Innovare Academic Sciences

International Journal of Pharmacy and Pharmaceutical Sciences
ISSN- 0975-1491 Vol 6, Issue 8, 2014

Original Article

ATORVASTATIN VS ROSUVASTATIN; FENOFIBRATE AS AN ADD ON: AN EXPLORATORY STUDY

MOHAMMAD ARIF KHAN[1], KRISHNA MURTI[1], VAIBHAV GROVER[1], KANHAYA LAL[2], DHARMENDRA SINGH[3], PRADEEP DAS[3], *KRISHNA PANDEY[4],

[1]Department of Pharmacy Practice, National Institute of Pharmaceutical Education and Research, Hajipur, (Bihar) India, [2]Department of Molecular Biology, Rajendra Memorial Research Institute of Medical Sciences, (Indian Council of Medical Research), Patna 800007 (Bihar) India, [3]Department of Clinical Medicine, Rajendra Memorial Research Institute of Medical Sciences, (Indian Council of Medical Research), Patna 800007 (Bihar) India.
Email: drkrishnapandey@yahoo.com

Received: 11 Jul 2014 Revised and Accepted: 12 Aug 2014

ABSTRACT

Objective: Statins being the first choice drug for dyslipidaemia, the quest for better one among all has always been and still a question for research in the field of medicine. *Objective* The objective of our study was to find out the best statin among the two, Atorvastatin and Rosuvastatin, in terms of efficacy and safety; alone or in combination with Fenofibrate for the management of dyslipidaemia.

Methods: This was an open label, randomized, parallel group, prospective comparative study, carried out in patients in two groups treated with Atorvastatin and Rosuvastatin (10mg each) for 6 weeks, after which Fenofibrate (67mg) was added as an add on therapy in either group for the next 4 weeks before and after treatment.

Results: After the treatment, the TC, TG, LDL- C, HDL- C and Non HDL- C were comparable between two groups. The changes in the levels of TC were -15.90±5.16 (-8.53%) vs -20.70±4.83 (-11.32%) respectively in groups treated with Atorvastatin (group I) and Rosuvastatin (group II). Changes in TGs were -11.60±4.16 (-7.46%) vs -15.10±5.18 (-9.99%), respectively; change in LDL- C were -16.90±3.58 (-15.31%) vs -13.0±3.04 (-11.56%) respectively; change in HDL- C were +6.75±0.86 (+18.72%) vs +9.0±1.22 (+23.72%) respectively in each group; change in Non HDL- C were found to be -6.90±4.83 (-4.4%) vs -7.8±4.78 (-5.05%) respectively in groups I and II. After the addition of Fenofibrate (67mg) there were no significant changes in the different parameters of serum lipid profile.

Conclusion: The result of our study suggests that Rosuvastatin (10mg) was more efficacious than Atorvastatin (10mg) in lipid lowering effect and HDL- C raising effect but should be used with great caution and care in patients with uncontrolled hyperglycaemia and in those with compromised hepatic status. Further addition of Fenofibrate (67mg) didn't make any significant difference in the result.

Keywords: Statins, Cardiovascular events, Fibrates, Open label, Randomized, HMG Co-A reductase.

INTRODUCTION

Although numerous studies have been done in the past and are still going on, regarding the efficacy, safety and potency of statins especially Atorvastatin and Rosuvastatin, the two most recently introduced among all, after the advent of Lovastatin in clinical practice in the 1980's and are ranked amongst the most widely studied and prescribed classes of medicine in the world. Today, the two most frequently prescribed and studied statins among all are Rosuvastatin and Atorvastatin and there is enough literature available regarding their safety and efficacy, and both of them have got their own list of advantages and superiorities over all other previously introduced statins as well as over each other.

We designed the open label, randomized study to compare the two statins in terms of efficacy and safety benefits and subsequently to optimize the best drug combination of statins along with Fenofibrate. Fibrates or fibric acid derivatives rank next to statins in the broad category of antihyperlipidaemic drugs and are often frequently prescribed as a dual combination therapy for the management of dyslipidaemias. Since today it is a globally established fact that dyslipidaemias are amongst the major risk factors for CVD (cardiovascular diseases) and death as its consequence [1]. In the past several large scale trials and studies have reported that the use of statins considerably reduces the risk of CVD and death and can be used for both the primary and secondary prevention of CVD [2–3]. Numerous large scale trials of statins in the past reported a significant reduction in relative risk of coronary events. Few studies of utmost importance among them are 4S study (Scandinavian Simvastatin Survival Study), LIPID (Long term Intervention with Pravastatin in Ischemic Disease) and HPS [6] (Heart Protection Study), which reported significant reduction in the relative risk for mortality by all causes due to CVD by 30%, 22% and 13% respectively [4–6]. Patients with Diabetes Mellitus type II, hypertension in association with dyslipidaemia have an increased incidence of atherosclerotic vascular disease where synergistic effect for increased risk is attributable to dyslipidaemia [7–9]. The study was designed and conducted in Northern India at a tertiary care center for tropical diseases, keeping the fact in mind that very lesser number of studies have been done here regarding statins and with the objective to optimize the best of the two statins alone or in combination with Fenofibrate.

Ethical approval

This was an open label, randomized, parallel group, prospective study carried out at Out Patient Clinic of Rajendra Memorial Research Institute of Medical Sciences, Patna, Bihar, India with the approval of Institutional Ethical Committee.

MATERIAL AND METHODS

Materials

A total of 213 patients were screened for recruitment in dietary run in period, out of which 164 patients, after providing written informed consent entered randomization into two groups of 79 and 85 patients respectively. The subjects were men and women of age 18 years and above. The patients recruited for randomization were first divided into 79 and 85 patients, received Atorvastatin and Rosuvastatin each 10mg respectively for a period of 6 weeks after which they were given add on therapy with Fenofibrate 67 mg nanoparticle tablets along with statins in both the groups for the next 4 weeks. The study was conducted from August 2013 to April 2014.

Setting, inclusion and exclusion criteria

This study was conducted at a tertiary care center for tropical diseases in Patna, Bihar, India. Patients of either gender of age 18 years and above, diagnosed with Diabetes Mellitus II, Hypertension, history of CVD, Metabolic syndrome along with Dyslipidaemia as defined by National Cholesterol Education Programme Adult Treatment Panel III (NCEP ATP III) were included in the study. NCEP ATP III defines dyslipidaemia as Total cholesterol>200mg/dl, TGs (Triglycerides) >150mg/dl, LDL - C (Low Density Lipoprotein-Cholesterol) >100 mg/dl and HDL - C (High Density Lipoprotein-Cholesterol) < 40 mg/dl. The patients with newly diagnosed dyslipidaemia only were included in the study. NCEP ATP III defines Metabolic syndrome as the presence of 3 or more of the following risk factors- (1) Increased waist circumference (≥102 cm for men and >88 cm for women) (2) Hypertriglyceridemia (>150 mg/dl) (3) Low HDL levels (<40 mg/dl for men and <50 mg/dl for women) (4) Hypertension (≥130/85 mmHg) (5) Impaired fasting glucose (≥110 mg/dl). Patients were excluded from enrolment into study if they met any of the following exclusion criteria- (1) Known contraindication or hypersensitivity to Statins or Fibrates (2) Known history or presence of renal or hepatic dysfunction (3) Thyroid dysfunction as well as (4) pregnant and lactating women (5) HIV, HBsAg and HCV positive were excluded from the study. Patients with history of tuberculosis confirmed by chest x-Ray PA view, sputum examination and IS6110-polymerase chain reaction (PCR) and other chronic diseases were excluded from the study [10–11].

Statistical analysis

Statistical analysis was done using the statistical software's SPSS and graph pad prism. The raw baseline and demographic variables were analysed as the mean, standard deviation minimum and maximum values as well as the number and percentage of observations. The baseline and the follow up characteristics for continuous variables were compared using students' test.

RESULTS

At the beginning of study 79 patients were included in group I (Atorvastatin group) and 85 patients were included in group II (Rosuvastatin group), out of which 10 and 13 patients were lost to follow up from each group respectively after the first follow up and after the Fenofibrate add on follow up, 18 patients from group I (Atorvastatin+Fenofibrate) and 16 patients from group II (Rosuvastatin+Fenofibrate) were lost to follow up during the second follow up period.

I. Difference in Serum Lipid Profile and other parameters between baseline and treatment period after 6weeks is described below.

At the beginning of study the baseline lipid profile were as follows; TC levels in group I and II were 194.3±38.03 mg/dl and 193.2±33.22 mg/dl respectively (p=0.84); the TGs levels were 161.3±26.40 mg/dl and 158.7±38.20 mg/dl respectively (p=0.61); the LDL-C levels were 118.8±22.2 mg/dl and 118.9±21.10 mg/dl respectively (p= 0.91); the VLDL-C levels were 31.85±8.66 mg/dl and 33.76±8.792 mg/dl respectively (p=0.16); the HDL-C levels were 32.68±5.12 mg/dl and 33.43±6.81 mg/dl respectively (p=0.42) and the non HDL-C levels were 160.1±32.85 mg/dl and 158.2±33.08 mg/dl respectively (p=0.71). The fasting plasma glucose levels were almost similar in both the groups and were 125.7±25.25 mg/dl and 126.7±22.2 mg/dl respectively (p=0.78). The blood urea nitrogen, serum creatinine, uric acid and SGPT levels were almost similar between the two groups; however group II patients had a slightly higher aspartate transaminase (AST) levels than group I patients (30.11±5.65 Vs 28.84±5.73 mg/dl; p=0.15). Also the high sensitivity C-reactive protein (HsCRP) levels were similar in both the groups (1.97±1.05 vs 2.0±1.06; p=0.86).

After the 6 week randomization period, the TC levels were found to be 178.4±21.13 mg/dl in group I and 172.5±24.16 mg/dl in group II; (p=0.12), TG levels were 140.7±23.9 mg/dl and 143.6±23.70 mg/dl respectively; (p=0.13), the LDL-C levels were 101.9±21.22 mg/dl and 105.9±16.20 mg/dl respectively (p=0.20), the VLDL-C levels were 29.3±5.76 mg/dl and 31.02±7.64 mg/dl respectively (p=0.13), the HDL-C levels were 39.43±8.4 mg/dl and 42.43±8.5 respectively (p=0.014*); while the non-HDL-C levels were 153.2±24.73 mg/dl and 150.4±25.5 mg/dl respectively (p=0.50) (Table 1).

The fasting blood glucose levels after the six week randomization period were found to be 109.3±19.44 mg/dl and 115.1±18.42 mg/dl respectively in group I and II (p=0.07). However the uric acid, serum creatinine and alanine transaminase (ALT) levels were almost similar to their baseline values but the AST levels were found to be slightly raised from 30.11±5.65 vs 31.54±5.14 mg/dl. The HsCRP levels were found to be slightly lowered than their baseline values (Table 2). The mean ± standard deviation and the percentage change in the lipid parameters after 6 week treatment period were found to be as follows:

Table 1: Patient demographics and baseline characteristics

Characteristics	Atorvastatin (10 mg) (79) (I)	Rosuvastatin (10 mg) (85) (II)	'p' VALUE
Age-years	52.04±8.6	54.0±9.35	0.15
Age-Range	37-77	36-78	
Sex-no. (%)			
Male	47(59.5)	52(61.2)	
Female	32(40.5)	33(38.8)	
Weight-kg	71.33±9.13	69.4±7.83	0.14
Height-cm	165.0±7.72	163.15±7.64	0.12
BMI- (kg/m^2)	26.45±3.27	26.6±3.29	0.77
Smoking status- no. (%)			
Never	37(46.9)	42(49.4)	
Former	24(30.3)	29(29.1)	
Current	18(22.8)	14(16.4)	
Alcoholic status- no. (%)			
Heavy	13(16.4)	17(20.0)	
Moderate	20(25.3)	19(22.3)	
Abstinent	46(58.2)	49(57.7)	
Previous CVD history- no. (%)	26(32.9)	31(36.4)	
Metabolic Syndrome- no. (%)			
Abdominal obesity	38(48.1)	34(40.0)	
Hypertriglyceridemia	39(49.3)	41(48.2)	
Low HDL-C	66(83.6)	70(82.3)	
Blood Pressure ≥ 130/85	24(30.3)	21(24.7)	
Fasting blood glucose ≥ 110 mg/dl	50(63.2)	57(67.0)	
Blood Pressure- mmHg			
Systolic	127.3±9.4	127.5±11.6	0.90
Diastolic	83.57±6.1	82.53±6.4	0.29

Blood Glucose- mg/dl			
Fasting	125.7±25.2	126.7±22.2	0.78
Post Prandial	168.2±38.1	167.2±27.7	0.84
Blood Urea Nitrogen-mg/dl	25.49±7.8	26.02±7.8	0.66
Creatinine- mg/dl	1.17±0.3	1.23±0.4	0.26
Uric Acid- mg/dl	4.45±1.5	4.4±1.6	0.85
Liver Enzymes- U/L			
AST	28.9±5.8	30.11±5.7	0.15
ALT	35.0±6.9	35.18±7.5	0.93
Serum Lipid Profile- mg/dl			
Total- C	194.3±38.0	193.2±33.2	0.84
TG	161.3±26.4	158.7±38.2	0.61
LDL- C	118.8±22.2	118.9±21.1	0.97
VLDL- C	31.85±8.7	33.8±8.8	0.16
HDL- C	32.7±5.1	33.4±6.9	0.42
Non HDL- C	160.1±32.9	158.2±33.0	0.71
Hs CRP Levels- no.(%)			
Low risk (<1.0mg/l)	20(25.3)	26(30.5)	
Average risk (1.0-3.0mg/l)	46(58.2)	49(57.7)	
High risk (>3.0mg/l)	13(16.4)	10(11.8)	
Average levels	1.98±1.0	2.0±1.0	0.86
Medications- no. (%)			
Metformin (Biguanides)	29(36.7)	36(42.3)	
Sulfonylureas	19(24.1)	33(38.9)	
Alpha Glucosidase Inhibitors	11(13.9)	09(10.6)	
Thiazolidinediones	06(7.5)	03(3.6)	
Diuretics (Thiazides)	16(20.2)	12(14.1)	
Angiotensin Converting Enzyme Inhibitors(ACEIs)	17(21.6)	20(23.6)	
Angiotensin Receptor Blockers(ARBs)	25(31.7)	19(22.3)	
Calcium Channel Blockers (CCBs)	23(29.1)	28(32.9)	
Beta Blockers (BBs)	21(26.6)	26(30.6)	
Dipeptidyl Peptidase 4 Inhibitors (DPP4Is)	04(5.0)	03(3.6)	
Bronchodilators	09(11.3)	07(8.2)	
5 Alpha Reductase Inhibitors	02(2.6)	05(5.9)	

Values are presented as mean±SD, unless stated otherwise., SD, Standard deviation of the mean, AST, Aspartate transaminase; ALT, Alanine transaminase., HsCRP, High Sensitivity C - reactive protein., BMI- Body Mass Index (weight in kilograms divided by square of height in meters).

The change in Total-C levels in group I and II were -15.90±5.16 (-8.53%) and -20.70±4.83 (-11.32%) mg/dl respectively; in TG levels were -11.60±4.16 (-7.46%) and -15.10±5.18 (-9.9%) respectively; in LDL-C levels were -16.90±8.58(-15.31%) and -13.0±3.04 (-11.56) mg/dl respectively; in VLDL- C levels were -2.58±1.22 (-8.34%) and -2.74±1.33 (-8.45%) mg/dl respectively; in LDL-C levels were 6.75±0.86(18.72%) and 9.0±1.22(23.72%) mg/dl respectively; in non HDL-C levels were -6.90±4.836(-4.4%) and -7.8±4.75(-5.05%) respectively in both the group I and II. Change in fasting blood glucose levels after the randomization period were -16.40±3.75 (-13.95%) in group I which was higher than the corresponding group II with a change of -11.60±3.29 (-9.59%).

Table 2: Randomized open label treatment for six weeks

Characteristics	**Atorvastatin(69) (10 mg)**	**Rosuvastatin(72) (10 mg)**	**'p' Value**
Serum Lipid Profile- mg/dl			
Total- C	178.4±21.1	172.5±24.1	0.12
TG	149.7±23.9	143.6±23.7	0.13
LDL-C	101.9±21.2	105.9±16.2	0.20
VLDL- C	29.3±5.8	31.0±7.7	0.13
HDL- C	39.4±5.4	42.4±8.5	0.01*
Non HDL- C	153.2±24.8	150.4±25.5	0.5
Blood glucose-mg/dl			
Fasting	109.3±19.4	115.1±18.4	0.07
Uric Acid- mg/dl	4.48±1.5	4.21±1.5	0.30
Creatinine- mg/dl	1.18±0.3	1.27±0.4	0.18
Liver Enzymes- U/L			
AST	27.88±5.4	31.6±5.1	**
ALT	34.9±7.2	35.9±7.5	0.45
Blood Pressure- mmHg			
Systolic	124.5±6.5	123.8±7.5	0.55
Diastolic	81.45±6.2	80.29±6.1	0.26
HsCRP	1.87±0.9	1.90±1.0	0.87

Values are presented as mean±SD, unless stated otherwise., SD, Standard deviation of the mean., AST, Aspartate transaminase; ALT, Alanine transaminase., HsCRP, High Sensitivity C - reactive protein., *$p < 0.05$, **$p < 0.01$. The AST and ALT levels in group I decreased by -0.96±0.92 (-3.38%) and -0.1±1.17 (-0.28%) respectively, where as in group II, the AST and ALT levels were increased by 1.43±0.86 (4.63%) and 0.74±1.21 (2.08%) respectively corresponding to group of patients treated with Rosuvastatin (10mg) (Table 3).

Table 3: Difference in parameters between the baseline and treatment period after six weeks

Characteristics	Atorvastatin(69) (I) Change Mean± SD (%)	Rosuvastatin(72) (II) Change Mean± SD (%)
Serum Lipid Profile- mg/dl		
TOTAL- C	-15.9±5.16 (-8.53%)	-20.7±4.83 (-11.32%)
TG	-11.6±4.17 (-7.45%)	-15.1±5.18 (-9.96%)
LDL- C	-16.9±3.58 (-15.31%)	-13.0±3.04 (-11.56%)
VLDL- C	-2.55±1.22 (-8.34%)	-2.74±1.33 (-8.45%)
HDL- C	+6.75±0.86 (+18.72%)	+9.0±1.22 (+23.72%)
NON HDL- C	-6.90±4.83 (-4.4%)	-7.8±4.78 (-5.0%)
Blood Glucose- mg/dl		
Fasting	-16.4±3.74 (-13.95%)	-11.60±3.29 (-9.59%)
Uric Acid- mg/dl	+0.03±0.25 (+0.69%)	-0.19±0.25 (-4.41%)
Creatinine- mg/dl	+0.02±0.06 (+1.70%)	+0.04±0.06 (+3.32%)
Liver Enzymes- U/L		
AST	-0.96±0.92 (-3.38%)	+1.43±0.86 (+4.63%)
ALT	-0.1±1.17 (-0.28%)	+0.74±1.21 (+2.08%)
Blood Pressure- mmHg		
Systolic	-2.80±1.35 (-2.22%)	-3.70±1.59 (-2.94%)
Diastolic	-2.12±1.02 (-2.56%)	-2.24±1.01 (-2.75%)
HsCRP	-0.10±0.15 (-5.5%)	-0.10±0.16 (-5.12%)

Values are presented as change in mean±SD, (%)., II. Differences in parameters following Fenofibrate add on after the next four weeks is described below.

The changes in serum lipid profile after the addition of Fenofibrate (67 mg) in both the groups were found to be; the Total- C levels were changed from 178.4± 21.13 mg/dl to 168.2± 27.91 mg/dl with a change of -10.20±4.47 (-5.88%) in group I and from 172.5±24.16 mg/dl to 162.3±26.87 mg/dl with a change of -10.2±4.52 mg/dl (-6.09%) in group II; the TG levels changed from 149.7±23.9 to 140.9±26.57 mg/dl (change -8.80±4.62; -6.05%) and from 143.6±23.7 to 131.5±26.6 mg/dl (change -12.1±4.45; -8.79%) respectively. The LDL- C levels changed from 101.9±21.22 mg/dl to 92.5±16.97 mg/dl in group I (change -9.39±3.6; -9.66%) and from 105.9±16.20 to 93.77±12.8 mg/dl (change -12.13±2.64; -12.15%) in group II. The VLDL- C levels changed from 29.30±5.76 mg/dl to 26.21±4.33 mg/dl (change -3.09±0.96; -11.13%) and from 31.02±7.69 mg/dl to 28.45±7.37 mg/dl (change -2.57±1.34; -8.64%), respectively in both the groups.

However the change in HDL- C levels were almost similar and were found to be increased in both the groups; in group I HDL- C levels increased from 39.43±5.4 mg/dl to 41.53±5.98 with a change of +2.1±1.04 mg/dl (+5.18%); where as in group II the levels increased from 42.43±8.5 mg/dl to 44.58±7.38 mg/dl with a change of +2.15±1.43 mg/dl (+4.94%). The Non HDL– C levels changed from 153.2±24.73 mg/dl to 151.2±24.9 mg/dl (change–2±4.58; - 1.31%) and from 150.4±25.5 mg/dl to 147.3±23.9 mg/dl (change –3.10±4.43; -2.08%) respectively in groups I and II. However, the fasting blood glucose levels changed more slightly in group I, from 109.3±19.4 mg/dl to 97.98±15.06 mg/dl, than in group II where the levels changed from 115.1±18.42 mg/dl to 105.4±20.4 mg/dl, with a mean ±SD (%) change of – 11.32±3.27 (- 10.92%) mg/dl and -9.7±3.4 (-8.79%) mg/dl respectively in groups I and II (Table 4–5).

Table 4: Randomized open label treatment as an add fenofibrate after four weeks

Characteristics	Atorvastatin+ Fenofibrate(10 mg + 67 mg)(51)	Rosuvastatin+ Fenofibrate(10 mg + 67 mg)(56)	'p' Value
Serum Lipid Profile- mg/dl			
Total- C	168.2±28.0	162.3±26.9	0.26
TG	140.9±26.5	131.5±26.7	0.07
LDL- C	92.51±16.8	93.8±12.9	0.66
VLDL- C	26.21±4.3	28.45±7.3	0.06
HDL- C	41.53±6.0	44.59±7.4	0.02
Non HDL- C	151.2±25.0	147.3±23.8	0.4
Blood Pressure- mmHg			
Systolic	122.5±6.2	120.8±7.0	0.16
Diastolic	80.3±6.3	80.0±6.0	0.74
Blood Glucose- mg/dl			
Fasting	98.0±15.0	105.4±20.4	0.03*

Values are presented as mean±SD, unless stated otherwise. SD, Standard deviation of the mean, *p < 0.05

DISCUSSION

The result of our study suggests that the efficacy of Rosuvastatin (10 mg) was more than Atorvastatin (10 mg) in terms of Total – C and TG lowering effect as well as HDL– C increasing effect (HDL– C raised by +23.7%), HDL- C raising effect was a more considerable phenomenon observed in case of patients treated with Rosuvastatin (10mg) than in patients treated with Atorvastatin (10mg); (HDL- C +18.7%). However as far as LDL–C lowering effect is concerned, Atorvastatin (10mg) was slightly more efficacious than Rosuvastatin (10mg); (LDL- C reduced by –15.3% vs - %11.5, respectively).

In case of VLDL- C and Non HDL- C lowering effect the efficacy of both the statins was almost similar and their results made no significant differences in the effect. However in case of blood glucose lowering effect, better control over fasting glucose levels was achieved in group of patients treated with Atorvastatin when compared to patients treated with Rosuvastatin; -13.95% vs–9.5% respectively. In a randomized control trial, it was found that Rosuvastatin has been found to have an association with significant risk for the causation of DM type II [12]. Comparatively inferior control of Rosuvastatin over blood glucose levels somewhere could be possibly attributable to its DM type II causing effect. As far as the

hepatic enzymes are concerned, the results of the effects were significantly interesting; where on one hand, the AST and ALT levels were found to be reduced in patients treated with Atorvastatin by -1.61% and -1.30% respectively, while on the other hand the levels of these hepatic enzymes were found to be raised by + 4.63% and + 2.08% respectively in case of patients treated with Rosuvastatin (10 mg), which could be referred to the phenomenon of 'transaminitis', observed in patients treated with Rosuvastatin, where slight rise in the levels of hepatic enzymes was noted [13]. It is interesting to note that the phenomenon here in this study was observed only in case with Rosuvastatin, but generally 'transaminitis' is associated with all the other statins as well. Therefore by keeping in mind the effects of both the statins over liver enzymes, it is suggested to prefer Atorvastatin in clinical practice, only if the hepatic status of a patient is compromised, otherwise Rosuvastatin is a better available option in patients with uncompromised hepatic status.

Table 5: Differences in parameters between six week treatments period and fenofibrate (67 mg) add on period after four weeks

Characteristics	Atorvastatin+ Fenofibrate(51)	Rosuvastatin+ Fenofibrate(56)
	change	change
Serum Lipid Profile- mg/dl	Mean±SD (%)	Mean±SD (%)
TOTAL- C	-10.2±4.47 (-5.88%)	-10.2±4.52 (-6.09%)
TG	-8.8±4.62 (-6.05%)	-12.10±4.45 (-8.79%)
LDL- C	-9.3±3.6 (-9.66%)	-12.13±2.64 (-12.15%)
VLDL- C	-3.1±0.96 (-11.13%)	-2.57±1.34 (-8.64%)
HDL- C	+2.1±1.04 (+5.18%)	+2.15±1.43 (+4.94%)
NON HDL-c	-2.0±4.58 (-1.31%)	-3.10±4.43 (-2.08%)
Blood Pressure- mmHg		
Systolic	-2.0±1.18 (-1.61%)	-3.1±1.30 (-2.53%)
Diastolic	-1.06±1.15 (-1.31%)	-0.29±1.08 (-0.36%)
Blood Glucose- mg/dl		
Fasting	-11.32±3.27 (-10.92%)	-9.7±3.44 (-8.79%)

Values are presented as change in mean±SD, (%).

Add on therapy with Fenofibrate (67mg) made no significant differences in either groups and the efficacy of both of the combination therapies were found to be almost similar, except for the TG lowering effect which was observed more in patients treated with Rosuvastatin and Fenofibrate (TG–6.0% Vs–8.7%) respectively. Slightly better control over fasting blood glucose levels was found in Atorvastatin group comparable to Rosuvastatin group; - 11.32% vs–9.7% respectively. Therefore it is evident by the results of the study to prefer Rosuvastatin (10mg) over Atorvastatin (10mg) for the achievement of better controls over serum lipid levels, except in patients with considerably uncontrolled blood glucose levels where Atorvastatin is a better choice for control of dyslipidaemias without compromised blood glucose status. Addition of Fenofibrate in either group made no significant differences in blood glucose lowering effect and was the same in case of statins alone (more with Atorvastatin). Rosuvastatin can be preferred over Atorvastatin in case where the hepatic status of the patient is not compromised; otherwise Atorvastatin can be a drug of choice over Rosuvastatin as well as over all other statins. Also it would be important enough to mention that the low doses of these statins are efficient enough for the management of dyslipidaemias in order to have a better control over serum cholesterol levels and no such requirement of higher doses of statins is felt, since it has already been concluded in few studies that Asians in general require low doses of statins than Caucasians for the management of dyslipidaemias, therefore low doses of statins are well enough to serve the desired purpose [14].

CONCLUSION

The result of our study conclude that Rosuvastatin (10mg) is more efficacious than Atorvastatin (10mg) in cholesterol lowering effect and HDL- C raising effect, but should be prescribed cautiously in patients with uncontrolled blood glucose levels and in patients with compromised hepatic status, otherwise Atorvastatin (10mg) is a better option to be preferred upon. Addition of Fenofibrate (67mg) didn't made any significant differences in the results and should only be considered in cases of uncontrolled hypertriglyceridemia where better control rates are not efficient enough to be achieved by statins alone.

ACKNOWLEDGEMENT

This work was supported by a grant from National Institute of Pharmaceutical education And Research (NIPER), Hajipur, Bihar by the Ministry of Chemicals and Fertilizers, Department of Pharmaceuticals, Govt. of India. The Rajendra Memorial Research Institute of Medical Sciences (Indian Council of Medical Research), Agamkuan, Patna, Bihar, under the Ministry of Health and Family Welfare, Govt. of India is the mentor Institute.

CONFLICT OF INTEREST STATEMENT

The authors hereby wish to declare that there are no conflicts of interest.

REFERENCES

1. Reiner Z, Sonicki Z, Tedeschi-Reiner E. Physicians' perception, knowledge and awareness of cardiovascular risk factors and adherence to prevention guidelines:the PERCRO-DOC survey. J Atherosclerosis 2010;213(2):598–603.
2. Gotto AM Jr. Review of primary and secondary prevention trials with lovastatin, pravastatin, and simvastatin. Am J Cardiol 2005;96(5A):34–8.
3. Expert panel on detection, evaluation and treatment of high blood cholesterol in adults. Executive summary of the third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult treatment panel III). JAMA 2001;285(19):2486-97.
4. Scandanavian Simvastatin Survival Study Group. Randomised trial of cholesterol lowering in 4444 patients with coronary heart disease:the Scandinavian Simvastatin Survival Study (4S). J Lancet 1994;344(8934):1383–9.
5. The Long-Term Intervention with Pravastatin in Ischaemic Disease (LIPID) Study Group. Prevention of cardiovascular events and death with prevastatin in patients with coronary heart disease and a broad range of initial cholesterol levels. N Engl J Med 1998;339(19):1349-57.
6. Heart Protection Study Collaborative Group. MRC/BHF Heart Protection Study (HPS) of cholesterol lowering with simvastatin in 20,536 high-risk individuals:a randomised placebo-controlled trial. J Lancet 2002;360(9326):7–22.
7. Almdal T, Scharling H, Jensen JS, 1. Vestergaard H. The independent effect of type 2 diabetes mellitus on ischemic heart disease, stroke, and death:a population-based study of 13,000 men and women with 20 years of follow-up. J Arch Intern Med 2004;164(13):1422–6.
8. Haffner SM, Lehto S, Rönnemaa T, 3. Pyörälä K, Laakso M. Mortality from cor-onary heart disease in subjects with type 2

diabetes and in nondiabetic subjects with and without prior myocardial infarction. N Engl J Med 1998;339(4):229-34.

9. Miettinen H, Lehto S, Salomaa V, *et al*. Impact of diabetes on mortality after the first myocardial infarction. J Diabetes Care 1998;21(1):69-75.
10. Maurya AK, Kant S, Nag VL, Kushwaha R, Dhole TN. Detection of 123 bp fragment of insertion element IS6110 Mycobacterium tuberculosis for diagnosis of extrapulmonary tuberculosis. Indian J Med Microbiol 2012;30(2):182-6.
11. Chauhan DS, Sharma VD, Parashar D, Chauhan A, Singh D, Singh HB, *et al*. Molecular typing of Mycobacterium tuberculosis isolates from different parts of India based on IS6110 element polymorphism using RFLP analysis. Indian J Med Res 2007;125(4):577-81.
12. Ridker PM, Danielson E, Fonseca FA, *et al*. Rosuvastatin to prevent vas-cular events in men and women with elevated C-reactive protein. N Engl J Med 2008;359(21):2195–207.
13. Dujovne CA. Side effects of statins: hepatitis versus "transaminitis"–myositis versus CPKitis. Am J Cardiol 2002;89 (12):1411–3.
14. Wu CC, Sy R, Tanphaichitr V, *et al*. A multicenter, double-blind study to compare the efficacy and safety of once aily ator-vastatin and aimvastatin in asian people with elevated LDL-cholesterol. Result from ASIA study. J Formos Med Assoc 2002;101(7):478-87.