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Comparative Effects of Physical Exercise Vs Statins In Reducing Atherosclerotic Cardiovascular Disease (ASCVD) Risk In Patients Of Dyslipidemias Presenting In Primary Care Clinics.

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Abstract

Objective: To compare the effects of statin therapy and structured physical exercise on reducing ASCVD risk among patients with dyslipidemias.

Study design: Comparative cross-sectional study.

Place and Duration of Study: Outpatient Department of Family Medicine, PEMH Rawalpindi, from July 2024 to January 2025.

Methodology: Total of 290 patients between 30–60 years with ASCVD risk between 5–7.5% were included using non-probability consecutive sampling. Further divided into two groups: Group I (statin therapy; atorvastatin 10 mg daily) and Group II (structured aerobic exercise ≥150 minutes/week), both for at least two months. Fasting lipid profile and ASCVD risk were assessed before and after intervention. Analysis of data was done on SPSS version 26, considering $p \leq 0.05$ statistically significant.

Results: Among 290 patients, 148 (51.03%) were in the statin group and 142 (48.9%) in the exercise group. In the statin group, significant reductions were observed in total cholesterol (5.49 to 4.71 mmol/L) and LDL-C (3.57 to 2.74 mmol/L), with a modest increase in HDL-C (1.06 to 1.14 mmol/L) ($p<0.05$). In the exercise group, HDL-C improved significantly (1.09 to 1.27 mmol/L), with modest reductions in total cholesterol and LDL-C ($p<0.05$). ASCVD risk decreased in both groups but was

greater in the statin group (6.4% to 5.2%) compared to the exercise group (6.3% to 5.8%).
Conclusion: Statin therapy more effectively reduce LDL-C and ASCVD risk, while physical exercise had significant impact on HDL-C. Both strategies are useful and their combined usage may provide optimum reduction of cardiovascular risk.

Introduction

Atherosclerotic cardiovascular disease (ASCVD) is a worldwide concern, considered to be most dominant type of cardiovascular disease. Sedentary lifestyle habits and metabolic risks are the major factors contributing in growing impact of ASCVD.[1] Dyslipidemia is an important cause in pathogenesis of cardiovascular disease and has substantial contribution in overall cardiovascular morbidity.[2] Increased low-density lipoprotein cholesterol (LDL-C) in body causes accumulation of lipid content in arterial walls, it initiates formation of atherosclerotic plaque and promotes inflammation of vessels. All these phenomena increase the likelihood of occurrence of cardiovascular events such as myocardial infarction and stroke.[3]

Recently, there is substantial increment in global burden of dyslipidemias, mainly because of urbanization, sedentary life behavior, poor dietary habits and growing cases of obesity.[4] South Asians, including Pakistani population, experience cardiovascular disease with more severity as compared to Western populations.[5] Recent studies have depicted that 39.7% of population in Pakistan have raised LDL-C levels, more prevalent in adults having age between 40 to 49 years, raising an important public health concern.[6]

Statins (hydroxymethylglutaryl-CoA reductase inhibitors) are amongst the major medicines used for treatment of dyslipidemia. Their mechanism of action is by blocking cholesterol synthesis in liver and augmentation of LDL receptors, hence lowering LDL-C levels in blood.[7] Studies have shown that statins reduce level of LDL-C by 30% amongst dyslipidemia patients, hence reducing danger of cardiovascular event. Besides lowering lipids, statins also help improve functionality of endothelium, reduces vascular inflammation and stabilize atherosclerotic plaques.[8]

Although statin therapy is effective, longstanding adherence is often compromised by concerns regarding adverse effects, including myalgia and hepatic dysfunction. As a result, greater attention is being directed toward lifestyle interventions as complementary or alternative approaches for reducing cardiovascular risk.[9] Physical exercise represents a key non-pharmacological intervention, demonstrating well-established benefits for lipid metabolism and overall cardiovascular health. The impact of regular aerobic exercise includes improvement in high-density lipoprotein cholesterol (HDL-C), reduced triglyceride levels and enhancement of insulin sensitivity and endothelial function.[10]

Physical activity not only improves lipid levels but also helps with weight loss, blood pressure control, and lowering inflammation, all of which affect cardiovascular risk. Still, exercise alone usually lowers LDL less than statin therapy. In everyday primary care, people may also find it hard to stick to structured exercise programs because of social and behavioral challenges.

While both statin therapy and physical exercise are recommended in clinical guidelines for dyslipidemia management, comparative evidence regarding their relative effectiveness in patients with borderline ASCVD risk (5% – 7.5%) where use of statins remains optional is limited, especially within primary care settings in developing countries.[11] In Pakistan, the increasing prevalence of lifestyle-related diseases necessitates a thorough understanding of the relative benefits of available interventions to optimize patient care. Our study seeks to compare the effects of statin therapy and structured physical exercise on reducing borderline ASCVD risk among patients attending primary care clinics.

Methodology:

A comparative cross-sectional study was conducted at OPD of Department of Family Medicine, Pak Emirates Military Hospital (PEMH), Rawalpindi from July 2024 to January 2025.

WHO sample size calculator estimated sample size with 95% confidence interval and 5% margin of error, considering 25% as prevalence of low ASCVD risk in Pakistan.[12] Total 290 patients were included in our study using non-probability consecutive sampling. Informed consent in written form documented from patients.

Inclusion criteria: Patients from both genders, 30–60 years of age with ASCVD risk between 5 to 7.5% on statins or structured exercise for ≥3 months.

Exclusion criteria: Patients with other ASCVD risk groups, Diabetes mellitus, Hypertension, CKD, liver disease, pregnancy or combination therapy.

Keeping in view treatment modalities, patients were segregated into two groups. Group I (statin therapy) had patients who received atorvastatin 10 mg OD for duration of at least two months while Group II (physical exercise) included patients who performed aerobic exercise ≥150 minutes/week for at least two months. Complete history and medical record including gender, age, smoking status, history of medication, previous lipid profile and ASCVD score was recorded. Standard sphygmomanometer was used for Blood pressure reading while patients were in sitting position and their arm at heart level, two measurements were taken at interval of 05 minutes and mean of two readings was noted. 3 ml of 8 – 12 hours fasting venous sample was collected in clot activator gel vacutainer for analysis of fresh lipid parameters; Total Cholesterol, LDL-C and HDL-C. Analysis was performed on Cobas c501 chemistry analyzer using photometric method. Two levels of controls were run on daily basis as a part of internal quality control. Fresh ASCVD risk was estimated by using ASCVD Risk Estimator Plus (ACC/AHA 2013) risk assessment tool.

IBM Statistical Package for the social sciences (SPSS) version 26.0 used statistical analysis. To determine normality of data Shapiro-Wilk test was applied which revealed that the data had parametric distribution (p value >0.05). Qualitative variables were expressed in frequency and percentage while Mean ± SD was used to expressed quantitative variables such as values of lipid profile and ASCVD risk. Mean values within the groups were compared by applying Paired sample T Test and amongst two groups were compared by utilizing independent sample T test and p-value ≤ 0.05 was considered as statistically significant.

Results:

Amongst 290 samples included in the study, 168 (57.9%) were male and 122 (42.06%) were females. Patients had mean age of 48.1 ± 9.4 years. Mean ASCVD risk value was 6.3 ± 0.75%. Participants were divided into two groups: Out of 290 participants, 148(51.03%) were in Group I (statin therapy) while 142 (48.9%) were in Group II (physical exercise).

The mean **ASCVD risk category of patients prior to intervention was 6.4 ± 0.8% in the statin group** and **6.3 ± 0.7% in the exercise group.** In Group I following statin use, there was noteworthy improvement in lipid parameters: Total Cholesterol (5.49 vs 4.8 mmol/l), LDL-C (3.57 vs 2.74 mmol/l) and HDL-C (1.06 vs 1.14 mmol/l). Improvement in lipid parameters (more in HDL-C) was also noted in Group II following physical exercise: Total Cholesterol (5.44 vs 5.07 mmol/l), LDL-C (3.52 vs 3.21 mmol/l) and HDL-C (1.09 vs 1.27 mmol/l). Both groups showed a reduction in ASCVD risk following intervention; however, reduction was more marked in Group I statin group (6.4 vs 5.2 %) as compared to Group II (6.3 vs 5.8 %). The reduction in ASCVD risk was statistically significant in both groups (p<0.05), but greater in the statin group. Paired sample T Test was used for comparison of mean values within groups, as shown in Table I.

Table I: Mean comparison of parameters within Groups

Group I – Statin Group (n=148)			
	Before (Mean ± SD)	**After Therapy (Mean ± SD)**	**p-value**
Total Cholesterol (mmol/l)	5.49 ± 0.88	4.71 ± 0.78	**<0.001**
LDL – C (mmol/l)	3.57 ± 0.73	2.74 ± 0.65	**<0.001**
HDL-C (mmol/l)	1.06 ± 0.13	1.14 ± 0.16	**0.02**
BMI (kg/m^{2})	27.9 ± 1.92	27.8 ± 2.14	**0.09**
ASCVD Risk %	6.4 ± 0.8	5.2 ± 0.9	**<0.001**
Group II – Exercise Group (n=142)			
Total Cholesterol (mmol/l)	5.44 ± 0.83	5.07 ± 0.88	**0.01**
LDL – C (mmol/l)	3.52 ± 0.70	3.21 ± 0.72	**0.01**
HDL-C (mmol/l)	1.09 ± 0.16	1.27 ± 0.18	**<0.001**
BMI (kg/m^{2})	27.6 ± 2.63	26.1 ± 1.98	**0.01**
ASCVD Risk	6.3 ± 0.7	5.8 ± 0.8	**<0.001**

Significant difference in lipid parameters and ASCVD risk was also observed between the two groups after the two different interventions, details in Table II.

Table II: Mean comparison of parameters between Groups

	Group I (n=148) (Mean ± SD)	**Group II (n=142) (Mean ± SD)**	**p-value**
Total Cholesterol (mmol/l)	4.71 ± 0.78	5.07 ± 0.88	**0.01**
LDL – C (mmol/l)	2.74 ± 0.65	3.21 ± 0.72	**0.001**
HDL-C (mmol/l)	1.14 ± 0.16	1.27 ± 0.18	**0.002**
ASCVD Risk %	5.2 ± 0.9	5.8 ± 0.8	**<0.001**

Discussion

This study made comparison between effects of statin therapy and structured physical exercise on lipid levels and ASCVD risk in patients with dyslipidemia. Statin therapy lowered LDL cholesterol more, while physical exercise led to better improvements in HDL cholesterol. Statin group had mean LDL-C level 2.74 mmol/L, whereas exercise group exhibited mean level of 3.21 mmol/L (p=0.001). This result aligns with large meta-analyses indicating that statins reduce LDL cholesterol by 30 to 50 percent, depending on dosage and baseline levels.[13] The findings are consonant with our study where 24% decreased LDL-C levels were observed in statin group. According to the Cholesterol Treatment Trialists' Collaboration, 1 mmol/L reduction in LDL-C corresponds to a 22% decrease in major cardiovascular events.[14] This supports the greater reduction in ASCVD risk observed in the statin group in our study.

Statin group had significantly lower Total cholesterol compared to exercise group (4.71 mmol/L vs 5.07 mmol/L, p=0.01), which reinforces the lipid-lowering efficacy of statins. These results align with current ESC and AHA guidelines that prioritize LDL reduction as the main therapeutic target for ASCVD prevention.[15] However, exercise group patients exhibited significantly higher HDL-C levels (1.27 mmol/L) compared to those in the statin group (1.14 mmol/L, p=0.002). The results in our study are also supported by other studies, highlighting the role of regular aerobic exercise in improving levels of HDL-C by facilitating reverse cholesterol transport, hence improving metabolism of lipid.[16] An other study has showed that exercise has significant role in improving functionality of HDL-C in addition to improving its level in blood.[17]

The exercise group displayed significantly lower mean BMI (26.1 kg/m² vs 27.6 kg/m², p=0.003), which emphasizes the importance of physical activity in reduction of weight and improvement of metabolism. As obesity is directly related to dyslipidemia and increase cardiovascular risk, therefore even a modest reduction in BMI will have improvement in lipid parameters and will ultimately decrease ASCVD risk.[18] In our study both groups revealed reduction in ASCVD risk scores; however, a more significant improvement was noted in statin group (6.4% vs 5.2%) in comparison with exercise group (6.3% vs 5.8%). The results can be explained in the context that statins are more effective in lowering LDL-C levels, which has primary role is atherosclerosis and indirectly improving ASCVD risk of patients.[19]

Although statins are more effective against dyslipidemia but patient compliance may be limited due to its long term adverse effects including myalgias documented in patients and leading to discontinuation of medicines in asymptomatic patients.[20] On the other side, implementation of lifestyle modification and exercise habits may be suboptimal due to lack of motivation factors. Combination of both the strategies may offer most impactful and sustainable measure to reduce cardiovascular risk. Few studies have shown that statins effect skeletal muscle metabolism and mitochondrial function, which could disturb exercise capacity.[21] Nevertheless, clinical significance of this interaction is unclear and needs further research.

Our study results are in line with previous comparative data, which indicate that both the pharmacological and lifestyle strategy function through synergistic mechanisms.[22] Statins are important for reducing LDL-C and stabilizing plaques, while exercise improves overall metabolic health and cardiovascular fitness.

This study will provide important local data from Pakistan, a region which is experiencing a rising prevalence of dyslipidemia. The findings highlight the importance of implementing integrated management approach within primary care settings. The main limitations of this study include its cross-sectional method and exercise is a subjective activity and may vary from person to person which could influence the results. Future multicentric studies with large sample size is required to be carried in order to evaluate long-term impact and effectiveness of combined interventions.

Conclusion

Statin therapy displayed more effectiveness in reducing LDL-C and ASCVD risk among patients in borderline risk category, highlighting its primary role in lipid-mediated cardiovascular risk reduction. In comparison, structured physical exercise had noteworthy improvements in HDL-C and BMI. These results depicts the necessity of integrated management strategy in primary care practice, in which combination of both pharmacological therapy and lifestyle modification achieves impactful cardiovascular risk reduction for patients with dyslipidemia.

CONFLICT OF INTEREST

There was no conflict of interest as declared by the authors.

Author Contributions

S. No.	Author Name	Contribution
1st	ST	Sampling, data analysis, statistical analysis, literature review, manuscript drafting, has given final approval of version to be published
2nd	SN	Conception and design of study, Overall supervision data analysis, Data interpretation, , has given final approval of version to be published
3rd	AIP	Study design, acquisition of data and its interpretation, critical review of manuscript, has given final approval of version to be published
4th	AK	Substantial contributions to study design, acquisition of data, Manuscript writing, has given final approval of the version to be published
5th	NN	Substantial contributions to analysis and interpretation of data, Critical review, has given final approval of the version to be published
6th	HT	Substantial contributions to acquisition of data, Manuscript writing, has given final approval of the version to be published

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