasma fibrinogen and increases fibrinolytic activity and thus possesses anti atherosclerotic properties. Garlic lowers triacylglycerol by inhibiting fatty acid synthesis. The garlic reduces cholesterol by inhibition of HMG CoA reductase enzyme[17].

The use of medicinal plants including Zinger, Fenugreek and garlic to reduce the serum cholesterol levels with in comparison with the statins was studied in present study. Variation in the hepatic enzyme levels was also monitored to observe the side effects among these substances.

MATERIALS AND METHODS

In the present descriptive comparative experimental study thirty six albino rats having weight of about 150-200 grams were included. The study duration was from January 2016 to December 2016 and was conducted at Department of Biochemistry Al-Tibri Medical College and Hospital Karachi. A total of thirty six rats were further grouped into six A, B, C, D, E and F with six rats in each group.

Animals in each group were fed on precisely disegned diet chardt as follows. Group A (control) rats were kept on normal rat diet. Group B rats were kept on hypercholesterolemic diet containing 20% fat and 1% cholesterol. Group C rats were kept on supplemented diet having 10% ginger powder with hyper-cholesterolemic diet. Group D rats were kept on supplemented diet having 10% Fenugreek seed powder with hypercholesterolemic diet. Group E rats were kept on supplemented diet having 10% crushed garlic with hypercholesterolemic diet. Group F rats were kept on 10 mg of Atorvastatin in 1 Kg of hypercholesterolemic diet.

At the completion of 08 weeks all the animals were sacrificed and serum was used for measuring total serum cholesterol, serum triacylglycerides, serum HDL and LDL and liver enzymes.

Results were analysed statistically by using student 'T' test and Analysis of variance (ANOVA). SPSS version 18 was used for statistical analysis. P Value < 0.05 was considered as statiscally significant.

RESULTS

The results revealed that animals in group B who were feed on hypercholesterolemic diet, they showed deranged serum lipid profile with increase in total cholesterol (TC), triacylglycerols (TAG), low density lipoproteins (LDL), while decrease in the HDL level was observed when compared with group A rats. Also in group B rats serum hepatic enzymes ALT, AST and ALP were elvated when compared to group A animals.

Table 1 and figure 1 & 2 shows the comparison of lipid profile and serum liver enzyme activities in different groups of rats after taking 10% ginger, Fenugreek, garlic and Atorvastatin 10 mg/kg of diet. There is significant lowered level of triacylglycerides in group C (10% ginger) in comparison to group E (10% garlic) and F (Atorvastatin 10mg/kg of diet). Also the values of HDL were significantly increased in group C in comparison to the group D, E and F. However significant decrease in the level of total cholesterol is found in F (Atorovastin) group in comparison to C and D group. The values of LDL were significantly lowered in group F in comparison to group C, D and E.

Alanine aminotransferase and Aspartate amino-transferase decreased significantly in group C (10% Ginger) as compared to E (10% Garlic). Alkaline phophatase (ALP) significantly decrease in group C as compared to D (10% Fenugreek) and E (10% Garlic) but had shown no significant difference as compared to group F (Atorvastatin) as shown in Table-1 and figure 1 & 2.

Table No.1: Comparison of the lipid profile and hepatic enzymes of group C, group D and group E with group F rats

Parameter	Group C	Group D	P value	Group E	P value	Group F	P value
TC (mg/dl)	161.33± 4.25	169.66±6.46	0.877	151.80±5.45	0.770	127.00±3.91	0.001
TAG(mg/dl)	74.50±1.89	85.50±4.07	0.075	106.50±2.44	0.001	105.16±2.79	0.001
HDL(mg/dl)	45.16±1.51	42.66±1.30	0.957	39.83±2.53	0.392	38.50±1.62	0.161
LDL (mg/dl)	101.33±4.39	109.33±5.43	0.830	89.73±3.08	0.542	67.50±4.02	0.001
ALT (IU/L)	35.83±1.16	37.16±1.47	0.998	50.83±2.21	0.001	33.16±2.74	0.944
AST (IU/L)	92.66±2.06	102.50±3.81	0.453	124.50±4.39	0.001	91.83±3.66	0.991
ALP (IU/L)	234.66±7.45	292.50±10.93	0.001	269.33±4.98	0.029	230.66±5.04	0.999

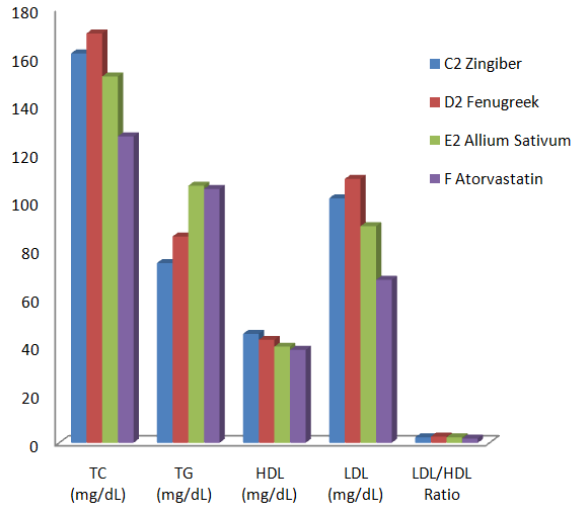

Figure No.1: Comparison of lipid profile in 10% supplemented groups.

The graph represents the mean values of lipid profile in 10% ginger, 10% Fenugreek, 10% garlic and atorvastatin supplemented rats.

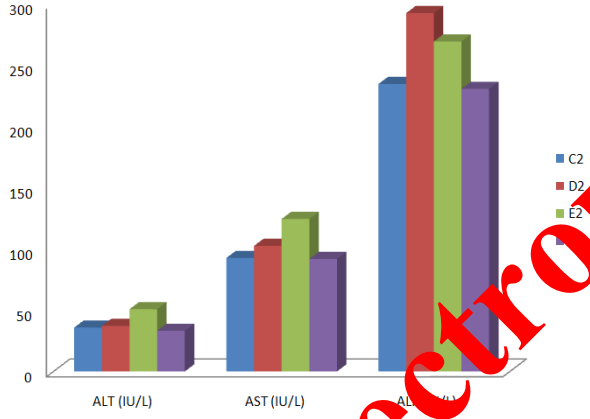

Figure No.2: Comparison of serum liver enzymes in 10% supplemented groups.

The graph represents the mean values of hepatic enzymes in 10% ginger, Fenugreek, garlic and atorvastatin supplemented rats.

The coefficient correlation between serum lipid profile and serum liver enzymes in ginger, Fenugreek and garlic supplemented groups showed that the group D had shown a positive correlation between the total cholesterol level with ALT and AST. The TAG also showed a positive correlation with AST in group C.

DISCUSSION

Continuing search is being carried out for natural substances that can treat hypercholesterolemia. Folic acid, green tea, spices Allium sativum (Garlic), Fenugreek (Methi), Zingiber (Ginger) have shown promising results. Use of high fat diet may result in the derranged lipid profile and with evidence of elevated serum triglycerides and total cholesterol as is shown in the present study. In a study conducted by Ramulu P et al[18] vanspati ghee reported that use of Vanspati ghee may cause higher levels of triglycerides and total cholesterol.

Ginger is widely used as a herbal medicine for the treatment of indigestion, vomiting and hypertension. A number of studies had been done to investigate the effect of ginger on hyperlipidemia. The daily intake of 2 gm of powdered ginger for 2 months decreased the level of triacylglycerol and LDL but no significant change in the level of total cholesterol and HDL level was observed[19]. The plasma lipid lowering effect of ginger is associated with several processes. It may be due to disruption of cholesterol absorption from the gastro Intestinal tract, or interference with cholesterol biosynthesis in liver. Ginger also contain antioxidant properties which inhibit LDL oxidation, and decrease the HMG – CoA reductase activity, may lead to the biosynthesis of bile acids which is one way of excretion of cholesterol from the body[20].

The liver enzymes aspartate amino transferase and alanine aminotransferase were increased in the rats feed on hypercholesterolemic diet in group B. The possible underlying mechanism responsible for such elevation is due to the hepatic cell membrane damage resulting in leakage of these enzymes and subsequent detection in the serum[21].

The effects of Fenugreek were studied in hyperlipidemic rats in the present study. A significant improvement was found in the deranged lipid profile with 10% Fenugreek supplemented diet given to rats in group D when compared to group B rats. Wan LX et al[22] has reported similar findings in accordance with our findings.

Fenugreek supplementation lowered the liver enzymes ALT, AST and ALP in supplemented groups as compared to hypercholesterolemic group, which showed the hepatoprotective effect of Fenugreek. Renuka et al[23] had reported lowering of alanine aminotransferase and aspartate amino transferase after the supplementation of Fenugreek seeds in diabetic rats. The lipid lowering effects have been pronounced with the high dose of garlic, whereas serum triacylglycerols level is significantly decreased in 10% garlic supplemented group. The results of this study confirm the earlier hypolipidemic effects of garlic[24].

On treatment with 10% garlic supplementation the ALT, AST and ALP level are slightly increased, where as Ajayi and his colleague (164) had found a significant rise in the level of AST and ALP in 10% supplemented group of garlic, So it is concluded that garlic reduces the lipid profile and also reduces serum liver enzymes, but garlic in high doses should not be taken, because it raises the serum liver enzymes[25].

In the present study the three herbs namely Zinger, Fenugreek, and garlic were compared from one another for their hypolipidemic and hepatoprotective effects and

they were also compared with a synthetic drug; Atorvastatin for lowering of lipid contents and enzymes.

Fenugreek and Atorvastatin hypolipidemic effects were compared by Sharma and Choudhary[26] found that Atorvastatin had lowered the TC, TAG, LDL-C significantly as compared to Fenugreek supplemented group but HDL-C level was raised in Fenugreek supplemented group as compared to atorvastatin group. The present work also shows a decrease of TC, and LDL-Cholesterol by Atorvastatin but no significant difference of HDL-C was observed in different supplemented groups of animals in the present study. Memon et al[27] reported that combination therapy of nigella sativa and Fenugreek with glibenclamide is beneficial for type – 2 diabetic patients as it increases serum HDL level in these patients.

In the present study group C rats supplemented with zinger showed significant decrease in the serum triacylglycerol when compared to Fenugreek, garlic and Atorvastatin treated animals. In contrast to our findings Islam and Choi have reported no significant difference in levels of triacylglycerols[28].

CONCLUSION

Zinger 10% supplementation had slightly higher HDL levels as compared to other herbs and atorvastatin treated group. However atorvastatin treated group showed more decreased LDL levels.

The triacylglyceriddes level is significantly lowered in 10% zinger supplemented group in comparison to (10% garlic) and F (Atorvastatin) groups. So big conclusion may be drawn that triacylglycerides lowering effect of zinger is more effective and more potent to that of atorvastatin and other three herbs used. Further that the ginger has more hepatoprotective effect as compared to Fenugreek and garlic supplemented group. However no significant difference was found when ginger was compared to atorvastatin group.

Author's Contribution:

Concept & Design of Study: Jawed Iqbal
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Data Analysis: Farheen Hameed
Revisiting Critically: Mazhar ul Haque
Final Approval of version: Fawed Iqbal, Mazhar ul Haque

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