

Research Article

Management of Dyslipidemia with Atorvastatin in Patients with Chronic Obstructive Pulmonary Disease

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) patients are very prone to cardiovascular diseases due to dyslipidemia. This study aimed to determine the prevalence of dyslipidemia in COPD patients and to find the role of rosuvastatin in managing dyslipidemia.

Methods: This study was conducted in pulmonology and medicine clinic, Khushal Medical Center (KMC) Peshawar. Total 300 COPD patients were enrolled using Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines. The dyslipidemia was evaluated using lipid profile. Patients with dyslipidemia were treated with atorvastatin 10mg daily for 8 weeks. Post follow-up, lipid profile was done and compare with the initial status of the patients. Data was analyzed using SPSS version 26.0.

Results: The study population of COPD patients had an average age of 56.88 ± 10.01 years. The mean body mass index (BMI) was 25.64 ± 3.08 kg/m². In our study, 24% patients were in stage 1, 29% in stage 2, 27% in stage 3 and 20% were in stage 4 COPD. The prevalence of dyslipidemia was 41.3%. Following atorvastatin therapy, the prevalence of dyslipidemia markedly decreased to 19.0% (n=57), whereas the proportion of patients without dyslipidemia increased to 81.0% (n=243). The observed reduction in dyslipidemia after treatment was statistically significant (p=0.001), indicating a strong therapeutic effect of atorvastatin in improving lipid abnormalities among the study population.

Conclusion: Dyslipidemia was found in 41.3% of COPD patients. Screening and managing dyslipidemia in COPD patients helps to reduce cardiovascular events in such patients.

Keywords: Atorvastatin, COPD, Dyslipidemia, Prevalence

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is significantly linked with the obstruction of the airways, difficulty in breathing which causes severe illness and lead to death (1). Globally, it is the 3rd leading cause of death, and till now more than 400 million patients all over the world affected (2) with 3.3 million deaths (3). Its prevalence in Pakistan was 2.1% (4), another study shows a prevalence

ranges of 14% to 33% (5). Patients of the COPD have worse metabolism of the lipids because of some factors involved, like severity of the disease, age, and sexuality of the patients which leads to dyslipidemia and obesity (6). Dyslipidemia is metabolic syndrome (7) define as the increase of cholesterol serum triglycerides, low density lipoprotein and decrease high density lipoprotein which worsen the condition of COPD (5, 6). In fact, it is still not evident the impact of

dyslipidemia on the progression of COPD but study in Taiwan shown the association of dyslipidemia and COPD incidence in people (8). The risk of COPD elevated and its prevalence in cardiovascular disease is ranging from 20-70% which increases with severity of the cardiovascular disease (8, 9). Actually, COPD is a combination of other co-morbidities, such as cardiovascular disease which not only cause pulmonary function but also increases cardiovascular disease risks. Most of the COPD and Cardiovascular disease patient's death is due to the respiratory problem that leads to morbidity and mortality of the patients, also increase the risk of staying in hospital ranges from 30% to 60% (10), and worsen the ones quality of life (8). Statins is used to treat COPD patients, (6) atorvastatin and simvastatin are the drugs used to reduces the lungs problems but also improve the response of inflammation in COPD patients (2). Its safety and efficacy profile is favorable but some of the adverse reactions are; gastrointestinal symptoms, dizziness, headache, palpitations, insomnia, and transient elevations in transaminases which can be reduces by discontinuation of the drug (11). Cardiovascular disease and dyslipidemia can be reduced by statin therapy (8, 12), about 20mg of Atorvastatin is used which reduced the COPD risks (2, 11). The aim of this study is to find the prevalence of dyslipidemia in COPD patients and treat the dyslipidemia in such patients using atorvastatin.

METHOD

The Prospective cohort study was completed in the pulmonology and medicine clinics, Khushal Medical Center (KMC) Peshawar. After ethical approval from KMC via letter number KMC/EB01/201, total 300 COPD patients were enrolled. GOLD guideline was used as criteria to diagnose the COPD patients (5). The duration of the whole study was 8 months from February 2022. The sample size was calculated using a web based tool

(<https://www.openepi.com>) using recent prevalence of dyslipidemia as 20.3% (13), 95% CI and 5% margin of error with power of study 80. The sample size came out to be 249; however, we enrolled 300 COPD patients for better picture. All the patients were guided verbally in their local language and after willing to participate in the study, a proper consent was signed. Demographic data was recorded on a pre-designed proforma followed by 3cc of blood in EDTA tube, for determination of plasma lipid profile using cobas 6000 analyzer c501. Those patients were excluded from the study that was already on anti-hyperlipidemic drugs and having co-morbidities; such as chronic liver disease, chronic kidney disease, and other known cardiovascular diseases. Furthermore, patients not consenting to participate in the study were also excluded from the study. Based on BMI values, patients were classified as having normal BMI (18-24.9), pre-obese (25-29.9), or obese (>30) (14). The dyslipidemia positive patients were treated with atorvastatin 10mg and the patients were followed for 3 months (12 weeks). Post follow-up, lipid profile was done and compare with the initial status of the patients. Data was analyzed using SPSS version 26.0. Mean and SD was used for numerical variables while frequencies and percentages were used for categorical variables. Chi-square test was applied to find the possible significant difference between dyslipidemia at enrollment and post follow-up. The value was 2 tailed for all the tests with a p-value <0.05 was considered significant.

RESULTS

The study population of COPD patients had an average age of 56.88 ± 10.01 years. The mean body mass index (BMI) was 25.64 ± 3.08 kg/m². The lipid profile showed a mean total cholesterol level of 170.76 ± 38.96 mg/dL, triglycerides 132.02 ± 55.79 mg/dL, HDL 43.52 ± 10.78 mg/dL, LDL 107.93 ± 34.92 mg/dL, and VLDL 26.05 ± 10.25 mg/dL. The mean of diseased duration was $7.52 \pm$

4.251 years. Details are shown in the given table no 1. The figure 1 shows the stages of COPD in which 24% patients

were in stage 1, 29% in stage 2, 27% in stage 3 and 20% were in stage 4 COPD.

Table 1: Demographic and clinical status of patients

Variables	Mean	Standard Deviation
Age (years)	56.88	10.018
BMI	25.64	3.085
Total CHO (mg/dl)	170.76	38.965
TGs (mg/dl)	132.02	55.797
HDL (mg/dl)	43.52	10.787
LDL (mg/dl)	107.93	34.925
VLDL (mg/dl)	26.05	10.256
Disease duration (years)	7.52	4.251

The categorical characteristics of the COPD study population showed that males were more prevalent, accounting for 59.3% of participants, while females represented 40.7%. Based on BMI classification, 43.0% of patients had a normal BMI, 43.7% were overweight, and 13.3% were obese. Regarding lipid profile, 41.3% of patients had dyslipidemia, while 58.7% did not. Most patients (81.7%) had normal total

cholesterol levels, whereas 18.3% had elevated values. Triglyceride levels were normal in 67.7% of cases, but high in 32.3%. For HDL, the majority (96.0%) had low HDL levels, while only 4.0% were within the normal range. LDL was normal in 75.0% of patients, whereas 25.0% showed elevated levels. Similarly, VLDL was normal in 69.0% of the study population, while 31.0% had high VLDL levels shown in table no 2.

Table 2: Categorical parameters of study population

Variables		Frequency	Percent
Gender	Male	178	59.3
	Females	122	40.7
BMI	Normal	129	43.0
	Overweight	131	43.7
	Obese	40	13.3
Dyslipidemia	No	176	58.7
	Yes	124	41.3
Total CHO (mg/dl)	Normal	245	81.7
	High	55	18.3
TGs (mg/dl)	Normal	203	67.7
	High	97	32.3
HDL (mg/dl)	Normal	12	4.0
	Low	288	96.0
LDL (mg/dl)	Normal	225	75.0
	High	75	25.0
VLDL (mg/dl)	Normal	207	69.0
	High	93	31.0

Table 3 presents the comparison of dyslipidemia status in COPD patients

before and after atorvastatin treatment. At enrollment, 41.3% of patients (n=124) had

dyslipidemia, while 58.7% (n=176) did not. Following atorvastatin therapy, the prevalence of dyslipidemia markedly decreased to 19.0% (n=57), whereas the proportion of patients without dyslipidemia increased to 81.0% (n=243).

The observed reduction in dyslipidemia after treatment was statistically significant (p=0.001), indicating a strong therapeutic effect of atorvastatin in improving lipid abnormalities among the study population.

Table 3: Dyslipidemia pre and post atorvastatin treatment

Dyslipidaemia at enrolment			Dyslipidemia post atorvastatin treatment		P-value
	Frequency	Percent	Frequency	Percent	
No	176	58.7	243	81.0	0.001
Yes	124	41.3	57	19.0	

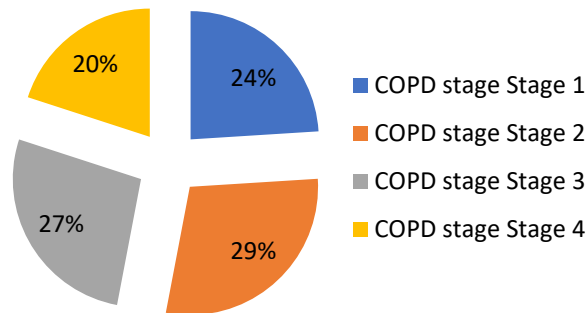


Figure 1: COPD stages among enrolled patients

DISCUSSION

The present study demonstrated that the mean age of COPD patients was 56.88 ± 10.01 years, with a male predominance (59.3%). These demographic findings are consistent with previous reports from Pakistan and neighboring regions, where COPD prevalence has been shown to be higher in males, often attributed to smoking habits and occupational exposures (1). Another study shows the same male dominance which is 63% because of the contributing factor which is smoking (15), while another study shows predominance in female 75% due to others factors like hormonal and genetics (16). Meanwhile other study shows that Growth in the burden of COPD was projected to be the largest among women (17). In terms of metabolic characteristics, our study found that 41.3% of COPD patients had dyslipidemia at baseline

(before treatment). This finding aligns with the 2021 Iranian study, which reported a higher prevalence of dyslipidemia (68.9%) (18) among COPD patients, whereas a 2022 study from Pakistan reported a relatively lower rate of 20.3% (13). Such variations across populations may reflect differences in dietary patterns, genetic predispositions, and access to healthcare services. Importantly, systemic inflammation and oxidative stress have been suggested as potential mechanisms linking COPD to dyslipidemia, while long-term corticosteroid use further exacerbates lipid abnormalities (8). The exact mechanism underlying the development of dyslipidemia in COPD remains unclear; however, increasing evidence suggests that systemic inflammation, oxidative stress, and long-term corticosteroid therapy play major roles in

lipid abnormalities observed in these patients (15). Following atorvastatin therapy for 12 weeks, the prevalence of dyslipidemia significantly decreased from 41.3% to 19.0% ($p= 0.001$). This highlights the strong therapeutic benefit of statin therapy in COPD patients with lipid abnormalities. Similar results were reported in a systematic review and meta-analysis which confirmed the efficacy and safety of atorvastatin as an adjunctive treatment in COPD, particularly in reducing inflammation and improving lipid profiles (11). Patients with COPD frequently experience cardiovascular diseases, which significantly impact their functional capacity and increase mortality risk (19). COPD Patients have a 2-5 fold higher likelihood of developing cardiovascular diseases compared to those without COPD, and CVD represent some of the most prevalent comorbidities associated with the condition (20). Dyslipidemia, a major risk factor for CVD and the most prevalent comorbidities in patients with COPD, has attracted increasing research interest due to its high occurrence and the potential role of statin therapy in reducing COPD-related risks and improving clinical outcomes (6, 21). Dyslipidemia is characterized by elevated LDL, decreased HDL, and increased triglycerides, is more common in patients with COPD than in the general population. This imbalance is linked to a higher risk of cardiovascular events, reduced lung function, and more frequent exacerbations (22). The prevalence of dyslipidemia in Serbia were 26.5% (18), 37% in Iraq (23), and 25.5% in Korea in COPD patients (24). In 2022 a across-sectional and observational study were performed in India which shows 47% dyslipidemia (25).

CONCLUSION

Dyslipidemia was prevalent in patients with COPD in our enrolled patients. Management of dyslipidemia in COPD patients using atorvastatin significantly reduces dyslipidemia thus decreasing the cardiovascular events in such patients.

Authors Contribution

SA and AB were actively involved in data collection and interpretation of the data as well as writing initial draft of the article. KI and AS helped in data interpretation and analysis. SHAH and NU conceptualize and design the study as well as finalizing the draft. All the authors approved final version of the article.

Conflict Of Interest: All authors declares no conflict of interest

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Ethical Approval: This study was approved by the ethical board KMC via letter number KMC/EB01/201

Patient Consent: All the enrolled patients were guide verbally in their local language and after willing to participate in the study, written consent was taken with their proper signature and thumb impression.

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