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Comparing the effect of drugs atorvastatin and rosuvastatin on the level of laboratory markers acute coronary syndrome patients

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Pharmacotherapy is one of the most important measures for improving the health status of patients, which can play a key role in this regard. The present study was performed to compare the effect of atorvastatin plus rosuvastatin on the value of laboratory markers in CVD patients. This research is a clinical trial study, whose research population consisted of the patients with ACS in Ilam city in 2021. The patients were randomly assigned into three groups: control, intervention A (receiving atorvastatin), and intervention B (receiving rosuvastatin). The patients who met the inclusion criteria were enrolled in the study through available sampling, for all of whom the required tests were performed. The laboratory variables including tests of triglyceride, cholesterol, ALT, AST, ALP, LDH, and LDL, using a single device which was in the laboratory in Ilam city were completed and the documents related to them were considered as assessment criteria. The data analysis was done using SPSS 16 software. The table indicated the comparison of laboratory index scores before and after taking rosuvastatin. According to the findings, in all laboratory indices after taking rosuvastatin, the status of the index has changed significantly to improve the patient's health status ($p < 0.05$). Considering the greater effect of rosuvastatin compared to atorvastatin on improving the laboratory variables, prescription of this drug is suggested for improving the status of CVD patients.

KEYWORDS

Atorvastatin; rosuvastatin; laboratory markers.

Introduction

The cardiovascular system, as a muscle pump responsible for blood circulation throughout the entire body, is perfused by the coronary artery system, with this system being composed of a set of arteries and veins. Any defect in the cardiovascular system can lead to devilment of cardiovascular disease (CVD), causing various complications in patients [1]. CVD is known as the most common cause of mortality in industrial countries, and in Iran, as well. It has further shown an ascending trend in the recent years, the age of developing CVD has decreased considerably which is really concerning [2].

Heart coronary diseases include a wide range of diseases including the unstable angina, chronic stable angina, silent ischemia, cardiomyopathy, myocardial infarction, and sudden cardiac death. Coronary artery disease is a type of heart disease with a high

prevalence, and can lead to complications as well as morality in 26% of premature deaths in men and 16% of premature deaths in women [3,4]. CVD has different risk factors including family history, sedentary lifestyle, poor diet, tobacco consumption, and history, or development of chronic diseases such as diabetes [5,6]. The major symptoms of heart disease include dyspnea at rest, or during activity, as well as fatigue causing activity intolerance. Patients with heart disease may experience various consequences including low quality of life, poor treatment adherence, and weak self-management, all of which could affect the improvement of the disease. As such, the proper therapeutic interventions are required [7].

Pharmacotherapy is one of the most important measures for improving the health status of patients, which can play a key role in this regard. Various drugs are used for improving CVD patients, including atorvastatin and rosuvastatin [8-10]. In patients with mild to severe hyperlipidemia, the use of lipid-lowering drugs can lead to decrease lipid levels and improve the patient status [11]. In CVD patients, triglyceride, cholesterol, AST, ALT, ALP, LDH, and LDL tests are effective to measure the health status of patients, and identifying the suitable drug for adjusting these tests can be effective in improving patients [12,13].

Objectives

Considering the significance of CVD and the role of healthcare team in treating these patients, the present study was performed to compare the effect of atorvastatin plus rosuvastatin on the value of laboratory markers in CVD patients.

Methods

Study design

This research is a clinical trial study, in which the research population consisted of patients with ACS in Ilam city in 2021.

Study population

The sample size, based on the previous studies, included 85 patients

Inclusion and exclusion criteria

Inclusion criteria

The inclusion criteria included developing MI based on the opinion of physician as well as the clinical documents of the patient's file, residence in Ilam city, the age range between 18 and 75 years, the patient's written informed consent for participation, and receiving Ethics Approval Code No. IR.MEDILAM.REC.1400.084.

Exclusion criteria

Lack of cooperation or patient's refusal to continue their participation in the study at any time of the research, the presence of any complication for the patient in the course of study (such as hospitalization, patient's death, etc.), changing the patient's drugs according to the physician's order, the clinical status of the patient, the lack of treatment adherence, and failure to take drugs properly, as well as the lack of cooperation to undergo tests were considered as the exclusion criteria.

Data gathering

Demographic characteristic

The demographic information, which was completed for patients using patient's clinical file and interview with them, included age, gender, place of residence, education, and body mass index (BMI).

The laboratory variables including tests of triglyceride, cholesterol, ALT, AST, ALP, LDH, and LDL, using a single device which was in the laboratory of Shahid Mostafa Khomeini Hospital in Ilam city were completed and the documents related to them were considered as assessment criteria.

Method of research

The patients were randomly assigned into three groups: control, intervention A (receiving atorvastatin), and intervention B (receiving rosuvastatin). The patients who met the inclusion criteria were enrolled in the study through available sampling, for all of whom the required tests were performed. Patient allocation to the groups was performed as blocks of size 4 random allocation. Briefly, first the size of each block was maintained in the block of size 4, and then the blocks were specified using www.randomizer.org site, the numbers were assigned to them, whereby the individuals selected numbers across the envelopes randomly. Group 1 received atorvastatin tablet 40 mg once a day for 3 months, and group 2 took rosuvastatin tablet 40 mg once per day for 3 months. Next, the triglyceride, cholesterol, ALT, AST, ALP, LDH, and LDL tests were performed again on the patients, and their results were compared with the pre-intervention stage.

Ethical approval

The informed consent for participation in the study, allocation of patients to the control group, as well as intervention A and intervention B through random allocation, freeness of all drugs and tests used for the patients, and the confidentiality of patients' information were among the ethical principles observed in this research.

The data analysis was done using SPSS 16 software and via statistical tests of mean, standard deviation, as well as frequency distribution table for reporting demographic variables. To compare the significance of the demographic variables, the independent t-test and Chi-square were employed. Likewise, to compare the laboratory markers, the inferential statistics were used.

Results

Table 1 indicates the demographic characteristics of the patients under study. According to the findings of Table 1, there was no significant difference among the demographic characteristics of the 3 groups, including control group, test A, and test B (P> 0.05).

Table 2 presents the comparison of laboratory index scores before and after taking rosuvastatin. According to the findings, in all laboratory indices after taking rosuvastatin, the status of the index has changed significantly to improve the patient's health status (p <0.05).

TABLE 1 Demographic characteristics of patients under study

Variable		Atorvastatin N (%)	Rosuvastatin N (%)	p-value
Gender	**Man**	20 (50.0%)	20 (50.0%)	1.00
	Female	20(50.0%)	20 (50.0%)	
Marital status (%)	**Single**	4 (10%)	6 (15%)	0.46
	Married	36 (90%)	34 (85%)	
Location (%)	**City**	22 (55%)	22 (55%)	1.00
	Village	18 (45%)	18 (45%)	
Education (%)	**Literate**	20 (50%)	20 (50%)	1.00
	Illiterate	20 (50%)	20 (50%)	
Age, (years) (Mean ± SD)		59.1 (1.7)	57.9 (1.8)	0.66
BMI (kg/m2) (Mean ± SD)		26.8 (0.3)	26.2 (0.2)	0.09

TABLE 2 The difference between the mean of laboratory variables before and after taking rosuvastatin

Variable	Mean Before	Mean After	Difference in Averages	P-value
ALT	46.30 (0.5)	31.05 (0.7)	15.25 (0.4)	<0.001*
ALKp	211.55 (6.22)	172.03 (6.6)	39.53 (2.9)	<0.001*
AST	46.23 (0.4)	30.50 (0.7)	15.13 (0.4)	<0.001*
LDL	199.63 (8.7)	136.03 (6.9)	63.60 (5.5)	<0.001*
HDL	21.88 (0.7)	42.15 (1.1)	-20.28 (1.2)	<0.001*
TG	272.43 (11.9)	192.10 (11.8)	80.33 (3.1)	<0.001*
CHLE	277.05 (6.8)	204.00 (7.5)	73.08 (2.1)	<0.001*
CRP	21.90 (1.3)	12.83 (1.2)	9.08 (0.5)	<0.001*

Table 3 reveals the comparison of laboratory index scores before and after taking atorvastatin. According to the findings, in all laboratory indices after taking atorvastatin, the status of the index has changed significantly to improve the patient's health status ($p < 0.05$).

TABLE 3 The difference between the mean of laboratory variables before and after taking atorvastatin

Variable	Mean Before	Mean After	Difference in Averages	P-value
ALT	47.80 (0.8)	37.70 (1.0)	10.10 (0.4)	<0.001*
ALKp	200.13 (3.9)	171.73 (5.1)	28.40 (2.7)	<0.001*
AST	47.88 (1.2)	38.38 (1.2)	9.50 (0.5)	<0.001*
LDL	217.75 (4.7)	188.80 (4.4)	28.95 (1.5)	<0.001*
HDL	20.20 (0.8)	35.95 (1.1)	-15.75 (0.7)	<0.001*
TG	298.38 (9.1)	222.65 (8.4)	75.73 (3.8)	<0.001*
CHLE	293.15 (5.7)	220.28 (5.8)	72.88 (3.9)	<0.001*
CRP	20.83 (1.0)	14.60 (1.0)	6.23 (0.2)	<0.001*

Discussion

Heart disease has a significant prevalence and is influenced by the other chronic diseases such as diabetes which are of high significance for this group of patients as one of the ways to reduce the complications of the disease should be a priority (14-17). The proposed study was performed to compare the effect of atorvastatin and rosuvastatin on the laboratory markers of CVD patients. According to the findings, atorvastatin showed a significant effect on improving the status of laboratory markers in CVD patients. After taking this drug, the status of AST and ALT of the patients diminished significantly. In the study by YongLi *et al.*, in which 47 patients had been assigned into placebo and atorvastatin groups, the patients received atorvastatin 40 mg for one year. It was found that consumption of this drug could lead to reduced cholesterol and LDL of the examined patients [18]. In the study by Fassett et al., in which atorvastatin had been used to examine the status of blood biomarkers of kidney disease patients, 120 patients had been assigned to placebo (n=61) and intervention (n=56) groups. It was found that atorvastatin led to significant reduction of eGFR of patients [19], which is in line with the results of this study regarding improvement of laboratory markers after taking atorvastatin.

Based on the findings, rosuvastatin also caused improvements in the status of laboratory variables in CVD patients. In the study by Sexton et al. enrolling 54 patients with ACS assigning them into intervention (receiving 40 mg rosuvastatin) and placebo groups, they found that this drug can lead to decrease troponin and CK-MB levels in patients with ACS [20]. Likewise, in the study by Luo et al., it was found that the use of high-

dose, in comparison to conventional-dose of this drug, could have a greater effect on improving blood lipid metabolism and reduce the blood lipid metabolism [21]. It is in line with the results of this study regarding improvement of laboratory markers following use of rosuvastatin. Meanwhile, in the study by Hearps et al., it was revealed that rosuvastatin had no significant effect on improving interleukin 6, CXCL10, and monocyte subsets. The reasons of this difference can be differences in the type of laboratory variables examined; in this study, triglyceride, cholesterol, ALT, AST, ALP, LDH, and LDL were explored, while in the study by Hearps, the other variables had been examined [22].

According to the results, both rosuvastatin and atorvastatin led to improvements in the blood markers of the patients; however, the extent of improvement and mean difference were greater for rosuvastatin than for atorvastatin. In the study by Umrani et al., who had examined atorvastatin and rosuvastatin on the status of blood markers of patients with ACS, they observed that rosuvastatin could lower the hs-CRP and ESR of patients more considerably than atorvastatin [23]. It is in line with the results of this study regarding the greater effect of rosuvastatin drug compared to atorvastatin in improving the blood biomarkers of CVD patients. Meanwhile, the findings of some studies have not accorded with the present study results; in the meta-analysis by Pratiwi et al., studying 687 patients in four papers with the aim of comparing these two drugs on the status of CRP of ACS patients, it was found that although atorvastatin and rosuvastatin both resulted in reduced CRP of patients, no significant difference was found between these two drugs regarding CRP reduction [24]. In the study by Kumar et al., examining both atorvastatin and rosuvastatin on the status of blood biomarkers of patients with ATS, it was found that in the rosuvastatin group, the hs-CRP and ESR levels were lower compared to the atorvastatin group [25]. Meanwhile, in the study by Umrani et al. investigating both atorvastatin and rosuvastatin on the status of blood biomarkers of patients with ACS, it was indicated that rosuvastatin could lower hs-CRP and ESR more considerably than atorvastatin did [23].

Conclusion

Regarding the greater effect of rosuvastatin compared to atorvastatin on improving the laboratory variables, prescription of this drug is suggested for improving the status of CVD patients.

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