

A comparative study of efficacy of atorvastatin, rosuvastatin, and atorvastatin + fibrates as lipid lowering agents

Karunasree Nagarur^{1*}, Yamini Vadlamannati¹, Narasimha Rao Raja²

¹Department of Pharmacology,
Government Medical College,
Nizamabad, Telangana, India

²Health Director, Central Hospital,
S C Railway, Secundrabad,
Telangana, India

Received: 22 June 2016

Accepted: 05 August 2016

***Correspondence to:**

Dr. Karunasree Nagarur,
Email: raja_narasimharao@yahoo.com

Copyright: © the author(s),
publisher and licensee Medip
Academy. This is an open-access
article distributed under the terms
of the Creative Commons
Attribution Non-Commercial
License, which permits unrestricted
non-commercial use, distribution,
and reproduction in any medium,
provided the original work is
properly cited.

ABSTRACT

Background: Hypercholesterolemia patients are at high risk of coronary heart disease. National cholesterol education programme (NCEP) Adult Treatment Panel III guidelines provide the option of aggressively lowering Low-density cholesterol in them. Presently the standard therapy of hypercholesterolemia is by HMG co-A reductase inhibitors. Present study shows that Rosuvastatin is better than Atorvastatin, Atorvastatin and Fibrate is better than Atorvastatin monotherapy in management of hypercholesterolemia.

Methods: The present research was an observational study conducted at Government general hospital, Nizamabad. A total of 150 patients on treatment for hypercholesterolemia for more than one year were enrolled in our study. They were divided into three groups. Group I: Atorvastatin (20 mg) (n=96; 64%); Group II: Rosuvastatin 10 mg (n= 41; 27.33%); Group III: Atorvastatin (20 mg) + Fibrate (145 mg) (n=13; 8.66%).

Results: Rosuvastatin is better than Atorvastatin and Atorvastatin with fibrates reduces LDL, TG more than Atorvastatin alone.

Conclusions: Rosuvastatin is better than Atorvastatin and Combination of atorvastatin with fibrates reduces LDL-Cholesterol and triglycerides more than atorvastatin alone.

Keywords: Atorvastatin, Rosuvastatin, Atorvastatin + Fibrates, LDL (low density cholesterol), TG (triglycerides), HDL (high density cholesterol), TC (total cholesterol)

INTRODUCTION

Hypercholesterolemic patients are at a high risk for coronary heart disease. The National Cholesterol Eradication Programme (NCEP) Adult Treatment Panel III (ATP III) guidelines provide the option of aggressively lowering low density lipoprotein cholesterol (LDL-C) in hypercholesterolemia patients.¹ LDL Cholesterol is associated with an increased risk of atherosclerosis and coronary heart disease.² In contrast, higher levels of HDL Cholesterol are protective.³

Presently the standard therapy of hypercholesterolemia is HMG Co A reductase inhibitors. The aim of the present study is to compare the efficacy of Atorvastatin and Rosuvastatin and Atorvastatin monotherapy with

combination of Atorvastatin with Fibrate as the lipid lowering agents.

METHODS

The study was conducted for a period of 18 months during the period of December 2013 to June 2015, on patients suffering from hyperlipidemia attending the medical and surgical OPD's of Government medical college, Nizamabad. The approval of Institutional Ethics committee (IEC) was taken before the start of the study.

Total 150 patients of both sexes, of age between 18-75 years and who were already on treatment for hyperlipidemia for more than 1 year were included in our study. Patients who are using injectable lipid lowering

drugs and with serious acute conditions were excluded from the study.

After taking written consent form they have been clinically examined the general parameters are noted. Then the laboratory investigations like TC (Total Cholesterol), HDL (High Density Lipoprotein), LDL (Low Density Lipoprotein), TG (Triglycerides) are recorded once during the study.

Data collected on drugs of study of prescribed hypolipidemic agents, Statins, Fibrates, and the combination regimens in subjects who were kept on such drugs. Data at the time of initiation of therapy is recorded and compared the same at the time of observation.

The optimal plasma lipid levels for treatment guidelines as per National Cholesterol Education Programme (2001), Risk of CAD: a) Optimal level -low risk, b) Borderline high-moderate risk, c) High level-high risk. Plasma lipid levels are as shown in Table 1.

The patients were divided into three groups. Group I: Atorvastatin (20 mg) (n=96; 64%); Group II: Rosuvastatin (10 mg) (n=41; 27.33%); Group III: Atorvastatin (20 mg) + Fibrates (145 mg) (n=13; 8.66%).

Statistical analysis

Using SPSS software version 16 statistical analysis was done.

The treatment groups were compared for efficacy using Students paired t Test.

RESULTS

At the end of the study the following observations and results were obtained:

Table 2 explains that there is a significant reduction in mean value of TC (22.98%, $p < 0.0001$), LDL (33.8%, $P < 0.0001$), TG (20.14%, $p = 0.0001$) and significant increase in HDL (2.6%, $p < 0.0001$) after treatment. There is a significant reduction in mean value of TC (25.66%, $P < 0.0001$), LDL (39.59%, $p < 0.0001$), TG (31.41%, $P < 0.0001$), and significant increase in HDL (12.67%, $P < 0.0001$) after treatment.

As given in Table 2, there is a significant reduction in mean value of TC (22.17%, $P = 0.0001$), LDL (34.66%, $p = 0.0001$), TG (30.36%, $P = 0.0001$), and significant increase in HDL (3.05%, $P = 0.0001$) after treatment.

Table 1: Plasma lipid levels.

Parameters	Desirable	Borderline	High
TC	<200 mg/dl	200–239 mg/dl	> 240 mg/dl
LDL	<130 mg/dl	130-159 /dl	>160 mg/dl
TG	<150mg/dl	150-199mg/dl	>200 mg/dl
HDL	>40mg/dl for men, >50mg/dl for women	-	>60mg/dl

Table 2: Lipid profile of Atorvastatin treated cases.

Parameters	Group-I (Atorvastatin)	Mean	SEM	P value	% decrease
TC	Pre Rx	248.13	0.79	0.0001	22.98
	Post Rx	191.35	0.38		
LDL	Pre Rx	170.8	0.78	0.0001	33.8
	Post Rx	113	0.30		
TG	Pre Rx	204.11	0.90	0.0001	20.14
	Post Rx	163	0.76		
HDL	Pre Rx	40.12	0.13	0.0001	2.6
	Post Rx	41.2	0.13		

Table 3: Lipid profile of Rosuvastatin treated cases.

Parameters	Group-II (Rosuvastatin)	Mean	SEM	P value	% decrease
TC	Pre Rx	272	0.77	0.0001	25.66
	Post Rx	202.2	0.46		
LDL	Pre Rx	190.7	0.82	0.0001	39.59
	Post Rx	115.2	0.21		
TG	Pre Rx	233.3	1.08	0.0001	31.41
	Post Rx	160	1.35		
HDL	Pre Rx	44.02	0.36	0.0001	12.67
	Post Rx	49.6	0.34		

Table 4: Lipid profile of Atorvastatin + Fibrates treated cases.

Parameters	Group-III (Atorvastatin+Fibrates)	Mean	SEM	P value	% decrease
TC	Pre Rx	231.3	1.25	0.0001	22.17
	Post Rx	180	0.71		
LDL	Pre Rx	150	1	0.0001	34.66
	Post Rx	98	0.75		
TG	Pre Rx	190	1.23	0.0001	30.36
	Post Rx	132.3	1.43		
HDL	Pre Rx	42.5	0.33	0.0001	3.05
	Post Rx	43.8	0.27		

Table 5: The post treatment values between Group I and II, Group I and III, Group II and III.

Groups	TC		LDL		TG		HDL	
	I	II	I	II	I	II	I	II
Mean	191.35	202.2	113	115.2	163	160	41.2	49.6
SEM	0.38	0.46	0.30	0.21	0.76	1.35	0.13	0.34
% decrease	22.98	25.66	33.8	39.59	20.14	31.41	2.6	12.67
P value	0.0001		0.0001		0.3789		0.0001	
Groups	I	III	I	III	I	III	I	III
Mean	191.35	180	113	98	163	132.3	41.2	43.8
SEM	0.38	0.71	0.30	0.75	0.76	1.43	0.13	0.27
% decrease	22.98	22.17	33.8	34.66	20.14	30.36	2.6	3.05
P value	0.0001		0.0001		0.0001		0.0001	
Groups	II	III	II	III	II	III	II	III
Mean	202.2	180	115.2	98	160	132.3	49.6	43.8
SEM	0.46	0.71	0.21	0.75	1.35	1.43	0.34	0.27
% decrease	25.66	22.17	39.59	34.66	31.41	30.36	12.67	3.05
P value	0.0001		0.0001		0.0001		0.0001	

Table 5 shows the post treatment values TC, LDL, TG, HDL compared in between groups i.e between Group I and Group II, Group I and Group III values, Group II and Group III.

Comparison of changes in lipid profile between Atorvastatin and Rosuvastatin group after treatment showed significant reduction in TC (22.98% vs 25.66%, $P < 0.0001$), LDL (33.8% vs 39.59%, $P < 0.0001$), increase in HDL which was significant (2.6% vs 12.67% $P < 0.0001$), but the reduction in TG level was insignificant (20.14% vs 31.41%, $P < 0.3789$).

Comparison of changes in lipid profile between Atorvastatin and combination of Atorvastatin and Fibrate showed significant reduction in TC (22.98% vs 22.17%, $P < 0.0001$), LDL (33.8% vs 34.66%, $P < 0.0001$), TG (20.14% vs 30.36%, $P < 0.0001$) and increase in significant increase in level of HDL (3.05% vs 0.002%, $P < 0.0001$) after treatment.

Comparison of changes in lipid profile between Rosuvastatin and combination of Atorvastatin and Fibrate after treatment showed significant decrease in TC

(25.66% vs 22.17%, $P < 0.0001$), LDL (39.59% vs 34.66%, $P < 0.0001$), TG (31.41% vs 30.36%, $P < 0.0001$) and significant increase in HDL (12.67% vs 3.05%, $P < 0.0001$) after treatment.

DISCUSSION

Table 2 shows the pre-treatment and post treatment values after 20 mg Atorvastatin. This table shows the difference in the lipid profile after treatment with Atorvastatin. There is a significant reduction in mean value of TC (22.98%, $P < 0.0001$), Our study is similar to Meenakshi et al TC (28%, $P < 0.001$), Maruti et al TC (25.5%, $P < 0.0001$), Bener et al (15.5%, $P < 0.001$).^{4,6} There was a significant decrease in the mean LDL (pre-treatment =248.13 mg/dl vs post treatment =191.35 mg/dl; $P < 0.0001$) with a mean reduction of 33.8%. This finding related to the study conducted by Maruti et al showed 35%, ($P < 0.001$) reduction in LDL after Atorvastatin treatment and Meenakshi et al 37% ($P < 0.001$) reduction in LDL.^{4,5}

There was a significant decrease in the mean value of TG after Atorvastatin treatment (pre-treatment =204.11 mg/dl

vs post treatment =163 mg/dl, $P < 0.0001$) with a mean reduction of 20.14%. Our study was similar to Barakat et al TG (19.95%, $P < 0.01$), Lella et al TG (20%, $P < 0.001$), Benner et al TG 16.7% ($P < 0.01$), Stalenhoef et al TG 25.2% ($P < 0.001$).⁵⁻⁸

There was significant increase in HDL level in our study (pre-treatment =40.12 mg/dl, post-treatment= 40.2 mg/dl) ($P < 0.0001$) with mean reduction in 2.6%. This study correlates with Lella et al HDL 1.5%, Stalenhoef et al HDL 5.8%, $P < 0.01$, Barakat et al HDL 5.5%.^{4,7,8}

Table 3 shows a significant reduction in mean value of TC (pre-treatment =272 mg/dl, post treatment =202.2 mg/dl, $p=0.0001$) with a mean reduction of 25.66 with Rosuvastatin. Our study is similar to Bener et al, Barakat et al, and Arshad et al.^{6,7,9}

Our study shows significant reduction in LDL in Rosuvastatin treated cases (pre-treatment = 190.7 mg/dl post treatment =115.2 mg/dl, $P < 0.0001$) with reduction in 39.59%. This is similar to Maruti et al LDL 29.03% ($P < 0.001$), Stalenhoef et al LDL 48.5%.^{5,8}

In Rosuvastatin treated cases there was significant decrease in TG. (pre-treatment value =233.3 mg/dl post treatment value=160 mg/dl, $P < 0.0001$), with mean reduction 31.41%. This correlates with Bener et al TG 25.2% ($p < 0.001$) and Barakat et al TG (25.1, $p < 0.01$).^{6,7}

Our study showed significant increase in the mean value of HDL (pre-treatment =44.02 mg/dl, post treatment =49.6mg/dl, $p < 0.0001$) 12.67% after treatment. This is similar to Maruti et al HDL-14% ($P = 0.001$), Stalenhoef et al HDL-10%.^{5,8}

Table 4 shows the pre-treatment and post-treatment values after Atorvastatin and Fibrate combination. There is a significant reduction in mean value of TC (pre-treatment =231.3, post treatment= 180, $P < 0.0001$), 22.17% reduction. This is similar to Lella et al TC 31%, $P < 0.001$.⁴

LDL (pre-treatment =150, post treatment =98 P value 0.0001), 34.66% reduction, this is similar to Lells et al⁴ LDL 33% $P < 0.001$. Similarly TG (pre-treatment =190, post treatment=132.3, $P = 0.0001$) 30.36%, reduction after treatment. This is similar to Lella et al LDL 39%, $P < 0.001$.⁴

There was significant increase in the mean value of HDL (pre-treatment =190 mg/dl, post treatment =132.3 mg/dl, $P < 0.0001$; 3.05% increase. This is similar to study by Khan HDL 5.18%.¹⁰ Table 5 shows the post treatment values of lipid profile in between all the 3 groups. There is significant difference ($P < 0.0001$) in TC, LDL, HDL between group I (Atorvastatin) and group II (Rosuvastatin). But there is insignificant decrease in TG level, $P < 0.3789$). There is significant reduction in TC, LDL, TG, HDL between group I and group III after

treatment and also between group II and group III. ($P < 0.0001$).

In our study Rosuvastatin is best in decreasing LDL level to 39%. This is similar to Eliasson et al¹¹ Rosuvastatin 67%, Clearfield et al¹² (Rosuvastatin 10 mg reduced LDL-C levels significantly more than atorvastatin 20 mg at week 6 (44.6% vs. 42.7%, $P < 0.05$).^{11,12}

In our result Atorvastatin with Fibrates was better than Atorvastatin monotherapy in decreasing LDL (34.66% vs 33.85%) our result was similar to the results of Karalis et al (33% vs 35%).¹³

Michael et al showed reduction in HDL (40%) more in Atorvastatin and Fibrate combination than in Atorvastatin monotherapy.¹² This is similar to our result (3%, $P < 0.0001$) in lowering HDL in Group I (Atorvastatin) vs Group III (Atorvastatin and Fibrate).

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Hunninghake DB, Ballantyne CM, Maccubbin DL. Comparative effects of simvastatin and atorvastatin in hypercholesterolemic patients with characteristics of metabolic syndrome. *Clinical therapeutics* 2003;25:1670-86.
- Carmena R, Duriez P, Fruchart JC. Atherogenic lipoprotein particles in atherosclerosis. *Circulation*. 2004;109(23):2-7.
- Kontush A, Chapman MJ. Antiatherogenic small, dense HDL-guardian angel of the arterial wall. *Mar2006. Nat Clin Pract Cardiovasc Med*. 2006;3(3):144-53.
- Lella M, Indira K. A comparative study of efficacy of atorvastatin alone and its combination with fenofibrate on lipid profile in type 2 diabetes mellitus patients with hyperlipidemia. *J Adv Pharm Technol Res*. 2014;4(3):166-70.
- Adsule SM, Baig MS, Gade PR, Khandelwal PN. Comparative evaluation of safety and efficacy of rosuvastatin, simvastatin and atorvastatin in patients of type 2 diabetes mellitus with dyslipidemia. *In J Diab Dev Ctries*. 2009;29(2):74-9.
- Bener A, Dogan M, Barakat L, Abdulla OAA Al-Hamaq. Comparison of efficacy, safety, and cost effectiveness of various statins in dyslipidemic diabetic patients. *IJP*. 2014;46(1):88-93.
- Barakat L, Jayyousi M, Bener A, Zuby B, Zirir M. Comparison of Efficacy and Safety of Rosuvastatin, Atorvastatin and Pravastatin among Dyslipidemic Diabetic Patients. *ISRN Pharmacol*. 2013;2013:1-7.
- Stalenhoef AFH, Christie M, Ballantyne, Cinzia Sarti, Jan Murin, Serena Tonstad, Helen Rose, and Wim Wilpshaar. A Comparative study with rosuvastatin in subjects with METabolic Syndrome:

- results of the COMETS study. 2005;26(24):2664-72.
9. Arshad AR. Comparison of Low-Dose Rosuvastatin with Atorvastatin in Lipid-Lowering Efficacy and Safety in a High-Risk Pakistani Cohort: An Open-Label Randomized Trial. *Journal of Lipids*. 2014;2014:1-5.
 10. Khan MA, Murti K, Grover V. Atorvastatin vs Rosuvastatin; fenofibrate as an add on: an exploratory study. *Int J of Pharmacy and pharmaceutical*. 2014;6(8)493-8.
 11. Eliasson B, Svensson A-M, Miftaraj M, Miao Jonasson J. Clinical Use and Effectiveness of Lipid Lowering Therapies in Diabetes Mellitus—An Observational Study from the Swedish National Diabetes Register. *Plos one*. 2011;6(4):18744.
 12. Clearfield MB, Amerena J, Jean-Pierre B. Comparison of the efficacy and safety of rosuvastatin 10 mg and atorvastatin 20 mg in high-risk patients with hypercholesterolemia – Prospective study to evaluate the Use of Low doses of the Statins Atorvastatin and Rosuvastatin (PULSAR). *Eur Heart J*. 2005;26(24):2664-72.
 13. Karalis DG, Victor B, Ahedor L, Liu L. Use of Lipid-Lowering Medications and the Likelihood of Achieving Optimal LDL-Cholesterol Goals in Coronary Artery Disease Patients. *Cholesterol*. 2012;2012:1-7.

Cite this article as: Nagarur K, Vadlamannati Y, Raja NR. A comparative study of efficacy of atorvastatin, rosuvastatin, and atorvastatin + fibrates as lipid lowering agents. *Int J Basic Clin Pharmacol* 2016;5:1924-8.