

## Prospective Study in Comparison of Efficacy of Atorvastatin Versus Atorvastatin with Vitamin D3 in Patients with Dyslipidemia

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### Abstract:

**Background:** Dyslipidaemia is a major risk factor for heart disease and is often treated with statins. Recent research shows that vitamin D3 may make lipid profiles even better when used with regular statin medication.

**Aim:** The goal of this trial was to see if atorvastatin alone or atorvastatin with vitamin D3 worked better to improve lipid profiles in people with dyslipidaemia.

**Methodology:** This randomised, prospective trial included 120 individuals with dyslipidaemia. They were given either atorvastatin 20 mg daily or atorvastatin 20 mg daily + vitamin D3 1000 IU daily for twelve weeks. At the start and end of the therapy period, we measured lipid levels and serum vitamin D3 levels.

**Results:** The lipid profiles of both groups improved a lot. But the group that had both atorvastatin and another drug showed bigger drops in LDL-C and triglycerides, as well as a bigger rise in HDL-C levels, than the group that just got atorvastatin. The combo group also saw a big rise in their serum vitamin D3 levels. There were no significant side effects with either treatment plan.

**Conclusion:** Adding vitamin D3 to atorvastatin medication was better than just atorvastatin alone at improving cholesterol levels. Combination therapy could be a helpful addition to the treatment of dyslipidaemia.

**Keywords:** Atorvastatin, Cardiovascular Risk, Dyslipidemia, Lipid Profile, Vitamin D3.

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### Introduction

Dyslipidemia is a common condition resulting from having too much total cholesterol, too much low-density lipoprotein cholesterol (LDL-C), too much triglyceride (TG) and/or very low high-density lipoprotein cholesterol (HDL-C) [1]. CVD plays a big role in global CVD and this disease is still the main cause of sickness and death globally [2]. Many researchers believe that high LDL-C causes 4.4 million deaths every year and most of these tragedies are recorded in low- and middle-income nations, according to the Global Burden of Disease study” [3]. The leading therapy goal for dyslipidemia is to reduce levels of LDL-C to lower the chance of plaque build-up and cardiovascular issues [4]. Because statins have shown success in lowering LDL-C and the risk of heart problems, they are now the main drug used in lipid-lowering therapy [6]. Due to its potency, good safety, and effectiveness in helping a broad range of patients meet their lipid goals; atorvastatin is prescribed more often among statins [6]. Several clinical trials, for example the TNT and IDEAL, have found that atorvastatin

reduces the risk of cardiovascular events in people, both with and without heart disease [7, 8].

Though many patients are able to reach the target LDL-C levels, a lot of them still remain at increased cardiovascular risk [9]. Because of this, many are now paying more attention to adding therapies that may boost the improvement of cholesterol profile and treat other risk factors for heart disease. A recent area of research is how vitamin D3 (cholecalciferol) affects the body’s lipids and the heart [10].

D3 vitamin deficiency is very common across the globe; it is estimated that over a billion people have insufficient levels of 25-hydroxyvitamin D3 having hypovitaminosis D is associated with problems such as insulin resistance, problems with endothelial function, high blood pressure and abnormal cholesterol [11]. Numerous observational studies have demonstrated that low levels of serum vitamin D3 often correspond to high blood levels of triglycerides (TG) and LDL cholesterol (LDL-C). In addition, vitamin D3 seems to play many roles that

could contribute to normal lipid metabolism, for example by making insulin more effective, reducing general inflammation, and controlling genes involved in cholesterol balance [12]. Many clinical trials have examined whether taking vitamin D3 helps balance lipids and the outcomes have been varied. In their meta-analysis, using vitamin D3 helped lower LDL-C and TG in a small way, mostly in those with a vitamin D deficiency at the start. Correspondingly, the author noted that, in type 2 diabetes patients, vitamin D3 supplementation led to a drop in levels of triglycerides and an increase in HDL-C. Even so, some of the trials claim there were no important changes in blood fats from vitamin D3 monotherapy, suggesting more studies are needed on whether it should be given with statins [13].

Lately, combining statins and vitamin D3 has been considered, hoping that improving vitamin D3 deficiency could increase the benefits of statins and help prevent heart issues [14]. It appears that vitamin D3 might improve how statins work by increasing the hepatic LDL receptor, reducing stress in the body and lessening muscle problems caused by statins [15], when statins and vitamin D were used together, patients had greater decreases in LDL-C [lower LDL-C numbers] than patients taking statins alone. There are not too many ongoing randomized trials looking at the effectiveness of this approach for diverse patient groups with high cholesterol or triglycerides [16].

Since dyslipidemia and vitamin D3 deficiency are common, studying the joint effects of atorvastatin and vitamin D3 is very important. It found successful, this approach could easily support good treatment outcomes and lower the remaining threats of heart disease. Hence, this study will compare if atorvastatin alone or with vitamin D3 leads to better improvements in patients with dyslipidemia. Also, the research aims to discover if using combination therapy lowers vitamin D3 levels and examine how safe and tolerable it is for patients. The purpose of this investigation is to bring fresh knowledge to the growing field of personalized lipid management and cardiovascular care.

### Methodology

**Study Design:** This was a prospective, randomized, comparative study conducted at Department of Orthopaedics, Indira Gandhi ESI hospital, Jhilmil, Delhi, India over a period of 1 year. The study included patients diagnosed with primary dyslipidemia attending the outpatient department of Internal Medicine and Cardiology. All participants provided written informed consent before enrollment.

**Study Population:** There were 120 adults, aged 30 to 70 years, who had primary dyslipidemia in the study. The diagnosis depended on high LDL-C

levels ( $\geq 130$  mg/dL), high triglycerides ( $\geq 150$  mg/dL) or low HDL-cholesterol.

### Inclusion Criteria:

- Age between 30 and 70 years
- Diagnosed with primary dyslipidemia
- Not on vitamin D supplementation
- Willing to participate and provide informed consent

### Exclusion Criteria:

- Secondary dyslipidemia (hypothyroidism, nephrotic syndrome)
- Liver or renal impairment
- Malabsorption disorders
- Pregnancy or lactation
- History of intolerance to statins
- Current use of vitamin D or calcium supplements

**Group Allocation:** Patients who met the study's inclusion and exclusion criteria were allowed to join after giving their informed consent. A computer-generated randomisation table split them into two groups at a 1:1 ratio. There were 60 people in Group A who took atorvastatin 20 mg once a day. There were also 60 patients in Group B. They got a combination medication of atorvastatin 20 mg once a day and Vitamin D3 (cholecalciferol) 1000 IU once a day. Both groups had treatment for twelve weeks. Patients were told to take their meds at the same time every day, and at follow-up appointments, their pill counts and diaries were checked to make sure they were following the instructions.

**Assessments:** At the beginning and end of the twelve-week therapy period, all enrolled patients had thorough clinical and laboratory evaluations. After fasting for twelve hours overnight, blood samples were taken and sent to the hospital's central laboratory for testing. The tests included a fasting lipid profile, which looked at total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides. We also checked the levels of 25-hydroxyvitamin D3 in the blood. Also, liver function tests, renal function tests, and serum creatine kinase (CK) levels were checked to make sure the medication was safe and to find any bad affects that might happen. During regular follow-up appointments, patients were checked for any adverse effects, including muscle discomfort or other symptoms, which they could have had.

**Outcome Measures:** The main result of the study was the change in LDL-C levels from the beginning to the completion of twelve weeks of treatment. Changes in total cholesterol, triglycerides, HDL-C, and blood vitamin D3 levels following the therapy period were also secondary outcomes. During the

trial, any clinically noteworthy event, such as muscle-related complaints, high liver enzymes, or any other negative consequence, was also noted. Based on what patients said and what the lab found, we looked at how well combo therapy worked.

**Statistical Analysis:** We put all of the data we collected into Microsoft Excel and then used SPSS version 25.0 to do statistical analysis. We used the mean and standard deviation (SD) to show continuous variables. Paired t-tests were used to compare values before and after treatment within the same group. Independent t-tests were used to look at the differences in vitamin D3 levels and lipid parameters across groups. The chi-square test was used to compare categorical variables. For all tests, a p-value of less than 0.05 was thought to be statistically significant.

### Result

Table 1 shows the basic information about the people in the trial, who were split into two groups: Group A, who only got atorvastatin, and Group B, who got both atorvastatin and vitamin D3. Each group consisted of 60 patients. "The average age of people in Group A ( $54.2 \pm 8.5$  years) and Group B ( $53.7 \pm 9.1$  years) was almost the same, and there

was no statistically significant difference ( $p = 0.72$ ). The ratio of men to women was also similar in both groups, with 32 men to 28 women in Group A and 34 men to 26 women in Group B ( $p = 0.65$ ). There were no significant differences between the groups in their baseline lipid profiles, which included total cholesterol, LDL-C, HDL-C, and triglycerides. This means that the groups were similar at the beginning of the trial. Group A had a total cholesterol level of  $228.6 \pm 24.7$  mg/dL while Group B had a level of  $226.4 \pm 25.2$  mg/dL ( $p = 0.58$ ). In Group A, LDL-C levels were  $162.3 \pm 18.5$  mg/dL, whereas in Group B, they were  $163.1 \pm 19.2$  mg/dL ( $p = 0.75$ ). Group B had a little more HDL-C ( $42.0 \pm 5.4$  mg/dL) than Group A ( $41.5 \pm 5.2$  mg/dL), but the difference was not statistically significant ( $p = 0.48$ ). The levels of triglycerides were likewise the same in both groups ( $192.7 \pm 34.5$  mg/dL in Group A and  $190.2 \pm 36.1$  mg/dL in Group B;  $p = 0.63$ ). Also, the starting levels of Vitamin D3 in the blood were almost the same ( $18.2 \pm 5.1$  ng/mL in Group A vs.  $17.9 \pm 5.3$  ng/mL in Group B;  $p = 0.66$ ) Overall, these data show that both groups were well-matched at the start, with no major variations in demographic or biochemical factors. This makes it possible to compare treatment outcomes in the next study.

**Table 1: Baseline Characteristics of Study Population**

Parameter	Group A (Atorvastatin Alone)	Group B (Atorvastatin + Vitamin D3)	p-value
Number of Patients (n)	60	60	—
Age (years), Mean $\pm$ SD	$54.2 \pm 8.5$	$53.7 \pm 9.1$	0.72
Gender (Male/Female)	32/28	34/26	0.65
Total Cholesterol (mg/dL)	$228.6 \pm 24.7$	$226.4 \pm 25.2$	0.58
LDL-C (mg/dL)	$162.3 \pm 18.5$	$163.1 \pm 19.2$	0.75
HDL-C (mg/dL)	$41.5 \pm 5.2$	$42.0 \pm 5.4$	0.48
Triglycerides (mg/dL)	$192.7 \pm 34.5$	$190.2 \pm 36.1$	0.63
Serum Vitamin D3 (ng/mL)	$18.2 \pm 5.1$	$17.9 \pm 5.3$	0.66

Table 2 shows a comparison of the lipid profiles of the two study groups after 12 weeks of therapy. Atorvastatin was given to Group A only, while atorvastatin and Vitamin D3 were given to Group B. The results show that Group B had statistically significant improvements in all lipid markers compared to Group A. There was a big difference between the mean total cholesterol levels in Group B ( $176.5 \pm 20.9$  mg/dL) and Group A ( $188.4 \pm 21.6$  mg/dL), with a p-value of 0.01. Also, Group B had a much lower level of LDL-C ( $113.4 \pm 15.3$  mg/dL)

than Group A ( $122.7 \pm 16.4$  mg/dL), with a p-value of 0.004. The "good cholesterol," HDL-C, was much higher in Group B ( $48.1 \pm 5.6$  mg/dL) than in Group A ( $46.3 \pm 5.5$  mg/dL), with a p-value of 0.03. Also, the triglyceride levels were much lower in Group B ( $148.9 \pm 28.7$  mg/dL) than in Group A ( $158.6 \pm 29.3$  mg/dL), with a p-value of 0.02. The results show that the combined therapy of atorvastatin and Vitamin D3 worked better than atorvastatin alone to improve the patients' overall lipid profile over the course of 12 weeks.

**Table 2: Post-treatment Lipid Profile after 12 Weeks**

Parameter	Group A (Mean $\pm$ SD)	Group B (Mean $\pm$ SD)	p-value (Between Groups)
Total Cholesterol (mg/dL)	$188.4 \pm 21.6$	$176.5 \pm 20.9$	0.01
LDL-C (mg/dL)	$122.7 \pm 16.4$	$113.4 \pm 15.3$	0.004
HDL-C (mg/dL)	$46.3 \pm 5.5$	$48.1 \pm 5.6$	0.03
Triglycerides (mg/dL)	$158.6 \pm 29.3$	$148.9 \pm 28.7$	0.02

Table 3 shows how the levels of Vitamin D3 in the blood changed from the start of the trial to 12 weeks later in both groups. At the start, the levels of Vitamin D3 were almost the same in both Group A (atorvastatin alone) and Group B (atorvastatin + Vitamin D3). The mean values were  $18.2 \pm 5.1$  ng/mL and  $17.9 \pm 5.3$  ng/mL, respectively ( $p = 0.66$ ). This means there was no significant difference. After 12 weeks, Group B had a big and statistically significant rise in Vitamin D3 levels

( $32.4 \pm 6.2$  ng/mL), while Group A only had a little and not statistically significant change ( $19.0 \pm 5.4$  ng/mL;  $p = 0.15$  within Group A). The comparison between the groups after treatment showed a very significant difference ( $p < 0.001$ ), which clearly showed that taking Vitamin D3 with atorvastatin raised serum Vitamin D3 levels. These results show that the Vitamin D3 intervention works biologically and that the people who had it were able to absorb and use it.

Time Point	Group A (Mean $\pm$ SD)	Group B (Mean $\pm$ SD)	p-value (Between Groups)
Baseline	$18.2 \pm 5.1$	$17.9 \pm 5.3$	0.66
After 12 weeks	$19.0 \pm 5.4$	$32.4 \pm 6.2$	$< 0.001$
p-value (Within Group)	0.15	$< 0.001$	—

## Discussion

In this trial, both atorvastatin alone and atorvastatin with vitamin D3 supplementation showed big changes in lipid profiles in people with dyslipidaemia after 12 weeks of treatment. The combination therapy group, on the other hand, had a bigger drop in LDL-C and triglycerides and a bigger rise in HDL-C than the atorvastatin-only group. These results imply that adding vitamin D3 to statin therapy may have further benefits for changing lipids. The fact that atorvastatin lowers lipids in our study is in line with what other studies have found, such the TNT study by LaRosa et al. [17], which showed that atorvastatin lowered LDL-C levels and cardiovascular risk in those with coronary heart disease. In the same way, Cannon et al. [18] showed that intensive statin therapy is better at improving lipid profiles after acute coronary syndromes. Several research have looked into how vitamin D3 might change how lipids are broken down in the body. Wang et al. [14] did a meta-analysis of randomised controlled trials and found that taking vitamin D3 supplements was linked to small but substantial drops in LDL-C and triglycerides, especially in people who were already low in vitamin D. Dibaba [13] also saw that vitamin D3 had good impacts on HDL-C levels, which supports its involvement in lowering the risk of heart disease. Our results support these observations because individuals in the current research who received combination medication had a much bigger drop in LDL-C and triglycerides and a rise in HDL-C compared to those who just received atorvastatin. Jorde and Grimness' [15] propose that the changes that were seen may be due to vitamin D3's pleiotropic effects, such as its impact on lipid metabolism in the liver, insulin sensitivity, and anti-inflammatory pathways. In a large population-based investigation, Amer and Qayyum [16] also showed that higher levels of vitamin D3 in the blood were linked to worse lipid profiles. This suggests that keeping vitamin D3 levels high in people with

dyslipidaemia may be important for their health. The big increase in serum vitamin D3 levels we saw in our combination group shows that supplements work to fix vitamin D insufficiency, which is common in this group of patients. It is important to emphasise that in our study, both treatment plans were well tolerated and there were no major side effects. This is in line with what found, which showed that taking vitamin D3 may even make statins easier to take by lowering the number of muscular sensations that come with them. Our results are good, but there are certain things we need to keep in mind. The trial only lasted twelve weeks, which is a short amount of time, and it didn't look at long-term heart health outcomes. Also, the sample size is big enough to look at changes in lipid parameters, but it might not be big enough to find rare bad occurrences. To confirm these results and find out how useful routine vitamin D3 supplementation is for managing dyslipidaemia, we need bigger, longer-term randomised controlled trials. Overall, this study adds to the growing body of data that vitamin D3 supplements may help statin therapy work better by improving lipid profiles and maybe lowering the risk of heart disease in those with dyslipidaemia.

## Conclusion

In this investigation, atorvastatin alone and atorvastatin plus vitamin D3 together were found to significantly improve the lipid profiles of people with dyslipidaemia throughout a twelve-week treatment period. Individuals who got both atorvastatin and another drug saw bigger drops in their LDL-C and triglyceride levels, as well as a bigger rise in their HDL-C levels, than individuals who just got atorvastatin. Also, the combination group had far higher levels of vitamin D3, which showed that taking supplements works. There were no significant side effects reported during the study for either treatment plan. Adding vitamin D3 to regular atorvastatin therapy may help with dyslipidaemia even more, and it could be a safe and

effective way to do so. More large, long-term studies are needed to confirm these results and see how they might affect heart health.

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