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Estimation of Serum Uric acid, Creatinine, Total Cholesterol and LDL among Sudanese Using Atorvastatin Drug

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Original Research Article

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Abstract: Atorvastatin is lipid lowering drug use in different cases to prevent complications of hyperlipidemia by lowering lipid mainly affect cholesterol, but it also affect in concentration of other serum parameters such as uric acid and creatinine. Case-control study was conducted during the period between Marchs to May 2017, included 100 participants 60% cases and 40% control with age between (20-70) years. Case group included 62% female and 38% male, used different doses (10, 20 and 40 mg/day) and different durations using for variable conditions such as (DM, HTN or protection for risk of CVD). Control group was matched for cases group but not used any lipid lowering drugs. The result of this study showed that significant association between atorvastatin uses and decrease in UA, Cr, T.Chl and LDL (P-value: 0.000, 0.020, 0.015 & 0.018 respectively). Decrease in all parameters by increase dose but not significant only significant with dose 40 mg/day (p-value: 0.037, 0.044, 0.044 & 0.005 respectively). Decrease in Cr, TCh and LDL by increasing the durational of atorvastatin intake and concentration (P= 0.042, 0.001 & 0.000 respectively). Significant relation was detected between combination DM & HTN and increase UA (4.55±0.87) & Cr (0.69±0.16) (P-value: 0.032 & 0.015 respectively) no significant relation with T.Chl and LDL (P-value: 0.636 & 0.594 respectively). Significant decrease in UA, Cr, T .Cho & LDL mean concentration found among atorvastatin user and the dose 40mg/day is highly significant effect. No correlation between durational of atorvastatin used and the parameter concentration. A more research should be done to detect specific correlation between atorvastatin and this parameters.

Keywords: Hyperlipidemia; Lipid lowering Drug (atorvastatin); Uric acid; Creatinine; Diabetes Mellitus (DM); Hypertension (HTN); Cardiovascular Disease (CVD).

INTRODUCTION

Many studies reported that SUA level is a powerful and independent predictor of cardiac and overall mortality in both sexes in patients with CHD [1] or arterial hypertension [2, 3]. A relation between elevated SUA level and stroke also has been shown in patients with (or without) CHD, [arterial] hypertension [(3)] or diabetes mellitus [2]. Study of the effect of statin treatment on renal function and serum uric acid levels and their relation to vascular events in patients with coronary heart disease and metabolic syndrome was done [4, 5]. Also long-term effect of statins, prescribed in the majority of patients with CHD, on SUA levels in dyslipidemia patients with CHD has not been investigated extensively. The GREek Atorvastatin and Coronary-heart disease evaluation (GREACE) study [6] was a prospective, randomized, target-based, open label, intention-to-treat secondary CHD prevention trial. GREACE showed that structured management of dyslipidemia with dose titration of atorvastatin can achieve the National Cholesterol Educational Program (NCEP) low-density lipoprotein cholesterol (LDL-C) treatment goal [7].

MATERIALS AND METHODS

Study Design and Patients: This case control study was conducted at (Al-Mualim Medical Center & Zenam Diabetic Center) Khartoum-Sudan in period between March to May 2017, included 100 participants 60% cases and 40% control with age between (20-70) years. Case group included 62% female and 38% male, used different doses (10, 20 and 40 mg/day) and different durations using for variable conditions such as (DM, HTN or protection for risk of CVD). Control group was matched for cases group but not used any lipid lowering drugs. All participants haven't use any drugs or disorders that affect SUA level, renal problem or SCr level > 1.3 mg/dl. The Venous blood samples was obtained after used a proper questionnaire and estimated by automated Cobas c311analyzer. Data was

analyzed and tabulated using the Statistical Package for Social Sciences (SPSS), program version 21. T test, a crosstabs and correlation was performed with differences categorical data. P-value $\leq$ 0.05considered significant.

RESULTS

All biochemical measured (UA, Cr, Chl & LDL) are expressed as *mg/dl*. Percentage of different correlated condition such as DM, Hypertension (HTN) and no DM or HTN showen in (Figure-1). In (Table-1) the mean for all biochemical's measured among study population showed within normal range, but as compare between case and control they showed significant decrease in case group in all as following: for UA (case 4.32±0.83 and control 5.15±1.04, P-value 0.000), for Cr (case 0.64±0.17 and control 0.75±0.25, *P*-value 0.020), Ch (case 159.88±33.34 and control 179.42±45.29, *P*-value 0.015) and LDL (case 100.92±24.96 and control 115.00±33.79, *P*-value 0.018). (Table-2) showed case group compared the dose of atorvastatin used showed decreased in mean concentration when concentration of drug increased but only significant in dose 40mg in all. In (Figure-2, 3, 4 and 5) showed the correlation between duration of drug used and mean concentration showed significant effect in Cr, TChl and LDL (P-value: 0.042, 0.001 and 0.000 respectively). As a result of compare the mean concentration for all biochemical's measured with different disease (DM, HTN and patients with both DM & HTN), it showed that diabetic hypertensive patients significant highest in UA and Cr (4.55±0.87, *P*-value 0.032), (0.69±0.16, *P*-value 0.015) with no significant in Chl and LDL.

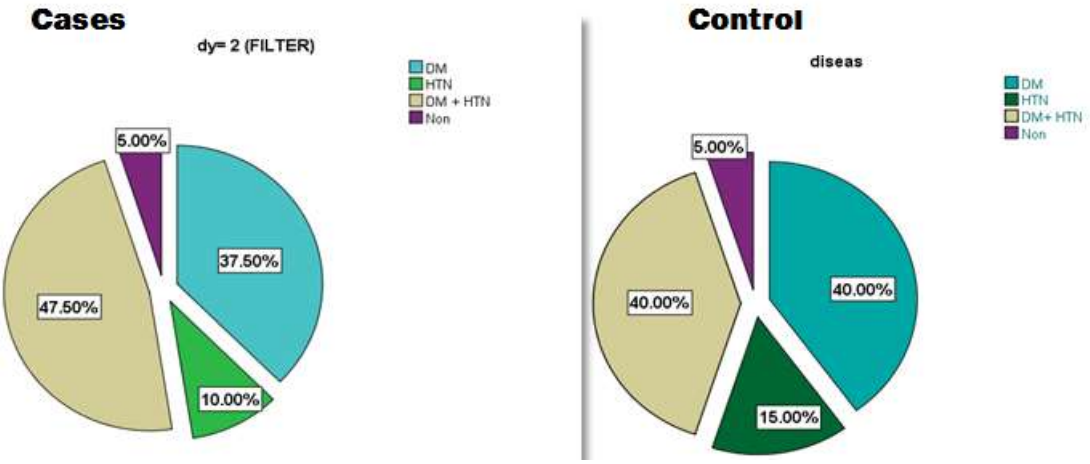

Fig-1: showed percentage of correlated condition such as DM, Hypertension (HTN) and no DM or HTN

Table-1: Comparison of biochemical measured among the study group

Parameters	Case (Mean±SD)	Control (Mean±SD)	P-value
Uric Acid	4.32±0.83	5.15±1.04	0.000
Creatinine	0.64±0.17	0.75±0.25	0.020
Cholesterol	159.88±33.34	179.42±45.29	0.015
LDL	100.92±24.96	115.00±33.79	0.018

Table-2: Comparison of biochemical measured among the different drug dose of Atorvastatin

Parameters	10 (Mg) (Mean±SD)	20 (Mg) (Mean±SD)	40 (Mg) (Mean±SD)
Uric Acid	4.62±0.62	4.38±0.91	3.84±0.12
p-value		0.078	0.037
Creatinine	0.74±0.15	0.67±0.17	0.64±0.16
p-value		0.053	0.044
Cholesterol	169.2±40.54	152.95±29.58	147.45±34.93
p-value		0.122	0.044
LDL	106.77±25.8	96.12±24.1	90.15±23.7
p-value		0.058	0.005

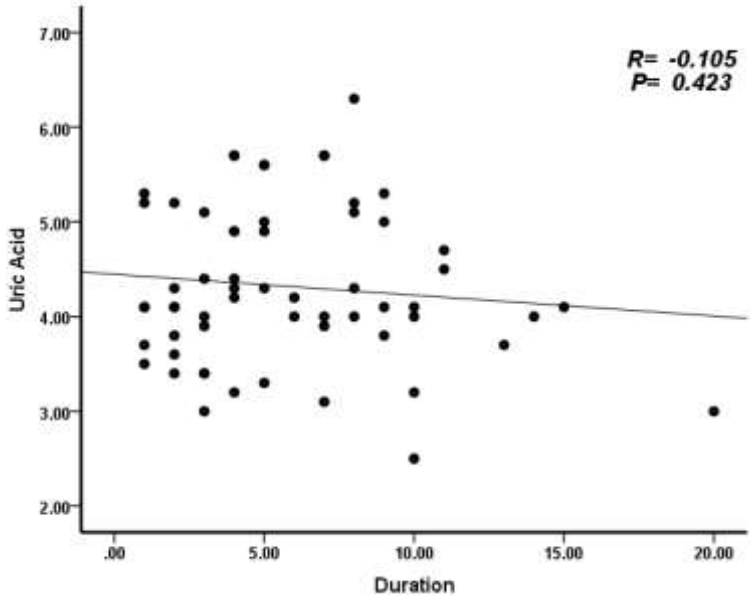

Fig-2: Correlation between uric acid concentration and duration of Atorvastatin use

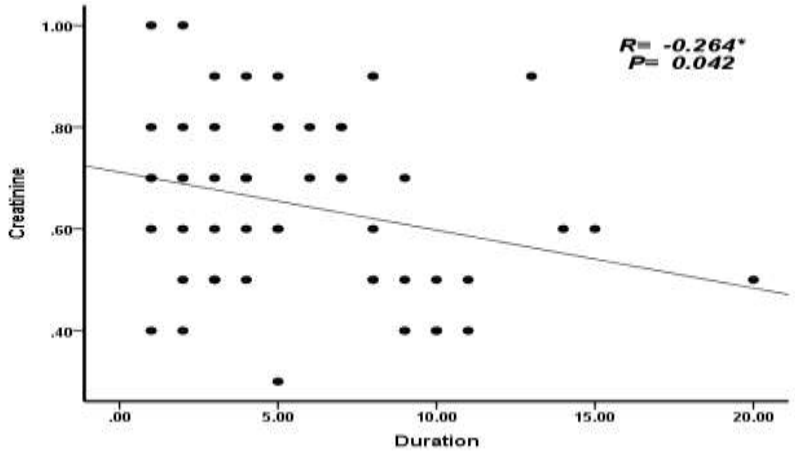

Fig-3: Correlation between creatinine concentration and duration of Atorvastatin use

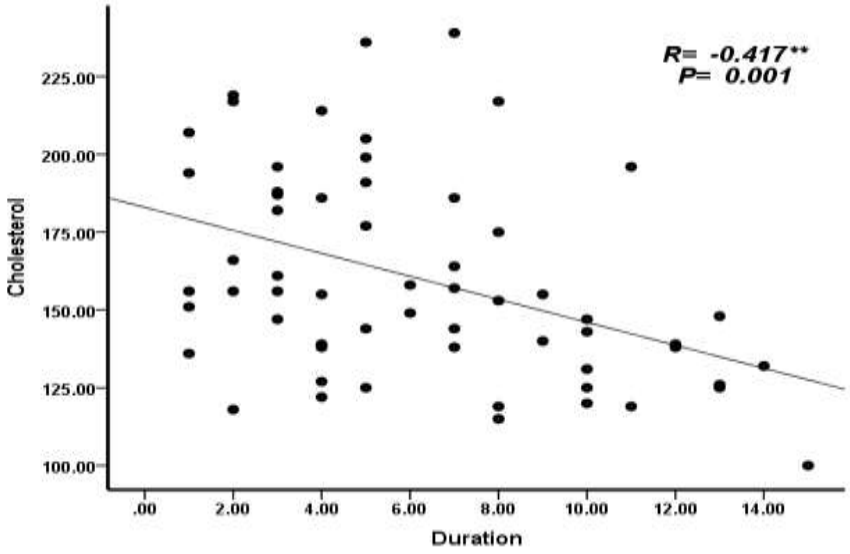

Fig-4: Correlation between cholesterol concentration and duration of Atorvastatin use

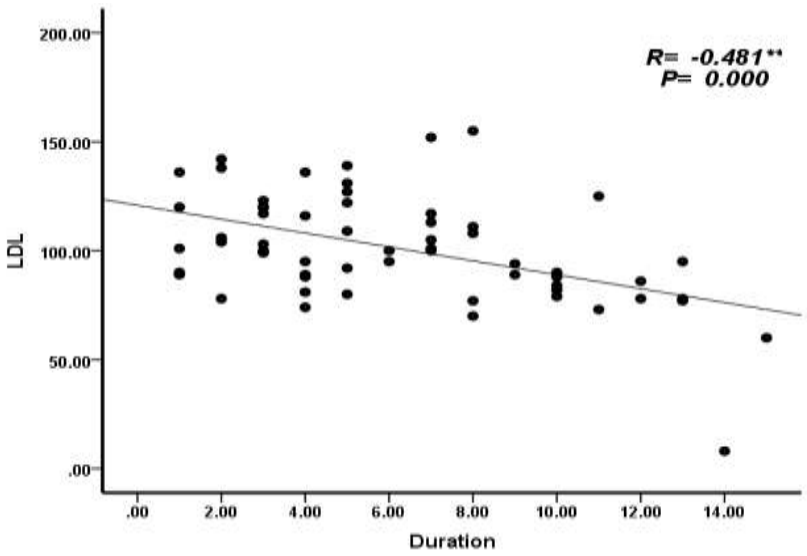

Fig-5: Correlation between LDL concentration and duration of Atorvastatin use

DISCUSSION

The result of the present study showed that there have significant decreased in all biochemical measured for case. Because atorvastatin is hyperlipidemic drug that mainly reduce T.Ch (P-value 0.015) & LDL (P-value 0.018) by inhibiting HMG-CoA reductase, an enzyme plays a key role in production of cholesterol in the body [8] but also showed to decreased UA (P-value 0.000) and Cr (P-value 0.020). The possible explanation of deceased UA and Cr is that Intensive lipid lowering with atorvastatin is associated with a significant improvement in renal function. The data was agreement with those of the TNT subgroup analysis [9], Results showed that there was a significant increase in e-GFR with both the 10 mg/day (by 5.6%) and the 80 mg/day dose of atorvastatin (by 8.4%). We speculated that the benefit probably relates to improved endothelial function and renal blood flow with treatment as well as from LDL-C lowering. It is well known that statins reduce peripheral resistance, raise cardiac output and improve endothelial function [5]. It has also been suggested that dyslipidemia per se represents a significant aggravating factor for renal dysfunction in subjects with DM and arterial hypertension [5]. Clinical and experimental studies have demonstrated the role of lipids and lipoproteins in the decline of renal function with emphasis on glomerulosclerosis. Statins have been shown to have a protective effect on renal function, by reducing the contribution of lipids to glomerulosclerosis [5], reducing neutrophil and macrophage infiltration [10], and up-regulating endothelial nitric oxide synthase [5]. In this study also increase the dose of atorvastatin used showed to decrease the mean concentration but only 40mg/day had significant value in UA (P-value 0.037), Cr (P-value 0.044), T.Chl (P-value 0.044) & LDL (P-value 0.005). The result agree to previous studies like TNT above [9], also Vasilios G. Athyros, MD, Moses Elisaf suggest that the greater doses of atorvastatin reduced SUA levels more than lower doses (*P* _ 0.025) [4]. And Milionis HJ, Kakafika AI that reported high dose atorvastatin (40 mg/day) significantly decreased serum uric acid levels although the underlying mechanisms remain speculative [(11)]. This might be related to the greater improvement in renal function, with greater LDL-C level reductions [(4)]. The present study result showed correlation between duration use of atorvastatin and Cr, T.Chl and LDL (P-value: 0.042, 0.001 and 0.000 respectively) compared with study that showed decrease in SUA and SCr levels gradually became more evident after treatment week 6. The possible explanations for that, a time dependent improvement in lipid profile during the atorvastatin titration period may represent a gradual reduction in the lipid contribution to glomerulosclerosis [4]. The present study result of UA may due to small sample size, different doses used, different in correlated conditions and longer time of atorvastatin (1 to 20 years) used (the previous study measured only first 6 week). The compare between mean concentration of UA and Cr and condition that showed the diabetic hypertensive have significant highest mean concentration in UA (*P*-value 0.032) and Cr (P-value 0.015) compare with those DM or HTN only, this may possible explain the role of this condition in elevated UA and Cr and the effect of Atorvastatin. Previous study showed that Atorvastatin can reduce insulin resistance in dyslipidemia patients with non–insulin-dependent diabetes [12]. However, it is unlikely that an atorvastatin-mediated increase in insulin sensitivity had a role in decreasing urate synthesis because this atorvastatin effect on SUA is small, and it is unlikely that the majority of their patients had insulin resistance. In addition, the effect of statin treatment on their patients with diabetes [(4)] was similar to that in patients without diabetes. Also was reported that Atorvastatin treatment not only inhibits the increase, but significantly reduces SUA levels in these patients [4].

CONCLUSION

This study suggest that, significant decrease in serum UA, Cr, T.Chl & LDL mean concentration found among atorvastatin user and the dose 40 mg/day is significantly high effect. Correlation between durational used and the parameter concentration found in Cr, T.Chl and LDL.

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