*Research Article*

# Evaluating Role of Clinical Pharmacist in Dietary Interventions Among Dyslipidemic Patients: A Prospective Study

**Aqsa Afzal**[*], **Syed NisarHussain Shah, Muhammad Fawad Rasool, Nabeela Ameer**

Faculty of Pharmacy, Bahauddin Zakariya University, Multan, Pakistan

## Abstract

***Purpose:*** *To investigate the effect of pharmacist dietary interventions on lipid levels of dyslipidemic patients.* ***Methods:*** *A randomized controlled trial was carried out on 266 dyslipidemic patients being studied period of 6 months in patients of Southern Punjab. Controlled group patients followed the standard medical care by the physician and intervention group followed with interventionary dietary advices by the clinical pharmacist who were based on ATP III Guidelines.* ***Results:*** *The results between the control and intervention groups were compared by using independent t-test and paired t-test using α value of 0.05. Statistically significant reductions in weight (kg) and BMI (kg/m²) were observed in both groups (p value <0.0001) but mean reductions were more in intervention group as compared to the control group (-3.47, -1.74) respectively. Similarly, significant reductions were also observed between patients of both groups in Total Cholesterol (TC), Triglycerides (TG), Low density lipoproteins (LDL) (αvalue <0.0001) but mean reductions were found increased in intervention group in comparison to control group in TC, TG, LDL (-28.77 mg/dL, -33.90 mg/dL, -25.29 mg/dL) respectively. Statistically insignificant difference was observed in High density lipoproteins (HDL) level in both intervention and control group (p-value =0.47, 0.30) respectively but mean value of intervention group increased (0.78 mg/dL) while mean value of control group decreased (-1.19 mg/dL). Slight addition in mean HDL level was noticed in intervention group 2.49 mg/dL (p value <0.0001) as compared to control group.* ***Conclusion:*** *Pharmacist dietary interventions can improve lipid levels of dyslipidemic patients.*

## Introduction

Cholesterol and triglycerides are main contents of lipids. Abnormal concentration of lipids in blood is a state called dyslipidemia (Wood *et al.*, 1991). Very important modifiable risk factor for coronary heart disease (CHD) found was dyslipidemia. Pharmacological therapy for dyslipidemia includes remedy like statins, fibrates, bile acid sequestrants, omega 3 - acid ethyl esters, cholesterol absorption inhibitors and nicotinic acid derivatives. Non pharmacological therapies produce extended beneficial effects on the lipid profiles and have no adverse effects (Ferdinand, 2004). Most common side effects of statin therapy are muscle related symptoms (Barry *et al.*, 2018). Clinical Pharmacist can help dyslipidemic patients in management of non-statin therapy (Sisson *et al.*, 2018). Characteristics of dyslipidemia involve;

increased serum level of LDL, decreased serum level of HDL, Raised level of TG (Martin *et al.*, 1986). Abnormalities in lipid levels were most common in males under 40 years of age with 60% frequency than in females under 50 years of age with 60% frequency. This disorder is produced due to faulty synthesis of LDL receptors because of which clearance of LDL cholesterol is weaken which leads to premature CHD due to increased levels of plasma LDL (Goldstein *et al.*, 1973). Lipid abnormality is seen in more than 50% of hypertensive patients. Significant morbidity or mortality is reported in patients suffering from obesity(Lungu *et al.*, 2001). The excess coronary risk from diabetes becomes greater due to other risk factors, which includes smoking, HTN, and obesity (Manson *et al.*, 1991).

NCEP includes therapeutic life style changes in dietary habits which includes reduce 25 t0 35% of the fats of total daily energy, 7% reduction in saturated fat intake of total

**\*Corresponding Author:** Aqsa Afzal
**Address:** Faculty of Pharmacy, Bahauddin Zakariya University, Multan Pakistan
**Email address:**aqsaafzalpharmacist@gmail.com

daily energy and limiting cholesterol utilization to 200 milligrams per day (Williams, 2002). In hypercholesterolemic children if saturated fat intake limitized to 7% to 10% of total calories and dietary intake of cholesterol limitized to 300mg/day it has bring down reduction in TC and LDL levels (FOR and CHILDREN, 2011)

**Tang** proves that modification of dietary fat intake and brought about 5.3% reduction in total cholesterol levels in the intervention group of patients who followed the dietary advice by the physicians (Tang *et al.*, 1998). Dietary life style modifications by AHA suggest that larger proportion of person's diet should be vegetables, fruits, rich fiber foods, whole grains and oily fish at least two times a week. Intake of saturated fats should be less than 7% of total energy, trans fats should be less than 1% of the total energy and cholesterol consumption should be less than 300 mg/day will reduce the development of heart diseases and heart diseases are a major cause of morbidity and mortality in USA (Lichtenstein *et al.*, 2006).

Diets containing low saturated fat collaborated with exercise and nutritional supplements for example fish oil, plant sterol or oat bran supplementation collaborated with exercise are useful in treating dyslipidemia (Varady and Jones, 2005).

It is revealed by **Pasternac,** in 1990 that risk for a CHD is reduced by 3% in women and 2% in men for every 0.026 mmol/L increase in HDL-C (Pasternak *et al.*, 1990).Use of lipid-lowering diet, along with appropriate drug treatment (if required), in men with CHD is helpful in reducing serum cholesterol concentrations (Watts *et al.*, 1992). Dietary intervention have reduced LDL-C levels by 10% and as many as

approximately 12.7 million which is 7% of all adult Americans would use cholesterol lowering drugs (Sempos *et al.*, 1993). **Hernández,** recommended 3.5 g daily consumption of green tea for the prevention of coronary heart disease. Catechins are the principal flavonoids present in green tea. Catechins play very important role in treatment of cardiovascular disease (CHD). Catechins decrease the cholesterol absorption from intestine and reduce its levels in serum also. Catechins inhibit LDL oxidation by having powerful free radical-scavenging activity. Catechins inhibit platelet aggregation so they have also the antithrombotic activity. They reduce both systolic and diastolic blood pressure (Hernández *et al.*, 2004).

Main objective of the study is to highlight the importance of Pharmacist in controlling lipid levels of dyslipidemic patients.

## MATERIAL & METHOD

Present study was conducted in Southern Punjab (Pakistan) for 6 months duration in two main health care units of Multan. A special *questionnaire was being designed to record patient data. A designed Questionnaire* had some open and close ended questions including all information related to patient's demographic data, height, family history, current illness of taking medicines and diseases were noticed. Data about life styles including smoking, diabetes, dietary habits, cholesterol food intake details were also collected from patient. Main parameters of study were Weight, BMI, TC, TG, LDL and HDL.

### Inclusion criteria

1. Patients of dyslipidemia and willing to participate in the study and agreed to follow the instructions.

2. Male and female patients according to age groups higher than 25 years.
3. Patients fall down in one of the following category was included in the study.

| | | | |
|---|---|---|---|
| • TC level | ≥ | 200 mg/dL | |
| • LDL level | ≥ | 100 mg/dL | |
| • Triglycerides level | ≥ | 150mg/dL | |
| • HDL level | | In ♀ ≤ 50 mg/dL and in ♂ ≤ 40 mg/dL | |

## Study design

Pharmacist supervised randomized control trial during 2012, March to 2012, October. Total (n = 266) patients took part in this study, 133 patients in each group. About 11 participants of control group and 14 participants of intervention group had given up the study for unknown reasons. Patients of controlled group had received standard medical care from physician while participants of intervention group obeyed the instructions given by pharmacist combined with physician in management of dyslipidemia through dietary interventions (interventions comprised of a diet lower in saturated fats and contained whole cereals. This diet was higher in viscous fibers, plant sterols, soy protein, nuts, fruits, vegetables, garlic, pomegranate and ginger. Patients are being motivated by counseling to follow the nutrition plan by the pharmacist for duration of 6 months. This counseling was delivered every month in hospital or by phone calls to those patients who are not able to come for monthly check up.

## Interventionary Guidelines

All dietary interventions were as per nutritional guidelines from the 3rd edition of recommendations of National Cholesterol Education Program. Dietary guidelines and AHA dietary life style recommendations which includes following;

- Cholesterol daily intake must be less than 200mg.
- Plant sterols intake must be 2g/day.
- Soluble fiber intake should be 10-25g/day.
- Person should do moderate exercise to burn 200 kcal/day.
- Incorporate oily fish to your diet which is rich in omega3 fatty acids.
- Incorporate barley, psyllium seeds, grape fruit, pomegranate, mint, ginger, garlic, orange, lemon, green tea, carrots, beans, berries, fish and skimmed milk to your diet.
- Avoid intake of trans fats and saturated fats, processed meats, soft drinks, alcohol, bakery products (muffin, cakes, doughnuts) (Sempos *et al.*, 1993, Lichtenstein *et al.*, 2006).

## Statistical analysis

It was being performed by using SPSS version 17.0 IBM, USA software. Level of significance was p=0.05 used in the study. Randomization was being determined by contrasting baseline values between both groups through independent t-tests. Final results of variables among intervention and control groups were being analyzed by using paired sample t-tests.

## RESULTS

Distinction in weight, BMI, LDL, HDL, TC and TG were noticed after 6 months in both groups.

## Weight

Weight reduction in control group was found insignificant in controlled group after six months (-0.21kg, p value =0.79) while significant reduction in weight was observed among intervention group was (-3.25 kg, p value <0.0001), Table 1. Statistically significant difference was observed between control and intervention group mean

reduction in intervention group was more as compared to control group (-3.47 kg, p value <0.0001), Table 2.

## BMI

BMI reduction in control group was found insignificant in controlled group after six months -0.12 kg/m$^2$ with p value =0.69, while observed significant reduction was more in BMI in intervention group (-1.61kg/m$^2$, p value <0.0001), Table 1. statistically significant difference was observed between control and intervention group mean reduction among intervention group was more as contrast to control group (-1.74 kg/m$^2$, p value <0.0001), Table 2.

## Total Cholesterol (TC)

Statistically significant difference observed in total cholesterol levels among patients of intervention and control group {(-41.98, p value <0.0001), (-15.04 mg/dL, p value =0.00)} respectively, Table 1. More significant reduction in TC was observed among patients of intervention in contrast to control group (-28.77 mg/dL, p value <0.0001), Table 2.

## Triglycerides (TG)

Statistically significant difference observed in triglycerides levels among participants of control group and intervention group {(-14.32 mg/dL, $\alpha$ =0.00), (-51.47, $\alpha$<0.0001)} respectively, Table1. More significant reduction in TG was observed among participants of intervention in contrast to control group (-33.90 mg/dL, p value <0.0001), Table 2.

## Low density lipoproteins (LDL-C)

Statistically significant difference observed in LDL level among participants of control and intervention group {(-11.74 mg/dL, p value =0.00), (-34.9, p value <0.0001)} respectively, Table 1. More significant reduction in LDL was observed in patients

of intervention group as compared to control group (-25.29 mg/dL, p value <0.0001), Table 2.

## High density lipoproteins (HDL-C)

Statistically insignificant difference observed in HDL levels among participants of control and intervention group {(-1.19 mg/dL, p value =0.30), (0.78, p value =0.00)} respectively, Table 1. Slight increase in mean level observed in participants of intervention in contrast to control group. Statistically notable difference observed in HDL level in participants of intervention in contrast to control group (2.49 mg/dL, p value <0.0001), Table 2. Significant increase in mean HDL level among patients of intervention group was being observed in comparison to control group.

## Compliance level

Compliance level was also measured among patients of intervention group. Classification in compliance level is given below;

| Excellent compliant | : | Patients who followed pharmacist dietary guidelines 80 to 90% |
|---|---|---|
| Good compliant | : | Patients who followed pharmacist dietary guidelines 60 to 80% |
| Partial compliant | : | Patients who followed pharmacist dietary guidelines 40 to 60% |
| Non compliant | : | Those patients who had not follow pharmacist dietary guidelines |

About 10 % patients among intervention group had left study due to unknown reasons.
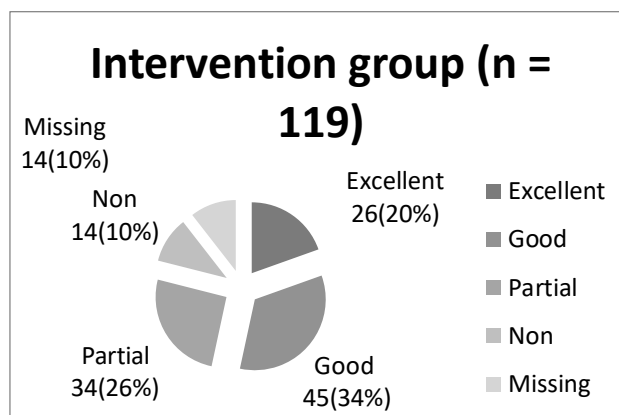


Intervention group (n = 119)

**Figure 1:** Difference Percentage Compliance level     among patients of intervention group

**Table 1:** Statistical difference in outcomes among control and intervention group from zero to six months

| Parameters | Controlled Group (n = 133) | | | Intervention group (n = 133) | | |
|---|---|---|---|---|---|---|
| | Starting Means of parameters | Ending means of parameters | Mean differences from baseline and 95% CI, p value | Starting Means of parameters | Ending means of parameters | Mean differences from baseline and 95% CI, p value |
| Weight (kg) | 74.68 ± 6.72 | 74.47± 6.41 | -0.21, 0.79 | 77.77± 6.68 | 74.52± 6.74 | -3.25, <0.0001 |
| BMI (kg / m²) | 28.95 ± 2.57 | 28.83± 2.49 | -0.12, 0.69 | 31.75± 3.06 | 30.14± 2.98 | -1.61, <0.0001 |
| TC (mg / dL) | 192.57 ± 31.98 | 177.53± 23.42 | -15.04, 0.00 | 223.24± 34.99 | 181.26± 31.21 | -41.98, <0.0001 |
| TG (mg / dL) | 157.61 ± 45.10 | 143.29± 35.09 | -14.32, 0.004 | 193.27± 96.97 | 141.80± 60.69 | -51.47, <0.0001 |
| LDL (mg / dL) | 119.18 ± 25.52 | 107.44± 16.96 | -11.74, 0.00 | 150.58± 27.97 | 115.68± 25.39 | -34.9, <0.0001 |
| HDL (mg / dL) | 38.69 ± 9.75 | 37.50± 8.46 | -1.19, 0.30 | 36.30± 8.84 | 37.08± 8.68 | 0.78, 0.47 |

**Table 2:** Comparison of mean and statistical difference between controlled and intervention group after 6 months

| Parameters | Controlled  Group (n = 122) Mean Differences from baseline | Intervention group (n = 119) Mean differences from baseline | Mean differences between controlled & intervention group and 95% CI, p value |
|---|---|---|---|
| Weight | 0.05 kg | -3.42kg | -3.47,<0.0001 |
| BMI | 0.015 kg/m² | -1.72kg/m² | -1.74,<0.0001 |
| TC | -12.84 mg/dL | -41.62 mg/dL | -28.77,<0.0001 |
| TG | -11.05 mg/dL | -44.96 mg/dL | -33.90,<0.0001 |
| LDL | -9.10 mg/dL | -34.40 mg/dL | -25.29,<0.0001 |
| HDL | -1.77mg/dL | 0.71 mg/dL | 2.49,<0.0001 |

**Table 3:** Differences among characteristics of variables from zero to six months

| | Intervention group at 0 month Mean ± SD Range = Max- Min | Intervention group after 6 months Mean ± SD Range = Max- Min | Controlled group at 0th month Mean ± SD Range = Max- Min | Controlled group after 6 months Mean ± SD Range = Max- Min |
|---|---|---|---|---|
| Weight (kg) | 77.77 ± 6.68 92-56 | 74.52 ± 6.74 92-56 | 74.68 ± 6.72 89-57 | 74.47 ± 6.41 89-58 |
| BMI level (kg / m²) | 31.75 ± 3.06 51.82-22.6 | 30.14 ± 2.98 37.14-20.7 | 28.95 ± 2.57 34.4-23 | 28.83 ± 2.49 34.4-22.75 |
| TC (mg / dL) | 223.24 ±34.99 345 - 145 | 181.26 ± 31.21 267-130 | 192.57 ± 31.98 288-123 | 177.53 ± 23.42 262-122 |
| TG (mg / dL) | 193.27 ± 96.97 500-77 | 141.80 ± 60.69 369-64 | 157.61 ± 45.10 281-75 | 143.29 ± 35.09 216-84 |
| LDL (mg / dL) | 150.58 ± 27.97 203-90 | 115.68 ± 25.39 185-70 | 119.18 ± 25.52 188-71 | 107.44 ± 16.96 164-71 |
| HDL (mg / dL) | 36.30 ± 8.84 67-21 | 36.83 ± 9.05 67-9 | 38.69 ± 9.75 68-21 | 37.50 ± 8.46 61-21 |

## DISCUSSION

Dietary interventionary guidelines for intervention group were in accordance with

national cholesterol education program ATP(Sempos *et al.*, 1993).Table 4 is describing the baseline characteristics of both groups. Table 3 is describing the characteristic difference in ranges and mean among all the variables from the start to end of the study after completing six months individually among control & intervention group.

Results of the present study can be related to the studies by **Shai** where mean weight reduction was 2.9 kg in individuals consuming low fat diet and about 4.4 kg mean reduction in weight was found in subjects using Mediterranean diet and 4.7 kg for the low-carbohydrate group ($\alpha<0.001$) (Shai *et al.*, 2008). Studies by **Varady** proved that exercise significantly decreased percentage of body fat by 3.9% (P<0.01) and 7.5% increase in HDL level was observed($\alpha< 0.01$) (Varady and Jones, 2005). **Hermann**, conducted a study on 35 male patients of CAD. Patients were given 12g/day fish oil for 4 weeks. In the end of study they noticed about 14.2%, 12.2% and 16% reduction in apolipoprotein B, TC and TG levels respectively(Herrmann and Kostner, 1995). **Fahlman,** who after six weeks observed 20% increase in HDL levels

with aerobic exercise training program (Fahlman *et al.*, 2002). **Bursill,** conducted a study on hamsters, mice and rats. He administered the crude catechin extract in 0, 0.5, 1 and 2% w/w for four weeks to animals which resulted in 60% reduction in plasma TC, 80% reduction in plasma LDL. Significant boost in hepatic LDL receptor activity (80%) was observed. It was summarized that green tea extract retards production of cholesterol. Cholesterol absorption is inhibited from the intestines and in liver it increases the activity of LDL receptors (Bursill *et al.*, 2007). Main strategy to reduce the TG levels is low intake of carbohydrates with increased intake of plant sterols, red yeast rice and soy protein bring improvement in lipid levels of dyslipidemic patients (Anagnostis *et al.*, 2018). Consumption of 25 grams per day of dietary fiber and incorporation of whole grains, fruits, vegetables instead of noodles, alcohol and meat reduce the risk of cardiovascular diseases (Doo and Kim, 2016). There is a strong evidence that cardiovascular disease risk decrease with reduction in LDL cholesterol level (Russell *et al.*, 2018)

**Table 4:** Baseline characteristics of each study group

| Parameters | | Controlled group n = 133 | Intervention Group n = 133 |
|---|---|---|---|
| Gender (%) | Male | 61.7 | 63.2 |
|  | Female | 38.3 | 36.8 |
| Age (Years) | Mean ± SD | 50.32 ± 6.60 | 54.59 ± 7.77 |
|  | Range | 32 – 65 | 28 – 82 |
| Height (cm) | Mean ± SD | 160.75 ± 6.02 | 157.67 ± 5.81 |
| Weight (kg) | Mean ± SD | 74.68 ± 6.72 | 77.77 ± 6.68 |
|  | Range | 57 – 89 | 56 – 92 |
| BMI | Mean ± SD | 28.95 ± 2.57 | 31.75 ± 3.06 |
|  | Range | 23 – 34.4 | 22.6 – 51.82 |
| % > IBW | Mean ± SD | 24.52 ± 8.82 | 31.78 ± 7.49 |
|  | Range | 3 – 42 | 3 – 58 |
| Marital status (%) | Married | 95.5 | 98.5 |
|  | Unmarried | 4.5 | 1.5 |
| Smoking status | Yes | 28.6 | 27.1 |

| (%) | No | 71.4 | 72.9 |
|---|---|---|---|
| Cholesterol food intake (%) | High | 71.4 | 40.6 |
| | Low | 28.6 | 59.4 |
| Area of residence (%) | Rural | 24.8 | 22.6 |
| | Urban | 75.2 | 77.4 |
| Diabetic status (%) | Yes | 39.8 | 40.6 |
| | No | 60.2 | 59.4 |

## CONCLUSION

This prospective study proved that through dietary interventions clinical pharmacist can improve lipid levels among dyslipidemic patients. It further proclaimed that if pharmacist and physician collaborate together for clinical management of patients suffering from dyslipidemia we can get better outcomes. Thus it is a need of the time to organize "Lipid Clinics" in developing countries like Pakistan. Lipid clinics will deliver the facility to treat dyslipidemia its diagnosisand treatment of genetic defects in metabolism of lipoprotein which can't be treated with normal pharmacological remedy. Pharmacist along with physician can motivate patients to take lipid lowering diet and improve dyslipidemic patient awareness about their diet which will reduce dyslipdemia related morbidity.

## CONFLICT OF INTREST

Authors have no conflict of interest to declare.

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