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THERAPEUTIC EFFECT OF SESAMUM INDICUM L. SUPPLEMENTATION ON BLOOD LIPID PROFILE AMONG MILD TO MODERATE HYPERLIPIDEMIC PATIENTS

Misbah Arshad[1*], Shahnai Basharat [1], Shahid Bashir[2], Maimoona Ashfaq[1]

[1] University Institute of Diet and Nutritional Science, Department of Allied Health Sciences, The University of Lahore, Lahore, Pakistan.

[2] University Institute of Diet and Nutritional Science, Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan.

Article Info

*Corresponding Author
Email: Fatimamisbah10@gmail.com

Abstract

Objectives: To find out the therapeutic effect of Sesamum indicum L. supplementation on blood lipid profile among mild to moderate hyperlipidemia patients.

Methodology: A total of 30 milds to moderate hyperlipidemic patients aged 25-40 years were selected for the 4 weeks of study. The sample was selected from the university of Lahore teaching hospital, Lahore. Sesamum indicum L. seeds were roasted at 200ºC for 15 minutes in hot air oven. After roasting seeds were ground into fine powder by using commercial blender. Patients were informed to consume 40mg of Sesamum indicum L. supplementation daily and follow basal diet plan for 4-weeks. The anthropometric measurements, biochemical evaluation (lipid profile) and dietary intake data were collected.

Results: The mean age group of Hyperlipidemic patients enrolled in study was 32.033 ± 4.895 years. There was a significant reduction in Low density lipoprotein (LDL) and Cholesterol levels with p-value less than 0.05. But no change in Triglycerides levels was observed (p-0.343). High density lipoprotein levels were also improved from 41.8±3.31mg/dl to 46.26±2.29mg/dl.

Conclusion: The study concluded that Sesamum indicum L. supplementation showed a significant improvement in hyperlipidemic condition. The study found an increase in high density lipoprotein among patients.

Keywords
Sesamum indicum L, Blood Lipid Profile, Sesamol, Lipid Peroxidation, Lipid Ameoliorating Effect

1. Introduction

Hyperlipidemia is a medical term for abnormally high levels of fats (lipids) in the blood. The two major types of lipids found in the blood are triglycerides and cholesterol (Clebak and Dambro, 2020). Triglycerides are made when body stores the extra calories it doesn't need for energy. They also come directly from diet in foods such as red meat and whole-fat dairy. A diet high in refined sugar, fructose, and alcohol raises triglycerides (Sarfraz *et al.,* 2016). Cholesterol is produced naturally in liver because every cell in body uses it. Similar to triglycerides, cholesterol is also found in fatty foods like eggs, red meat, and cheese. Hyperlipidemia is more commonly known as high cholesterol. Although high cholesterol can be inherited, it's more often the result of unhealthy lifestyle choices (Brooks and Schindler, 2019). Hyperlipidemia is reported to be closely associated with the pathophysiology of Coronory heart diseases. It is considered as a major, independent, and modifiable risk factor for atherosclerotic cardiovascular disease (Elia M, 2013; Kong *et al*., 2014). Atherosclerosis, angina, impaired lipid metabolism and myocardial infarction are most common conditions of hyperlipidemia (Qudoos *et al.,* 2016). Hyperlipidemia is the leading cause of death in both the developed and developing countries worldwide, accounting for 16.7 million deaths/y worldwide (Burkhardt R, 2019). Prevalence of hyperlipidemia in the Pakistani population is 63%. The study population displayed irregularities in at least one major lipid-fraction including total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), or triglycerides (TG). The most common form of isolated-dyslipidemia was low HDL-C (17.3%) (Zaid and Hasnain, 2018). Different pharmaceutical plants are used to prevent and ameliorate hyperlipidemia. Sesame seed plant is one of these pharmaceutical plants. Sesame (Sesamum indicum L.) belongs to family Pedaliaceae and cultivated both in subtropical and tropical regions (Nzikou *et al*., 2009). According to previous studies biological activities of ''sesamin'' active ingredient of sesame seeds is inhibition of the activity of Acyl-CoA reductase, reduction of intestinal cholesterol absorption and inhibition of lipid per oxidation. Several animal studies have confirmed that an adequate intake of sesame seeds or sesamin lower lipids, cholesterol and glucose levels (Hernández-Ortega, *et al.,* 2012). Sesame seed lignans also increase the excretion of cholesterol and reduce its synthesis by inhibiting lipogenesis in liver (Aondona, *et al.,* 2021). It has been proved that a diet rich in MUFAs and PUFAs increase the rate of thermogenesis in body (Awad and Al-Shaye, 2014).

2. Material and Methods

Interventional Non-randomized (quasi Experiment) with pre-, post-test.

2.1. Subjects

Interventional Non-randomized (quasi Experiment) study designed to check therapeutic effect *Sesamim Indicum L. supplementation.* A

total of 30 milds to moderate hyperlipidemic patients aged 25-40 years were selected for the 4 weeks of study. The sample was selected from the university of Lahore teaching hospital, Lahore.

2.2.Procurement and preparation of Sesamum indicum L. supplementation

White sesame seeds (*Sesamum indicum L.*) were purchased from local market. After removing physical contaminants like dirt, dust and foreign grains sesame seeds were roasted at 200ºC for 15 minutes (Nadeem *et al.,* 2015) in hot air oven. After roasting seeds were ground into fine powder by using commercial blender. Then Sesame seed powder was shifted into air tight jars.

2.3. Treatment plan

2.3.1. Screening

The participants who meet the study inclusion criteria were enrolled in the study. Blood samples were collected by the hospital lab assistant. The baseline data were comprised of blood lipid profile (HDL, LDL, TC, TG), anthropometric measurements and 24-hour dietary recall. After that the participants were advised to use 40g *Sesamum indicum L* supplement for 4 weeks (Sankar *et al.,* 2005). Participants were also advised to follow the given 7-day diet plan over the course of study.

Table 1: Sesamum indicum L Supplement Dosage

Sesamum indicum L. supplement	40g
Frequency	Daily
Duration	4 weeks
Target Group	Hyperlipidemic Patients

2.3.2. Follow up

The follow ups for patients were conducted twice a week. The anthropometric measurements were collected in each follow up. Participants were asked for facing any constraints and barrier to follow the study procedure.

2.3.3. Post study data

After 4 weeks of study the same protocol of baseline visit were conducted. The baseline and post-test study data were compared to test the study hypothesis.

3. Results

Table 1.1: Average age distribution of Hyperlipidemic patients enrolled in study

	Mean± SD	Minimum	Maximum
Age	32.0336±4.89	25	39

The mean age of Hyperlipidemic patients enrolled in study are presented in the Table 1.1. The mean age of participants was 32.66 years with standard deviation 4.89.

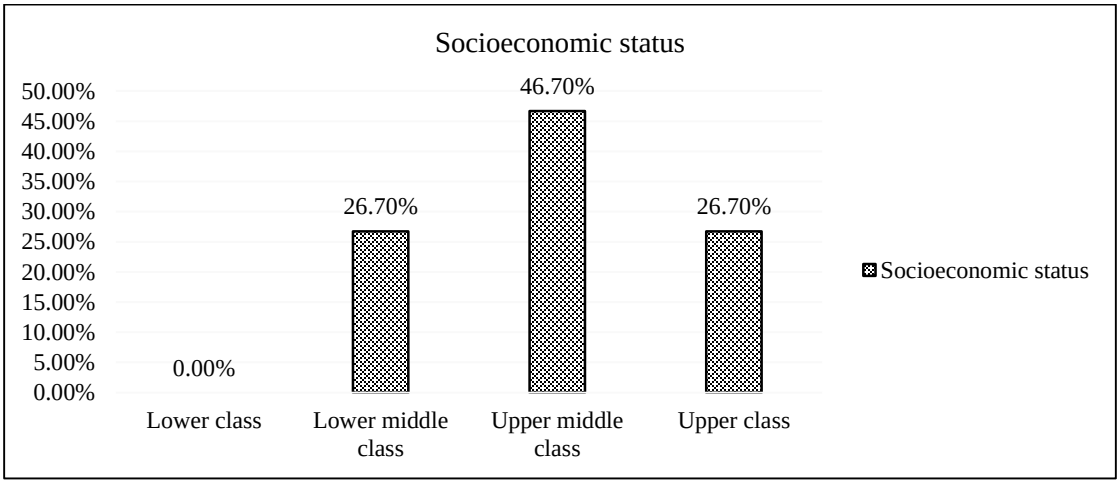

Figure. 1.1: Average socioeconomic status among hyperlipidemic patients

In this study 46.7% participants were belonged to upper middle class and 26.7% from lower middle class while remaining 26.7% were from upper class.

Table.1.2. Comparison of average Low-Density Lipoprotein (LDL) pre and post treatment

Treatment		Mean± Standard Deviation	Paired sample t-test (p-value)
Sesame seed supplementation	**Pre**	166.00±2.04	0.000
	Post	162.26±1.84	

The mean LDL of patients was 166.00±2.04mg/dl before the treatment, whereas the mean LDL after treatment was 162.26±1.84mg/dl. Findings showed statistically significant difference in pre and post treatment with p-values 0.00.

Table.1.3: Comparison of average High-Density Lipoprotein (HDL) level pre and post treatment

Treatment	Mean± Standard Deviation	Median (IQR)	Wilcoxon (p-value)

Sesame seed supplementation	**Pre**	41.8±3.317	42.0(14.25)	0.001
	Post	46.26±2.29	45.0(8)	

The mean HDL of patients was 41.8±3.317mg/dl, whereas the mean HDL after treatment was 46.26±2.29mg/dl. The median was 42.0(14.25) before treatment and the median after treatment was 45.0(8). Findings showed statistically a significant difference in pre and post treatment with p-value 0.001.

Table.1.4: Comparison of average Cholesterol level pre and post treatment

Treatment		**Mean± Standard Deviation**	**Median (IQR)**	**Wilcoxon (p-value)**
Sesame seed supplementation	**Pre**	228.50±2.12	232.00(17.25)	0.015
	Post	220.36±1.68	223.00(18.25)	

The mean Cholesterol of patients was 228.50±2.12mg/dl before the treatment, whereas the mean Cholesterol after treatment was 220.36±1.68 mg/dl. The median was 232.00(17.25) before treatment and after treatment was 223.00(18.25). Findings showed statistically a significant difference in pre and post treatment with p-value 0.015.

Table.1.5: Comparison of average Triglycerides level pre and post treatment

Treatment		**Mean± Standard Deviation**	**Median (IQR)**	**Wilcoxon (p-value)**
Sesame seed supplementation	**Pre**	217.83±1.964	213.5 (65.75)	0.343
	Post	217.46±1.885	207.5(61.75)	

The mean triglycerides of patients were 217.83±1.964 mg/dl, whereas the mean triglycerides after treatment was 217.46±1.885 mg/dl. The median was 213.5 (65.75) before treatment and after treatment was 207.5(61.75). Findings showed that there was not statistically significant difference in pre and post treatment with p-values 0.343.

4. Discussion

Hyperlipidemia is the leading cause of death in both the developed and developing countries worldwide, accounting for 16.7 million deaths/y worldwide. Migrant studies clearly show that individuals of South Asian (India, Pakistan, Bangladesh) descent are particularly vulnerable to hyperlipidemia when moving to affluent countries, with rates at least 1.5- to 2-fold higher

compared with native whites (Qudoos *et al.*, 2016). There are many interventions that has been introduced and approved by the health authorities to reduce hyperlipidemia and among those major influence is given to the dietary interventions. Different pharmaceutical plants are used to prevent and ameliorate hyperlipidemia. Sesame seed plant is one of these pharmaceutical plants (Shasmitha, 2015; Terefe *et al.*, 2012). Existing analysis shows that sesame seeds and its derivatives are used for many health complications such as it helps to control blood pressure and prevents lipid per oxidation (Annema *et al.*, 2016). Another study was conducted to find out the therapeutic effect of Sesamum indicum L. supplementation on blood lipid profile among mild to moderate hyperlipidemic patients. In the present study, sesame supplementation was prepared for the evaluation of effectiveness in reducing hyperlipidemia among mild to moderate hyperlipidemic patients visiting the university of Lahore teaching hospital. The formulation of sesame supplementation was developed by following the similar work performed by Sankar D and his colleagues (Sankar *et al.*, 2005) on analyzing the potential of sesame seed for using it as a therapeutic agent in certain health conditions. It has been evaluated that Sesamum indicum helps to reduce lipids levels. In a previous study after consuming sesame seed powder blood lipids level were significantly reducing and antioxidants levels were also improved as compare to initial levels. LDL-cholesterol level was reduced from 182.9 ± 27.9 to 165.6 ± 29.6 with p-value less than 0.05. Total cholesterol levels were also reduced (262.2 ± 24.8 to 245.5 ± 22.3) with p-value less than 0.005 (Chen et al., 2005). Current findings show also reduction in LDL level (166.00±2.04 mg/dl to 162.26±1.84 mg/dl) with p-value 0.000. Shishehbor F and his colleagues also investigated therapeutic impact of sesame consumption along with healthy diet but there was no significant reduction in BMI, lipid profile, triglycerides levels and lipid accumulation products which leads toward further investigations. While results of this study showed a remarkable reduction in total cholesterol levels from 228.50±2.12 mg/dl to 220.36±1.68 mg/dl with p-value 0.015 (Shishehbor *et al*., 2015). In a study there was no significant difference in triglycerides levels after consuming sesame supplementation (101.0 ± 35.1-100.9 ± 43.3). But another study indicated a remarkable improvement in serum cholesterol, triglycerides, high sensitive C-reactive protein, fasting blood glucose and melonaldehydes levels in group 1(sesame seed oil enriched with vitamin E) with p value 0.02 (Farajbakhsh *et al*., 2019). In present study the mean triglycerides level of patients was 217.83±1.964 mg/dl, whereas the mean triglycerides after treatment was 217.46±1.885 mg/dl. Findings showed that there was no statistically significant difference in pre and post triglycerides with p-values 0.343 shown in table 1.5. Black sesame seed also has great impact on lipid profile, in this study there was

about 128.52% reduction in triglycerides levels (El-baz *et al*., 2015).

5. Conclusion

The study concluded that Sesamum indicum L. supplementation showed a significant improvement in hyperlipidemic condition. The study found an increase in high density lipoprotein among patients.

Conflict of Interest

Authors declared no conflict of interest

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