

Comparative Study of Hypolipidemic Effects of *Momordica Charantia* (karela) with Atorvastatin in Fat Fed Rats

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Abstract:

Background: Disorders of lipid metabolism are manifested by elevation of the plasma concentration of the various lipid and lipoprotein fractions and the result, predominantly cardiovascular diseases. Lipid research clinic's coronary primary prevention trial has provided useful information on the reduction of plasma cholesterol level in hyperlipidemic subjects by diet and drug therapy and thus the reduction in risk of myocardial infarction and death. Conventional lipid lowering drugs are used for lowering lipid level. But in the last few years' herbal drugs are gaining popularity in the management of hyperlipidemia. In this study we compare the hypolipidemic effect of *Momordica Charantia* (MC) with atorvastatin, a commonly used hypolipidemic drug.

Methods: The present experimental study was done in the pharmacology department of Dhaka Medical College during the period of July, 2011 to June, 2012. For this study a total number of 30 Norwegian rats of either sex were selected. They were divided into 5 groups each comprises of 6 rats. In the experiment group A was given normal diet with high fatty diet (1.5 ml olive oil plus 1% cholesterol) which was control group and other experimental groups (B,C,D,) were allowed to feed a high fatty diet along with fresh juice of *Momordica Charantia* (in different doses) for 10 days. Another experimental group, E was given high fatty diet along with atorvastatin (0.14mg/kg/day) for 10 days. Rats were sacrificed on 11th day and blood was collected by cardiac puncture for estimation of serum lipid profile.

Results: After administration of fatty diet in group A for 10 days, there was significant increased total cholesterol (TCL), low density lipoprotein (LDL) and triglyceride (TG) levels. Concomitant administration of fatty diet and fresh juice of MC (in different doses) daily for 10 days in group B,C,D reduced serum TCL, LDL and TG levels which was more significant in higher doses in comparison to atorvastatin given group E.

Conclusion: The present study provides a rationale for use a new herbal medicine much needed for the reduction of serum lipid levels. *Momordica Charantia* could be useful in hyperlipidemic conditions. They are as effective as a standard lipid lowering agent- atorvastatin.

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Introduction:

Disorders of lipid metabolism are manifested by elevation of the plasma concentration of the various lipid and lipoprotein fractions (total cholesterol, low density lipoprotein, very low density lipoprotein and triglyceride) and they result predominantly cardiovascular diseases¹. Coronary heart disease is the commonest form of heart disease and the single most important cause of premature death in the developed world. The death rates from CHD in the United Kingdom are among the highest in the world. Unfortunately the incidence of the condition is increasing rapidly in Eastern Europe and many developing countries like Bangladesh². Lipid research clinic's coronary primary prevention trial has provided useful information on the reduction of plasma cholesterol level in hyperlipidemic subjects by diet and drug therapy and thus the reduction in risk of myocardial infarction and death³. Reductase inhibitor, niacin, fibrate are the drugs used for lowering the lipid level. But these drugs are costly and toxic. Therefore studies are still going on in search of more potent, less toxic, cheaper and easily available hypolipidemic agent. Plants have been used as source of medicine throughout human history and they continue to serve as the basis for many pharmaceuticals used today⁴. So many research works have been done on various herbal agents such as *Momordica Charantia* (karela), garlic oil, onion, chatharanthus roseus, etc⁵. Among these we choose *Momordica Charantia* to compare its hypolipidemic effects with that of atorvastatin. *Momordica Charantia* is called bitter melon, bitter gourd in English, is a tropical and subtropical vine of the family cucurbitaceae, widely grown in Asia, Africa and the Caribbean. It is commonly known as karela in our country⁶. In addition to culinary usage bitter melon is also used in folklore medicine. The seeds, fruits, leaves and root of the plant have been used in traditional medicine for microbial infections, sluggish digestion and intestinal gas, menstrual stimulation, wound healing and inflammation⁷. Documentation has found that *Momordica Charantia* possess blood glucose lowering effect^{8,9}, hypolipidemic effect¹⁰, antiviral effect¹¹, anti helminthic¹², antioxidant¹³ and anticancer effect¹⁴. The recent research focus has shifted to explore the hypolipidemic effect of *Momordica Charantia* in comparison to atorvastatin, a

hypolipidemic drug.

Materials and Methods:

A total number of 30 Norwegian rats of either sex and weighting 150-200g were selected for the experimental study performed in pharmacology department of Dhaka Medical College (DMC) from July, 2011 to June, 2012.

They were divided into 5 groups with each group comprising of 6 rats. They were treated for 10 days and sacrificed on 11th day.

Preparation of *Momordica Charantia* Juice

Fresh fruits were bought from the local market. Fruits were authenticated from National Herbarium, Mirpur, Dhaka. The DACB accession number is 36525. The fruits were crushed through a shell and mortar. After removal of the seeds the juice were filtered through fine cloths to remove debris.

Procedure:

In the experiment, 30 rats were equally divided into group A, B, C, D, E. Group A served as fat fed control group who received normal diet and fatty diet (1.5 ml olive oil plus 1% cholesterol¹⁵) for 10 days. Group B, C, D served as fat fed experimental group where they received fatty diet along with fresh juice of *Momordica Charantia* for 10 days at different doses. Group B received 0.5 ml/kg MC juice, group C received 1.0 ml/kg MC juice and group D received 1.5 ml/kg MC juice per day. Group E is the fat fed experimental group which received fatty diet along with atorvastatin (0.14mg/kg/day). After treating those for 10 days rats were sacrificed on the 11th day and blood was collected by cardiac puncture for estimation of serum lipid profile. The doses were adjusted according to previous work¹⁶.

Measurements

Sera were obtained. Subsequently, serum total cholesterol, HDL, LDL and triglyceride levels were measured by enzymatic colorimetric method in the department of pharmacology and therapeutics, Dhaka Medical College, using lipid profile kits.

Data Collection and Analysis

All relevant information of each rat was recorded in a predesigned data collection sheet. Collected data were screened, complied and

appropriate statistical analysis, unpaired student's 't' tests, was applied using computer based software. P value < 0.05 was taken as minimum level of significance.

Results

Here the effects of extract of *M. Charantia* at different doses in group B, C and D on lipid levels of fat fed rats were observed.

The mean TCL in group A,B,C,D,E were 141.50 ± 2.66, 139.50 ± 3.39, 135.50 ± 4.64, 65.83 ± 29.23 mg/dl, 63.67 ± 3.78 respectively. Serum TCL decreased significantly in group C, D, E.

The mean LDL in group A,B,C,D,E were 79.83 ± 2.40, 74.50 ± 4.64, 76.00 ± 3.46, 32.00 ± 3.29 and 27.50 ± 1.76mg/dl respectively.

The mean HDL in group A,B,C,D,E were 30.83 ± 1.47, 31.33 ± 2.25, 30.50 ± 2.66, 31.17 ± 2.99 mg/dl and 37.00±3.03, respectively.

The mean triglyceride levels in group A, B,C,D,E were 109.00 ± 3.22, 103.50 ± 3.27, 94.67 ± 4.27, 95.67 ± 4.41 mg/dl and 84.67 ± 4.89, respectively.

were made by a number of researchers, who demonstrated hyperlipidemia by administering 1.5 ml olive oil solution containing vitamin D₃ and cholesterol for consecutive 5 days. In their studies they got the similar results. Serum TCL, LDL and TG levels increased significantly (P <0.05)¹⁷. In another study they demonstrated hyperlipidemia in adult long evans rats by administering 1.5 ml olive oil and 1% cholesterol for 10 days. They showed that fatty diet increased total serum cholesterol, LDL and VLDL significantly (P< 0.001)¹⁵.

In this study concomitant administration of fresh juice of *Momordica Charantia* and fatty diet (olive oil plus cholesterol) daily orally for 10 days reduced serum TCL, LDL and TG levels. The reduction was highly significant in comparison to hyperlipidemic control group, which was best observed at the higher doses (1.0 ml/kg/day and 1.5 ml/kg/day) of MC and atorvastatin treated group. It was observed that the serum TCL levels significantly decreased in group C (P <0.05), D (P < 0.001) and E (P<0.001) compared to group A and the serum LDL levels significantly reduced in group B (P < 0.05), D (P < 0.001) and E (P<0.001) compared to group A. No significant change of serum HDL levels was observed in group C and D but

Table- Mean lipid profile of different groups of rats

Group N=6	TCL (mg/dl)	LDL (mg/dl)	HDL (mg/dl)	TG (mg/dl)
Group A	141.50 ± 2.66	79.83 ± 2.40	30.83 ± 1.47	109.00 ± 3.22
Group B	139.50 ± 3.39 ^{ns}	74.50 ± 4.64*	31.33 ± 2.25*	103.50 ± 3.27*
Group C	135.50 ± 4.64*	76.00 ± 3.46 ^{ns}	30.50 ± 2.66 ^{ns}	94.67 ± 4.27***
Group D	65.83 ± 29.23***	32.00 ± 3.29***	31.17 ± 2.99 ^{ns}	95.67 ± 4.41***
Group E	63.67 ± 3.78***	27.50 ± 1.76***	37.00 ± 3.03***	84.67 ± 4.89***

Data expressed as mean ± SD

P < 0.05 is significant (*)

P < 0.001 taken as highly significant (***)

Discussion:

The present study was carried out to evaluate the effect of *Momordica Charantia* on serum lipid levels in comparison to atorvastatin. In the present work hyperlipidemia was induced in rats by administration of 1.5 ml olive oil with 1% cholesterol for 10 days. The hyperlipidemia was evidenced by significant increase in serum TCL, LDL and TG levels. Similar observations

significantly increased in group B (P < 0.05) and group E (P<0.001). The serum TG levels reduced significantly in group B (P < 0.05), C (P < 0.001), D (P < 0.001) and E (P<0.001).

The reduction of serum TCL, LDL and TG by higher doses of *Momordica Charantia* (1.0ml/kg and 1.5ml/kg) were almost similar to that of atorvastatin. As far as our knowledge goes, no other work has been carried out on this aspect of *M. Charantia* in our country. Further investigations

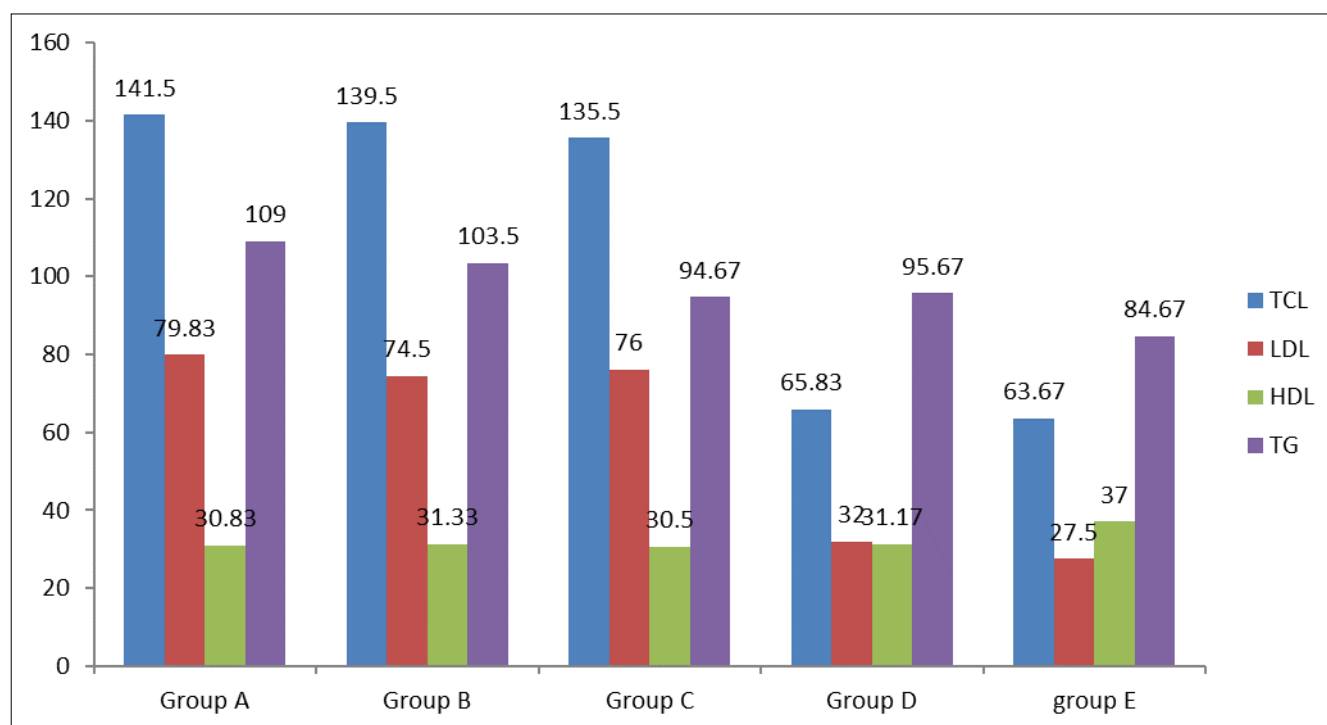


Figure: Bar diagram showing serum lipid levels in different groups of rats

identify the hypolipidemic active principles and elucidate their mechanism of action. The present study provides an initial step in demonstrating juice of *M. Charantia* as effective as atorvastatin in hyperlipidemic states. Thus it could be a new agent in reducing morbidity and mortality resulting from dyslipidemia.

Conclusion:

In present study we compared the hypolipidemic effects of *M. Charantia* with a standard known hypolipidemic agent atorvastatin. Thus it could be useful in hyperlipidemic conditions. **Purpose of this study is to introduce herbal agents instead of costly and toxic drugs.** But before stabilising *M. Charantia* juice as a therapeutically effective hypolipidemic agent, further studied should be carried out to determine the active principles responsible for hypolipidemic effect and its cellular mechanism of action.

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