EFFECT OF STATIN AND LUBRICANTS IN PATIENTS WITHMEIBOMIAN GLAND DYSFUNCTION AND DRY EYES ASSOCIATED WITH DYSLIPIDEMIA

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ABSTRACT

Purpose: The objective of this research was to find out the impact of statin use and causing dry eyes and MGD associated with dyslipidemia.

Methodology: Quasi-Experimental study was conducted at Al-Nafees Hospital, Islamabad with a non-purposive sampling technique. The study comprised 100 participants who met the specified inclusion criteria. Group I included 50 patients who were advised to take statin along with eye lubricant thrice a day for a time period of 90 days. Group II consisted of 50 patients who took only statin for treatment of dyslipidemia. All the participants were diagnosed case of dyslipidemia. Dry eyes assessment was performed by using Schirmer test and Tear Break up Time, and MGD was assessed using meiboscores. All assessments were carried out at the three follow-ups. First at the baseline at second follow-up (after one month of treatment) and third follow-up (after three months when treatment was completed).

Results: 83% of subject belongs to age group 41-45 and17% in age group36-40. Gender wise 53% male and 47% females. The mean scores of TBUT test were statistically significant within the groups (P-Value=0.00). Results of Schirmer Test at the baseline, first and second follow up. Significant differences were found at the baseline (P-Value= 0.008). MGF were statistically significant within the groups (P-Value=0.00). No significant association was found among cholesterol level and Schirmer test as (P-Value=0.096). For TBUT no significant differences were found at the baseline (P-Value= 0.324) and first follow up (P-Value=0.286) significant differences were present among the study groups at the second follow up (P-Value: 0.00).

Conclusion: The study has concluded with a finding that significantly improved results were observed in terms of OSDI score and tear-break-up time in the patients who had used lubrication for dry eyes with statins for dyslipidemia.

Keywords: Dry eyes, Dyslipidemia, lubricants, statin, Cholesterol

1. INTRODUCTION

Dyslipidemia is characterized by an abnormal balance of lipids in the body, specifically cholesterol, triglycerides, low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein (HDL). This disorder, which can be caused by one's diet, their exposure to cigarettes, or their genetics, can progress to cardiovascular disease, which can have severe implications. Dyslipidemia is a medical condition characterized by increased levels of triglycerides, low-density lipoprotein cholesterol, and total cholesterol, in addition to decreased levels of high-density lipoprotein cholesterol. This condition is a major risk factor for atherosclerosis, a pathological process that can lead to a variety of heart diseases. (1). The intestines are responsible for the absorption of lipids like cholesterol and triglycerides, which are then carried throughout the body by lipoproteins. These lipids are used in the production of bile acid, steroid hormones, and energy. Triglycerides, high-density lipoprotein, low-density lipoprotein cholesterol (LDL-C), and cholesterol are the main contributors to these routes (HDL). Any of these components are out of balance, whether brought on by organic or inorganic causes, might contribute to the development of dyslipidemia (2). There are a number of disorders that can be inherited and that tend to run in families that can lead to dyslipidemia. The majority of cases of familial hypercholesterolemia, LDL receptor autosomal dominant mutations, which result in an increase in LDL-C levels, are responsible for this (3). Changes in cholesterol and triglyceride levels are its defining characteristics. The condition may run in families as a genetic disorder, or it may be brought on by a fatty diet, a sedentary lifestyle, type 2 diabetes, or other long-term conditions that harm the liver (4). Several different practices related to health can have an effect and raise lipid levels. Use of tobacco products, inactivity, unhealthy eating patterns, and obesity are a few examples. To be more specific, nutritional risk factors include an inadequate eating of vegetables, fruits, nuts, and seeds, as well as an excessive consumption of saturated fats (5). There are a number of genetic conditions that can lead to dyslipidemia. The majority of cases of familial hypercholesterolemia are caused by mutations in LDL receptors that are autosomal dominant raising the amount of total LDL-C as a result. It has been discovered that despite being much less frequent, the cholesterol pathway has more mutations (3).

History is essential for identifying those who are at risk. Cigarette usage and the absence of dietary supplements would be the most important components of social history. It is critical in order to determine which patients should start taking statins and which ones need primary

prevention as rather than secondary prevention. Last but not least, family history is essential for determining familial hypercholesterolemia. The assessment of the body's physical condition is restricted in dyslipidemia conditions (6). The incidence of dyslipidemia is seen to rise with advancing age. In the United States, it was projected that among 2005 and 2008, 33.5% of persons older than 20 had elevated LDL-C levels. Among those with increased LDL-C levels, only 48.1% sought medical attention, and only 33.2% were successful in bringing their LDL-C levels under control. The proportion of people whose LDL-C levels were under control appeared to be lowest among those who lacked health insurance, were of Mexican ancestry, or had incomes that fell below the federal poverty line (8).

Non-communicable illnesses have surpassed infectious diseases is the main reason of death in a number of states located in the Asia Pacific area. These nations have progressed from a situation in which infectious diseases were the primary reason for mortality (8, 9). Cardiovascular disease (CVD) is becoming more widespread and factors contributing to this growth include rising rates of dyslipidemia, diabetes, obesity, and hypertension in the Asia Pacific area. These conditions are the direct result of fast urbanization, changes in dietary habits, high smoking rates, and a decline in the amount of time spent engaging in physical activity (10, 11). Dyslipidemia is a disorder marked by abnormally higher level of lipids in the blood and a significant contributory hazardous factor for atherosclerosis, which affects both large and medium-sized arteries and can result in ischemia in the heart, brain or legs. Higher blood levels of triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), total cholesterol (TC), and high-density lipoprotein cholesterol (HDL-C), as well as lower levels of HDL-C, raised the likelihood of developing heart disease (12).

The World Health Organization (WHO) reported that dyslipidemia was significantly more common in Southeast Asia (30.3%) and the Western Pacific (36.7%) than it was in Europe (53.7%) and the Americas (47.7%). which has been defined as blood levels of TC > 5 mm/L [190 mg/dL]. These estimates were based on data collected in 2008 (13).

Dyslipidemia is classified into two types: primary, which is most common in children and has a genetic basis, and secondary, which is more prevalent in adults and is caused by lifestyle factors (14). Primary dyslipidemia is often caused by one or more gene alterations that result in either excessive production or improper clearance of low-density lipoprotein (LDL) cholesterol, triglycerides (TG) as well as excessive synthesis or insufficient clearance of high-density lipoprotein (HDL). Secondary dyslipidemia, on the other hand, is often associated with

lifestyle factors such as excessive consumption of saturated fats, cholesterol, and trans-fats, sedentary behavior, and alcohol overuse. Secondary dyslipidemia is also related with a number of medical problems, such as type 2 diabetes, chronic kidney disease, primary biliary cirrhosis, and various diseases of the cholesteric liver (15).

The main diagnostic method for determining dyslipidemia is the fasting lipid panel, which evaluates the blood's levels of low-density lipoprotein (LDL), cholesterol, triglycerides, high-density lipoprotein (HDL). The most suitable age to begin screening for dyslipidemia is a subject of debate, optimal screening frequency may vary depending on an individual's risk factors and overall health status. Therefore, it is crucial to discuss with a healthcare professional the best course of action for managing dyslipidemia (16).

Dyslipidemia can manifest with various symptoms such as confusion, dyspnea, and balance impairment, tendinous xanthomas in the elbows and knees, and difficulty speaking. It can lead to symptomatic vascular illnesses left untreated. Acute pancreatitis can result from high triglyceride levels of more than 1000 mg/dL, while lipemia retinalis, marked by a milky white appearance of the retinal arteries and veins, can result from severe hypertriglyceridemia of more than 2000 mg/dL. Furthermore, abnormally high lipid levels might result in the appearance of milky or latescent blood plasma (17).

. The endogenous pathway is in charge of the liver's process of producing lipids, whereas the exogenous pathway deals with the absorption of lipids from the diet. Lastly, the reverse cholesterol transport pathways are responsible for the removal of excess cholesterol from the body. Despite the complexity of lipid metabolism, an understanding of these pathways is crucial to effectively manage dyslipidemia and maintain overall health (15).

Effective management of dyslipidemia involves a multifaceted approach that combines therapeutic lifestyle modifications in drugs to aid with changes to one's diet, exercise routine, and smoking habits. Patient adherence to drug treatment is also critical for successful outcomes, so it is essential to provide education on dyslipidemia management and encourage patients to actively participate in their treatment. By doing so, clinical prognosis can be improved (18). Dyslipidemia is often treated initially with non-pharmacological measures, and modifying the diet is an essential component of it. By making dietary and lifestyle changes, it is possible to reduce cholesterol levels and manage dyslipidemia without the need for medications. In cases where medication is necessary, lifestyle modifications can be used in conjunction with drug therapy to achieve optimal results (19).

The primary objective of drug therapy for dyslipidemia is to regulate LDL cholesterol levels to remain below the target threshold, while non-HDL cholesterol levels can also be brought under control as a secondary objective. However, prior to commencing drug therapy, it is essential to evaluate and address any secondary underlying causes that may lead to elevated LDL cholesterol or triglyceride levels. This could include dietary or lifestyle changes, treatment of co-existing medical conditions, and other interventions to improve overall cardiovascular health (20).

Statins are one of the most widely used lipid-lowering drugs due to their clear clinical benefits and minimal side effects. In addition to reducing the incidence of cardiovascular disease and improving survival rates by lowering LDL cholesterol levels, statins have also been shown to have other potential therapeutic effects. For example, several studies suggest that statins may develop endothelial function and reduce inflammation in addition to their lipid-lowering effects. Moreover, statins have been found to be generally well-tolerated, with most side effects being mild and reversible (21).

Statins work primarily by competitively inhibiting the enzyme reductase of HMG-CoA, which is a precursor to cholesterol, and so reducing the production of hepatic cholesterol. This causes hepatocytes to have more LDL receptors and a lesser cholesteryl ester is produced as a result of this action, resulting in a reduction in LDL cholesterol levels in the blood. Furthermore, it is thought that some statin effects that are unrelated to LDL cholesterol lowering are caused by changes in protein prenylation (22).

3-Hydroxy-3-methyl-glutaryl-coenzyme, Reductase (HMGCR), an enzyme that controls rate, is an essential component of the mevalonate pathway, which is the metabolic process that produces cholesterol. Human meibum and the lipid complex that makes up the majority of the human tear film that is created from meibum have both been found to contain free sterols and lipid molecules like phospholipids, free fatty acids, wax esters, glycerides, and cholesterol, in addition to cholesterol. Human eyelid tissue sebaceocytes from meibomian glands have been found to exhibit HMG-CoA reductase. Therefore, it's likely that statin use could affect the production of cholesterol and the homeostasis of lipids (23).

Statins impart a benefit in concentrations of low-density lipoproteins (VLDL), triglycerides, high-density lipoproteins (HDL). Patients with dyslipidemia experience dry eyes as a result of taking statins, which lower blood cholesterol levels and lower the lipid content of tears.

Especially in elderly folks, dry eye is a common and frequently persistent issue. Tears flow across the cornea, the transparent front surface of the eye, with every blink of the eyelids (24). The results of a study conducted on a population have revealed a new discovery regarding the correlation among statin usage and the prevalence of moderate to severe dry eye disease (DED). (25). Dry eye disease (DED) is believed to impact a substantial amount of people across the globe, which has an expected prevalence of among 7% and 33% (26, 27). Major risk factors for the severity and occurrence of DED include age and gender of the female gender (28). Reduced tear generation and/or higher evaporation are the causes of this multifactorial condition manifests as ocular pain, visual impairments, and a reduced quality of life (29, 30). The malfunctioning of the meibomian glands, often known as MGD, is the most prevalent cause of evaporative dry eye. MGD is a complex multifactorial disorder made up of several different factors, including eyelid inflammation, microbial development, related skin disorders, and potentially serious corneal consequences. The syndrome of MGD has the potential to be diverse in nature resulting from any combination of the five distinct pathophysiological pathways listed below: inflammation of the eyelids, conjunctiva, cornea, microbiological alterations, and DED brought on by tear film instability. The pathophysiological mechanisms of dry eye disease (DED) and meibomian gland dysfunction (MGD) are interconnected, leading to a reciprocal cycle of exacerbation and this interaction is the pathogenesis of both MGD and DED. Microbiological alterations cause the MGD vicious loop to self-stimulate, which causes a rise in the melting temperature of meibum and, as a result, a blockage of the meibomian glands, which furthers the MGD cycle. Blockage, dropout, and inflammation of the meibomian glands are the direct causes of both vicious cycles. Inflammation and hyperosmolarity, which are both causes and effects of DED, are brought on by MGD-associated tear film instability, which serves as a gateway into the vicious cycle of DED (31).

The study previously showed that meibomian lipid films (MLF) might be disrupted in vitro by even tiny, physiologically significant levels of FFA, possibly via a solubilization process. On the other hand, are stiff, high-melting amphiphilic lipids that could prevent meibum from spreading and melting due to their amphiphilic character. FC, a lipid that is stiff, amphiphilic, and has a very high melting point, is well recognized for its capacity to intercalate lipid layers (32). Although the connection among anomalies in systemic lipids and those in the tear film is still unknown, earlier research points to a possible relationship among MGD/DED and dyslipidemia (33, 34).

DED is more common and more severe as people get older and more women. Ocular discomfort, impaired vision, and a low quality of life are all potential effects of this multifaceted disease (29). Reduced tear production and/or greater evaporation are its defining features. An estimated 12% of individuals are thought to have dyslipidemia, which is a significant determinant of potential harm for heart disease. The most popular kind of treatment is "statin" medicine. HMG-CoA reductase inhibitors are a subclass of medication that prevent the bottleneck in the cholesterol production process. The use of statins in people with pulmonary artery Disease to lower cardiovascular events and death is strongly supported by the available research. Use is also advised for patients undergoing open and endovascular procedures. Use of statins may lessen the need for revascularization, but there is no evidence that it will result in fewer amputations. The benefits of moderate-dose statin medication much outweigh any slight hazards, making it safe. (35).

Insufficient tear production and extreme evaporation are the main reasons of dry eye syndrome (DES), which can lead to symptoms such eye fatigue, ocular discomfort and visual abnormalities that can interfere with everyday activities. The meibum, or secretion from the meibomian glands constitute the principal origin of lipids for the Tear Film Lipid Layer (TFLL) in the human eye. The human meibum is made up of a very complex mixture of lipids from different classes, as demonstrated by a number of studies conducted over the past few decades. This presented a number of difficulties in determining the composition of the human meibum. The limited sample size that may be collected from donors (usually in the range of a few milligrams) further hampered the development of the compositional analysis of human meibum (36). The lipid layer is essential for shielding the eye from stress from the environment. Mucin, Aqueous and lipid are the three layers that make up the tear film. It has been proven to be successful to treat the layer through the application of a topical lotion with a low dosage. On the complete length of the eyelid margin. As a result of the lipid being administered, a homogenous lipid layer was created, improving tear stability and the symptom (37). The lipid layer is produced by the secretion of lipids from the meibomian glands, including cholesterol ester and cholesterol. Meibomian gland dysfunction (MGD), which is a common chronic ground cause of eye issues as a result of the dominance of meibomian glands in the lipid layer, is a common condition. MGD can therefore result in DES by impairing the lipid layer. People who often use visual display terminals are also more likely to have DES, a chronic illness. The

continual rise in DES prevalence over the world has led to it becoming a significant public health issue (38).

Dry eye disease (DED) is a complex condition affecting the tears and eye surface, characterized by signs such as eye pain, blurred vision, tear film instability, and possible damage to the eye surface. Despite widespread importance of the significance of the lipid layer in tear composition, it is unclear whether dyslipidemia brought on by a systemic lipid disease is connected to DED (39).

The purpose of the tear film is to provide the surface of the eye a trophic environment. The preservation of the epithelium's integrity and secretory function is crucial in maintaining its inherent role as an obstacle and "seal" over the wide range of epithelial free nerve terminals. (40).

Dry eye disease (DED), commonly known as the Dysfunctional Tear Syndrome, is caused by lacrimal gland dysfunction. For comfort along with clear vision to continue, tear stability must be maintained. The main tear ingredients listed below must interact dynamically to maintain tear stability. Tear dysfunction/deficiency is characterized by an unstable tear film, hence one of the main objectives of therapy is to maintain stability. Tear mucus keeps the hydrophobic surface epithelial cell membranes hydrated, wettable, and performing as a barrier, this Tear mucus is made up of water and mucin glycoproteins, also acts as a matrix for lacrimal released substances and reduces friction caused by blinking (41).

DED also damages the interpalpebral ocular surface and is a condition that is typified by a reduction in tear secretion and/or an elevation in tear evaporation. DED symptoms include pain, impaired vision, and an unstable tear film. Up to one out of every 5 individuals have dry eye disease, which is more common in the elderly. DED is related to diminished quality of life and depression4, and it places a heavy financial strain on the person, the healthcare system, and society. Meibomian gland dysfunction (MGD) may be the primary basis of evaporative dry eye in 32 to 83% of DED patients. According to theory, evaporative dry eye and blepharitis in MGD are caused by abnormalities in the tear film's lipid composition, such as a surplus of free cholesterol and cholesterol ester, which harm the meibum layer (32).

Epidemiologic research revealed that the condition is particularly prevalent in the elderly and women (especially those who have gone through menopause). A number of risk factors have also been linked to DED, according to reports The association among DED symptoms and signs, however, was low, according to multiple investigations. To systematically assess the

symptoms, validated questionnaires with items allowing to utilize for tracking dehydration effects and their occurrence or severity over time. These tests include the Standard Patient Evaluation of Eye Dryness (SPEED) test, the Ocular Surface Disease Index (OSDI), the Dry Eye Questionnaire (DEQ), the MacMonnies Dry Eye Test, and the Ocular Surface Disease Index (OSDI) (41).

The current method of diagnosing dry eye looks at factors including tear secretion volume, tear stability, lipid layer thickness, vital staining, etc. The concept behind TFOD was created to effectively and efficiently cure dry eye condition. These techniques minimise photostimulation on the eyes and any reflex tear production. Anterior segment optical coherence tomography (OCT) and strip meniscometry are two supplementary techniques that aid in the assessment of tear meniscus and the measurement of aqueous tear volume on the ocular surface. (42).

OBJECTIVES

- To ascertain dyslipidemia and its effect on tear film.
- To determine the effect of statin on tear film stability in the patients with dyslipidemia.
- To find out the effect of statin with lubricant in patients with dyslipidemia.
- To ascertain the effect of statin on meibomian gland dysfunction.

2. METHODOLOGY

This investigation employed was a quasi-experimental design. This study was conducted at Al-Nafees Hospital, Islamabad. This study was done during Sep 2022-May 2023. The sample that was part of the research consisted of 200 eyes of 100 patients. All the participant of the study were diagnosed cases of dyslipidemia. The sample was divided into two groups. Group I which included 50 patients who were advised to take statin for the treatment of dyslipidemia along with eye lubricant (Hicel) three times a day for three months. Group II consisted of 50 patients who took only statin for treatment of dyslipidemia. Non-probability purposive sampling technique was employed for participant selection in the study.

Inclusion criteria for the study participant includes all patients with diagnosed dyslipidemia having history of six months or less at age group 30-45. All patients with dyslipidemia were included in this study. Both genders were included. The exclusion criteria was observed as

Patients already taken treatment for dyslipidemia in last six months. Patient already diagnosed with dry eyes disease and taking treatment. Patient having hormonal imbalances, pregnancy, arthritis, diabetes. Patients having active eye diseases of eye lids, corneal and conjunctiva and posterior segment diseases. Patients went through any eye surgery in last three months. All non-cooperative patients.

The data was inputted and subjected to statistical analysis using the SPSS version 22.0 software package. The statistical tests employed included chi square, repeated measures ANOVA, and independent sample T test. The participants of the study were delivered with all information regarding the procedure that was carried during research process and data collection. To ensure that the included subjects had understand well, verbal and written consent was taken after being fully briefed about the aims and design of the study.

2. DATA COLLECTION INSTRUMENTATION:

This research was carried out by using self-designed proforma, SPEED questionnaire and ocular surface Disease Index OSDI questionnaire. After taking consent from the patient the study was carry out by getting information from the patient about his dyslipidemia and ocular symptoms. Two groups of participants were formed. Participants in Group I had taken statin along with eye lubricant (Hicel) three times a day for three months. Group II who had taken only statin for the treatment of dyslipidemia. Every participant of the study was assessed after taking consent from the participants. All the participants were diagnosed case of dyslipidemia.

Tear film assessment was performed by using Tear Break up Time and Schirmer test and MGF was assessed using meiboscores. All participant of the study had filled the OSDI and SPEED questionnaire. All assessments were carried out at the three follow-ups. First at the baseline (before the treatment), at second follow-up (after one month of treatment) and then at the third follow-up(after three months when treatment was completed).

Fasting lipid profile

This is test used for the diagnosis and assessment of lipid levels of patients. A blood test called as a complete cholesterol test, and additionally referred to as a lipid panel or lipid profile, can be used to evaluate the level of triglycerides and cholesterol in the blood. A cholesterol test can help determine whether atherosclerosis, also known as the accumulation of fatty deposits (plaques) in arteries that may result in blocked or restricted circulation all through the body, is likely to occur. The test for cholesterol is a crucial instrument. A key risk factor for coronary

artery disease is high cholesterol levels. Four different types of fats in your blood are calculated as part of a complete cholesterol test that include total cholesterol, LDL-cholesterol, HDL-cholesterol and triglycerides.

Ophthalmoscope

An upright, or unreversed, image of about 15 times magnification is produced using an ophthalmoscope. The fundus of the eye, or the rear of the internal eyeball, is examined with a direct ophthalmoscope. A darkish space is ideal for conducting an examination. The macula lutea, the region of the retina that only receives and processes light from the very centre of the visual field, is also examined for any abnormalities. The fundus, the area of the retina that receives and processes light from the centre of the visual field, is also examined for changes in colour or pigment. Direct ophthalmoscopy allows one to see opacities of the lens and macular degeneration.

Figure: Ophthalmoscope.

Schirmer Test

The Schirmer test, also known as the Schirmer tear test (STT), is used for measuring tear making, especially among individuals who could have dry eyes, keratoconjunctivitis sicca, or produce an excessive amount of tears. The capillary action concept, on which the test is based, allows tears to run down the length of a paper test strip in a manner similar to how water would move down a horizontal capillary tube. The speed at which the test strip is moving down is inversely connected to the rate at which tears are forming.

During this treatment, tear strips are placed into the lower eyelid's fornix. The patient is told to gently close their eyes for five minutes without squeezing them once both of the strips have been positioned. The patient is instructed to open both of his eyes and look skyward after five

minutes in order to the test strips can be easily taken out. The Schirmer test score is calculated by measuring the wet area's length on the test strip and the duration in minutes. The test strip contains a scale for reference. An average score is considered when the wet area exceeds 10 mm within a 5-minute period. On the other hand, a score below 5 mm after 5 minutes indicates a tear deficit.

Figure : Schirmer Test Tool.

4. RESULTS

There were 100 (n=100) participants in our research, and were divided into two groups. Participants of Group I were given statin along with eye lubricant (Hicel) for the treatment of dyslipidemia and they were advised to use it three times a day for three months. Group II was given only statin for the treatment of dyslipidemia.

4.1: Age Groups

The age group was divided into two categories. The age range of participants in one category was among 36 to 40 years, while the age range of participants in the other category was among 41 to 45 years.. Overall, there were 17(17%) participants who had their age among 36-40 years of age and 83(83%) belong to the age group 41-45 years of age. In Group I, out of 50 participants, 14(28%) had age among 36-40years, and 36(72%) belong to the age group of 41-45 years. While in group II, (3)6% belong to the age group 36-40 years of age and 47(94%) had the age ranging from 41-45 years as described in table 4.1 and figure 4.1.

Table 4.1: Table for age group distribution.

Age Groups	Study Group		Total (n=100)
	Group I (n=50)	Group II (n=50)	
36-40	14 (28%)	3(6%)	17 (17%)
41-45	36 (72%)	47 (94%)	83 (18%)

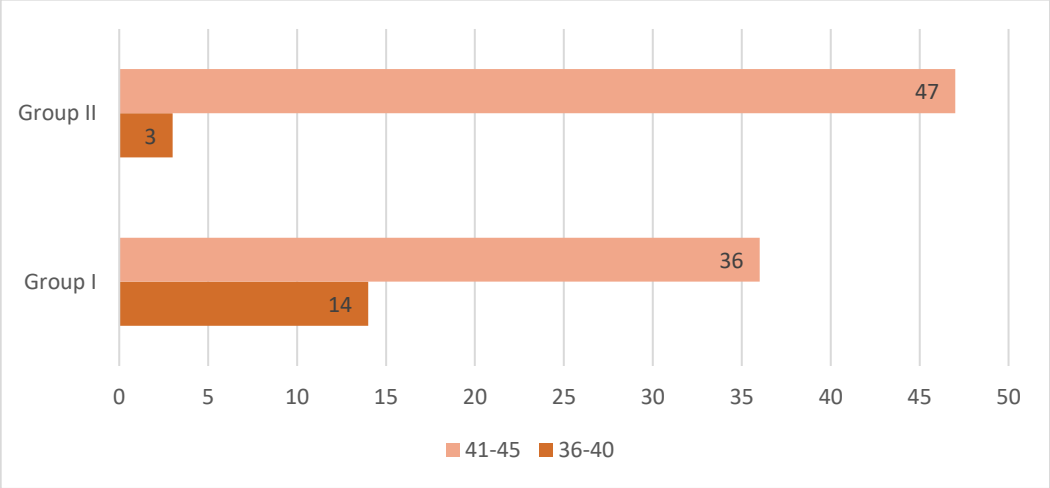

Figure 4.1: Graphical presentation of age group.

4.2: Gender based distribution

There were 53(53%) males and 47(47%) females. In group I, 27(54%) were males and 23(46%) were females. While in Group II, 26(52%) were males and 24(48%) were females as described in table 4.2 and figure 4.2.

Table 4.2: Gender based distribution of the participants.

Gender	Study Groups		Total
	Group I	Group II	
Male	27 (54%)	26(52%)	53(53%)
Female	23(46%)	24(48%)	47(47%)

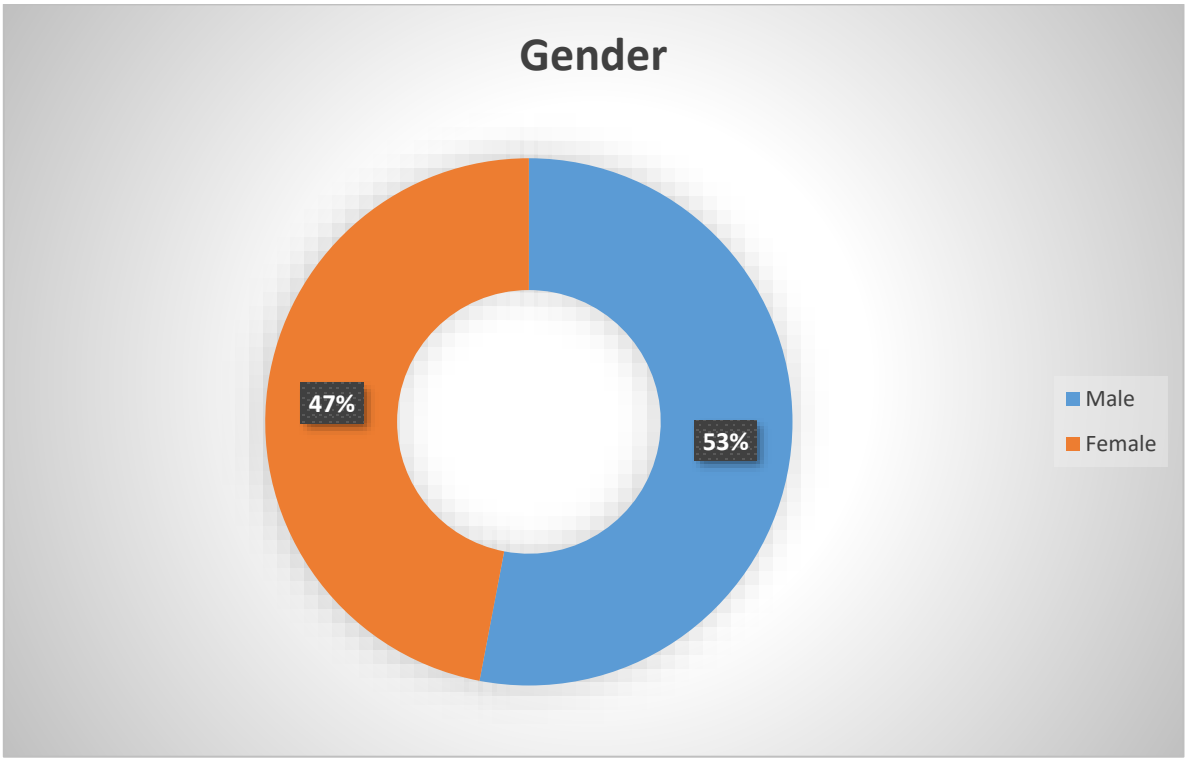

Figure 4.2: Graphical presentation of gender-based distribution of subjects.

4.3: Assessment of Schirmer test within groups

The utilization of repeated measures in research involves the collection of data from the same subjects at different points in time. The ANOVA statistical test was employed to compare the outcomes of the Schirmer test among Group 1 and Group 2. These groups were distinguished by their use of lubrication with statin and sole use of statin for dyslipidemia, respectively, across three separate visits.. The mean value for Schirmer Test at the baseline for group 1 11.46±1.88mm. The mean value for Schirmer Test at the first follow-up for group 1 came out to be 11.27±1.85mm. The mean value for Schirmer Test at the second follow-up for group 1 show 12.38 ±1.61mm. The mean value for Schirmer Test at the baseline for group 2 came out to be 10.83±1.44mm. The mean value for Schirmer Test at the first follow-up for group 2 was 10.96±12.01mm. The mean value for Schirmer Test at the second follow-up for group 2 as 7.78 ±1.67mm (Greenhouse Geissere =0.00). The mean values showed that there is significant

difference present among Schirmer test values of the participants in both groups at three follow ups as described in table 4.4.

Table 4.4: Comparison of the results of Schirmer test within groups.

Schirmer Test	Study Groups	Mean	Std. Deviation	N	P Value (P=0.00)
Schirmer Test (Baseline)	Group 1	11.4600	1.87714	100	(Greenhouse Geisser Value=0.00).
	Group 2	10.8300	1.44289	100	
	Total	11.1450	1.69953	200	
Schirmer Test (First follow up-1 month)	Group 1	11.2700	1.84695	100	
	Group 2	10.9600	2.01469	100	
	Total	11.1150	1.93403	200	
Schirmer Test (Second Follow up-3 months)	Group 1	12.3800	1.60668	100	
	Group 2	7.7800	1.66715	100	
	Total	10.0800	2.82551	200	

4.5: Assessment of tear film stability tear break time at three follow ups within two groups

The results of TBUT test within Group 1 and Group 2 which was using lubrication and statin both dry eyes and dyslipidemia at the three visits. The mean value for TBUT test at the baseline for group 1 came out to be 10.41±0.67. The mean value for TBUT Test at the first follow-up for group 1 came out to be 10.35±0.77. The mean value for TBUT Test at the second follow-up for group 1 came out to be 12.33 ±1.99. The mean value for TBUT Test at the baseline for group 2 came out to be 10.51±0.76. The mean value for TBUT Test at the first follow-up for group 2 came out to be 10.20±1.17. The mean value for TBUT Test at the second follow-up for group 2 came out to be 7.98 ±1.24. According the Greenhouse Geisser it was reported that using ANOVA repeated measure, the mean scores of TBUT test were statistically significant within the groups (P-Value=0.00). The paired wise comparisons also showed no statistical difference within the groups with reference to the results of TBUT Test at the three visits as described in table 4.5.

Table 4.5: Comparison of the results of TBUT within study groups.

Descriptive Statistics					
Tear Break Up Time	**Study Groups**	**Mean**	**Std. Deviation**	**N**	**P Value**
TBUT (Baseline)	Group 1	10.4100	.66810	100	0.00
	Group 2	10.5100	.75872	100	
	Total	10.4600	.71481	200	
TBUT (First follow up-1 month)	Group 1	10.3500	.77035	100	
	Group 2	10.2000	1.17207	100	
	Total	10.2750	.99212	200	
TBUT (Second Follow up-3 months)	Group 1	12.3300	1.99015	100	
	Group 2	7.9800	1.23893	100	
	Total	10.1550	2.73650	200	

4.6: Assessment of Meibomian gland function within groups

Repeated measures ANOVA test was used to compare the results of the Meibomian gland function within Group 1 and Group 2 which were using lubrication with statin and only statin for dyslipidemia at the three visits. The mean value for MGF at the baseline for group 1 was 3.700±0.67. The mean value for MGF at the first follow-up for group 1 came out to be 3.6500±0.53. The mean value for MGF at the second follow-up for group 1 show 2.85±0.43. The mean value for MGF at the baseline for group 2 came out to be 3.85±0.73. The mean value for MGF at the first follow-up for group 2 was 3.80±0.67. The mean value for MGF at the second follow-up for group 2 as 3.50±0.52. The mean scores of MGF were statistically significant within the groups (Greenhouse Geisser Value=0.00). The table 4.5 shows that there is statistical difference within the groups with reference to the results of MGF at the three visits as described in table 4.6.

Table 4.6: Comparison of the results of Meibomian gland function within study groups.

Meibomian gland function	**Study Groups**	**Mean**	**Std. Deviation**	**Greenhouse Giessere**	**P-Value**
Baseline	Group 1	3.7000	0.6723	0.915	**0.00**
	Group 2	3.8500	0.7332		
First follow up-1 month	Group 1	3.6500	0.5351		
	Group 2	3.8000	0.6723		

second Follow up-3 months	Group 1	2.8500	0.4351
	Group 2	3.5000	0.5238

4.7: Comparison of results of Schirmer test among study groups

Independent Sample T- Test was used to compare the results of Schirmer Test at the last follow up. The mean value for Schirmer Test at the last follow for group 1 came out to be12.33±1.60 and mean value for Schirmer Test at the last follow-up for group 2 came out to be 7.78 ±1.66mm as described in table 4.5. Significant differences were found among the two study groups group 1 taking statin and lubricants and group 2 who were taking only statin at last follow up (P-Value= 0.00) as described in table 4.7 and 4.8.

Table 4.7: Group statistics for Schirmer test among study groups.

Schirmer Test at last follow Up	Group	N	Mean	Std. Deviation	Std. Error Mean
Schirmer Test (Last Follow up)	Yes	100	12.38	1.60668	0.16067
	No	100	7.78	1.66715	0.16672

Table 4.8: Comparison of results of Schirmer test among study groups.

Schirmer Test		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std Error Difference
Schirmer Test (Last Follow up)	Equal variances assumed	0.005	0.945	19.867	198	0.00	4.6	0.23153
	Equal variances not assumed			19.867	197.73	0.00	4.6	0.23153

4.8: Comparison of tear breakup time among study groups

The mean value for TBUT test at the last follow-up for group 1 came out to be 12.33 ±1.99 and the mean value for TBUT Test at the last follow-up for group 2 came out to be 7.98 ±1.23 as described in table 4.7. Significant differences were present among the study groups at the second follow up (P-Value= 0.00) as described in table 4.9 and 4.10.

Table 4.9: Group statistics of TBUT test among study groups.

TBUT Test	Group	N	Mean	Std. Deviation	Std. Error Mean
TBUT (Last Visit)	Yes	100	12.33	1.99015	0.19902
	No	100	7.98	1.23893	0.12389

Table 4.10: Comparison of results of TBUT- test among study groups.

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
TBUT (Last Visit)	Equal variances assumed	3.982	0.047	18.556	198	0.00	4.35	0.23443
	Equal variances not assumed			18.556	165.714	0.00	4.35	0.23443

4.9: Association of Cholesterol with Schirmer Test Outcome at the last visit

Chi Square was used to found association among Schirmer Test outcome at the last visit with the HDL cholesterol as described in table 4.9. No significant association was found among cholesterol level and Schirmer test value of both groups. (P-Value=0.096) as described in table 4.11.

Table 4.11: Association of Schirmer Test (Last Visit) with HDL Cholesterol.

Follow up visit three months/ HDL Cholesterol Crosstabulation		HDL Cholesterol		Total	P Value
		Normal	High		
Schirmer Test (Last Visit)	1-10	12	27	39	0.096
	11-20	30	31	61	
Total		42	58	100	

4.10: Ocular Surface Disease Index (OSDI) Before the Treatment

OSDI was used to compare the severity of the ocular surface disease in the participants. In Group I, it was reported that 17 had severe ocular surface disease. In Group I, it was reported that 5 had severe ocular surface disease as described in figure 4.3.

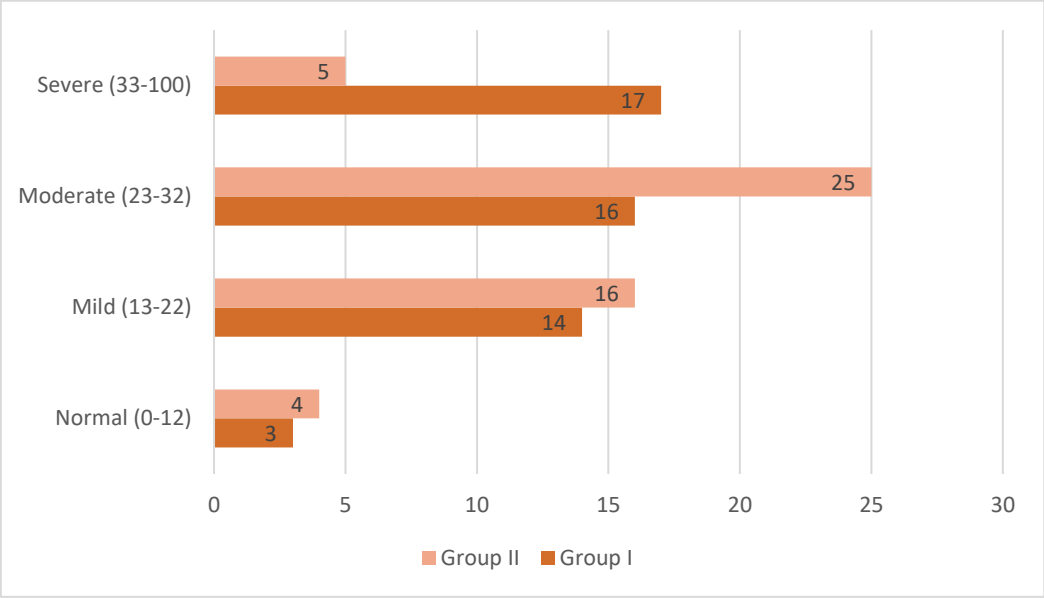

Figure4.3: Ocular Surface Disease Index (OSDI) Before the Treatment.

4.11: Ocular Surface Disease Index (OSDI) After the Treatment

In Group I, it was reported that 44 had mild, 5 had moderate, 1 had severe ocular surface disease. In Group II, it was reported that 2 had normal OSDI, 21 had mild, 13 had moderate, 14 had severe ocular surface disease as described in figure 4.4.

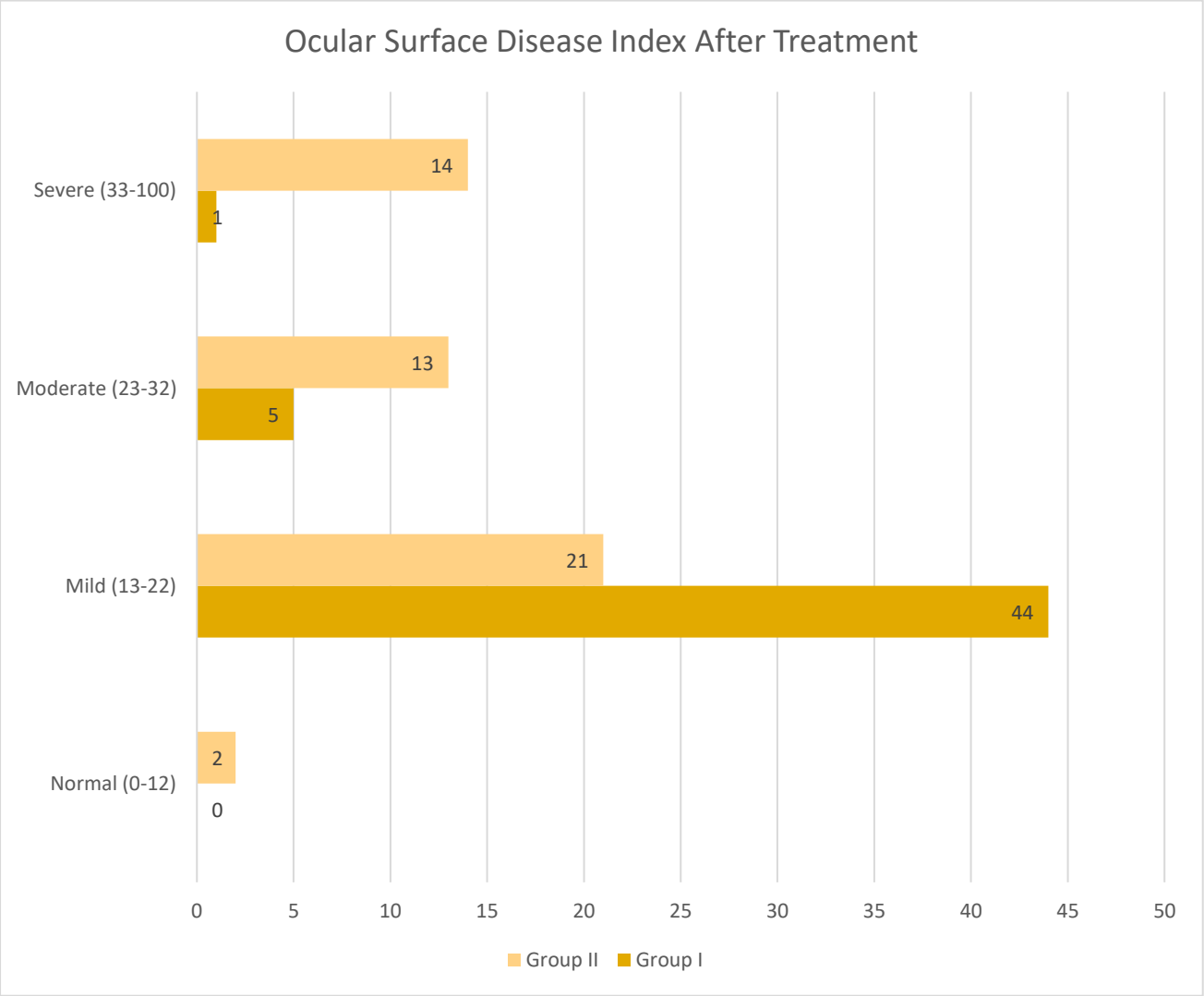

Figure 4.4: Ocular Surface Disease Index (OSDI) After the Treatment.

4.12: Association of HDL Cholesterol Ratio with OSDI After the Treatment

Chi Square was used to found association among OSDI with the HDL cholesterol as described in table 4.10. A significant association was found among cholesterol level and OSDI values (P-Value =0.019) as described in table 4.12

Table 4.12: Association of Ocular surface disease index after treatment with HDL Cholesterol.

OSDI After Treatment / HDL Cholesterol Crosstabulation		HDL Cholesterol		Total	P Value
		Normal	High		
OSDI After Ranges	1.00	0	2	2	0.019
	2.00	25	40	65	
	3.00	13	5	18	
	4.00	4	11	15	
Total		42	58	100	

4.13: Assessment of Symptoms Associated with Eye Dryness using SPEED questionnaire

Speed Questionnaire was used to assess the symptoms, their frequency and severity associated with Eye dryness. It was reported that in group I, 37(74 %) had Dryness, grittiness or scratchiness at the time of visit, 38(76%) had complaint about soreness or irritation, 37(74 %) had watering and burning in their eyes, and 33(66 %) had eye fatigue at the time of visit. While in group II, 27(54%) had dryness, grittiness or scratching at the time of visit, while 2(4%) had experience dryness or grittiness in past 72 hours as well, 27(54%) had complaint about soreness and irritation at the time of visit, 24(48%) had burning or watering in their eyes at the time of visit, 22(44%) had eye fatigue as described in table 4.13 and figure3 and figure 4.5.

Table 4.13: Symptoms Associated with Dry Eyes (SPEED Questionnaire).

Symptoms			Study Groups		Total
			Group I (n=50)	Group II (n=50)	
Dryness, Grittiness, or Scratchiness	At this visit	Yes	37	27	64
		No	13	21	34
	Past 72 hours	Yes	0	2	2
Soreness or Irritation	At the Visit	Yes	38	27	65
		No	12	19	31
	Past 72 hours	Yes	0	4	4
Burning or Watering	At the Visit	Yes	37	24	61
		No	13	26	39
Eye Fatigue	At the visit	Yes	33	22	55
		No	17	28	45

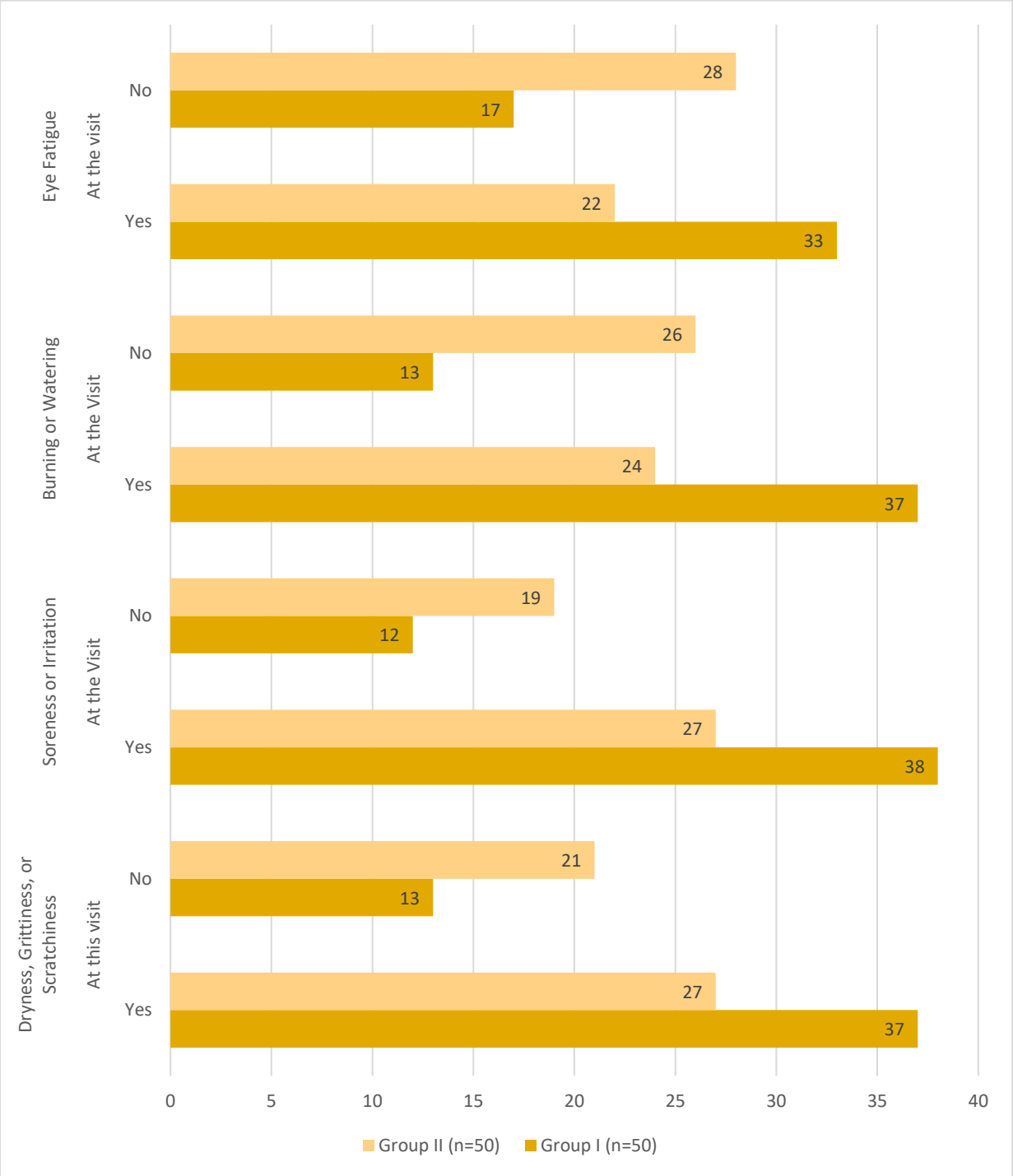

Figure 4.5: Symptoms Associated with Dry Eyes.

4.14: Descriptive analysis of Frequency of Symptoms using SPEED questionnaire

In Group I, out of 50, 27 reported to have dryness, grittiness or scratchiness sometimes, 7 often had this, while 6 constantly had this symptom. 6 had soreness 0r irritation sometimes, 42 often had this, while 2 complained of constantly having this symptom. 13 had burning or watering in their eyes sometimes, 25

often had this, and 12 constantly had this symptom. Eye fatigue was sometimes experienced by 10 participants at the time of visits, 26 often had this, and 14 constantly had this issue. In Group II, out of 50, 39 reported to have dryness, grittiness or scratchiness sometimes, 9 often had this, while 2 constantly had this symptom. 22 had soreness 0r irritation sometimes, 26 often had this, while 2 complained of constantly having this symptom. 21 had burning or watering in their eyes sometimes, 17 often had this, and 12 constantly had this symptom. Eye fatigue was sometimes experienced by 22 participants at the time of visits as described in table 4.14.

Table 4.14: Frequency of symptoms Associated with Dry Eyes.

Frequency of Symptoms		Study Groups		Total
		Group I (n=50)	Group II (n=50)	
Dryness, Grittiness, or Scratchiness	Sometime	37	39	76
	Often	7	9	16
	Constant	6	2	8
Soreness/Irritation	Sometime	6	22	28
	Often	42	26	68
	Constant	2	2	4
Burning or Watering	Sometime	13	21	34
	Often	25	17	42
	Constant	12	12	24
Eye Fatigue	Sometime	10	22	32
	Often	26	20	46
	Constant	14	8	22

4.15: Assessment of Severity of Symptoms using SPEED Questionnaire

In Group I, 20 reported to have Tolerable dryness or grittiness, 20 said that it was uncomfortable and irritation, while 10 said that it was bothersome irritating and interferes with their day. Regarding soreness or irritation, 19 said that it was uncomfortable and irritation, while 14 said that it was bothersome irritating and interferes with their day. With reference to burning and watering, 26 said that it was uncomfortable and irritation, 17 had uncomfortable irritating eye fatigue, 20 said that it was bothersome irritating and interferes with their day. In Group II, 28 reported to have Tolerable dryness or grittiness. Regarding soreness or irritation, 29 said that it was uncomfortable and irritation, with reference to burning and watering, 11 reported to have tolerable burning or watering, 14 said that it was uncomfortable and irritation,

and 25 said that it was bothersome irritating and interferes with their day,13 had uncomfortable irritating eye fatigue as described in table 4.15.

Table 4.15: Severity of symptoms Associated with Dry Eyes.

Severity of Symptoms		Study Groups		Total
		Group I (n=50)	Group II (n=50)	
Dryness, Grittiness, or Scratchiness	Tolerable not perfect	20	28	48
	Uncomfortable irritating	20	13	33
	Bothersome irritating and interferes with my day	10	9	19
Soreness/Irritation	No problem	0	1	1
	Tolerable not perfect	13	13	26
	Uncomfortable irritating	19	29	48
	Bothersome irritating and interferes with my day	14	1	15
	Intolerable unable to perform my daily task	4	6	10
Burning or Watering	Tolerable not perfect	14	11	25
	Uncomfortable irritating	26	14	40
	Bothersome irritating and interferes with my day	6	25	31
	Intolerable unable to perform my daily task	4	0	4
Eye Fatigue	No problem	0	4	4
	Tolerable not perfect	7	9	16
	Uncomfortable irritating	17	13	30
	Bothersome irritating and interferes with my day	20	9	29
	Intolerable unable to perform my daily task	6	15	21

5. DISCUSSION

Determining the impact of statins with lubricant on patients with dyslipidemia was the major goal of the current investigation. Two groups were created out of the 100 study participants. Those who were in Group I were given statin along with eye lubricant and they were advised to use it three times a day for three months. Group II was given only statin for the treatment of dyslipidemia.

Rathnakumar conducted a study in 2018 on the incidence of dry eye disease and its relationship to dyslipidemia. They found that, of the 60 cases of DED, 21.6% occurred in people among the ages of 25 and 35 years, while 36.6% and 41.6%, respectively, were detected in the age ranges of 35 to 50 and 51 to 70 (43). The majority of the participants in the current study there were 17(17%) participants who had their age among 36-40 years of age and 83(83%) belong to the age group 41-45 years of age. This outcome is consistent with what was found in the recent study.

Braich et al conducted a study on dyslipidemia and its association with meibomian gland dysfunction. In this study it was proved that those adults with All differences were statistically significant ($P < 0.05$) (33). Compared to adults of the same age and sex who do not have MGD, those with MGD are more likely to have abnormal serum lipid levels. Mean values for triglycerides, total cholesterol, LDL, and HDL in cases and controls, respectively, were 98.5 ± 42.1, 203.1±13.2, 126.1 ±10.2, and 53.3 ±4.2 mg/dL and 82.3 ±36.5, 156.6± 14.5, 92.2 ±12.4, and 45.8± 2.6 mg/dL, respectively. In the current study it was proved that individuals with high cholesterol level have meibomian gland dysfunction with a mean value of 3.700±0.67 for group 1 and 3.85±0.73 for group 2. The outcome of this study is consisted with the above mentioned study.

In order to identify the dry eye problems related to vision, Barber did a study in 2018 on the symptoms of dry eyes and their effects on visual function through the International Task Force standards severity levels in the United States. The majority of the participants had normal visual acuity, which is consistent with the findings of the current investigation (44).

Chun YH conducted a study on the Korean population in 2013 titled "Total cholesterol and lipoprotein composition are associated with dry eye disease in Korean women." According to the study's participants who had dry eye illness, their levels of total cholesterol and LDL were fairly high (45). The current study has shown that majority of the participants had high cholesterol, triglycerides, HDL, LDH and HDL/cholesterol ratio and the HDL/cholesterol ration was found to have significant associations with the final outcomes of the study. In order to inspect the relationship among total cholesterol and lipoproteins and dry eyes.

In a study conducted by Lyu Y in 2019, the objective was to examine the impact of the duration of diabetes on corneal nerves and dry eye. This showed significant impact on the duration of

diabetes with dry eyes symptoms frequency and severity, During this study the SPEED questionnaire was used to analyze the severity and frequency of dry eyes (46). In this research majority of the participants in both the groups had shown the symptom of dryness/grittiness followed by soreness, burning or watering and eye disease associated with dyslipidemia and this study also used speed questionnaire.

A study conducted in 2022 by Facchin to find out repeatability and validation of Standard Patient Evaluation of Eye Dryness (SPEED) Questionnaire to analyze the validity of the SPEED questionnaire including 206 participants showed that three main factors, namely dryness and soreness, fatigue, and burning were present in all participants of the study and also showed validity when assessed after two week of using lubricants (47).This also supports the results of current study as In Group I, out of 50, 27 reported to have dryness, grittiness or scratchiness sometimes in term of burning or watering in their eyes sometimes, 25 often had this, and 12 constantly had this symptom. Eye fatigue was sometimes experienced by 10 participants at the time of visits, 26 often had this, and 14 constantly had this issue. In Group II, out of 50, 39 reported to have dryness, grittiness or scratchiness sometimes, 22 had soreness or irritation sometimes. 21 had burning or watering in their eyes sometimes, 17 often had burning sensations and 12 constantly had symptom. Eye fatigue was sometimes experienced by 22 participants at the time of visits.

Mullick in 2021 study focused on evaluating the effectiveness of topical cyclosporine 0.05% and osmo-protective lubricating eye drops in the treatment of dry eye disease and inflammation. The study findings indicated that the administration of topical osmo-protective lubricating eye drops along with cyclosporine A 0.05% over a period of 6 months led to a noticeable decrease in inflammation among individuals with DED. This reduction in inflammation was positively correlated with improvements in OSDI scores, reduction in ocular surface staining, and decreased levels of tear matrix demonstrating the overall effectiveness of the treatment approach (48). In current study it was noted that the mean value for TBUT test at the baseline for group 1 came out to be 10.41±0.67. The mean value for TBUT Test at the first follow-up for group 1 came out to be 10.35±0.77. The mean value for TBUT Test at second follow-up for group 1 came out to be 12.33 ±1.99. The mean value for TBUT Test at the baseline for group 2 came out to be 10.51±0.76. The mean value for TBUT Test at the first follow-up for group 2 came out to be 10.20±1.17. The mean value for TBUT Test at the second

follow-up for group 2 came out to be 7.98 ±1.24. The results obtained from the conducted study exhibited a high degree of alignment and concurrence with the outcomes of the current investigation. The findings of both studies harmoniously converged, indicating a strong correlation and agreement among the research outcomes.

In order to determine the efficacy of rebamipide 2% ophthalmic solution as a lubricant in the treatment of dry eyes in a cohort of forty patients presenting with dry eye signs and symptoms, Shrivastava conducted a prospective study on the topic in 2018. During the course of the trial, patients were evaluated based on a number of parameters , including the Schirmer's test, the fluorescein ocular surface staining score (FOSS), the tear meniscus height, the tear film break-up time (TBUT), and the dry eye-related symptom score. These assessments were carried out after 2, 4, 6, and 12 weeks, and the results were then compared with the baseline measurements. When compared to the baseline at different time intervals, including 2, 4, 8, and 12 weeks, the study found a substantial improvement in the mean dry eye-related symptom score, TBUT, and FOSS values. These results strongly suggested that the use of rebamipide 2% ophthalmic solution as a lubricant not only reduced the symptoms of dry eyes but also shielded the ocular surface from further harm. Additionally, the lubricating effect contributed to the stabilization of the tear film, further enhancing the overall therapeutic outcomes (49). The finding of current study shows that the mean value for TBUT test at the last follow-up for group 1 came out to be 12.33 ±1.99 and the mean value for TBUT Test at the last follow-up for group 2 came out to be 7.98 ±1.23. The significant support and credibility provided by this noteworthy coherence amongst the investigations as patient using lubricant improvement in tear production further reinforces the reliability and validity of the stated findings.

A research investigation was conducted to explore the correlation among Dry Eye Disease (DED) and Dyslipidemia, as well as the influence of Statin Use in 2020 by Aldaas findings revealed noteworthy associations among these factors. Patients who were on statin regimens, regardless of their intensity, had an approximately 40% higher likelihood of being diagnosed with DED. Moreover, patients with cholesterol levels exceeding 200 displayed 60% increased odds of DED, while those with triglyceride levels surpassing 150, HDL levels below 40, or LDL levels exceeding 130 showed 40-50% greater odds of developing DED. The observed relationship among statin use and DED may be attributed to the potential impact of statins on cholesterol synthesis and lipid homeostasis within the meibomian glands. Disruptions in these

processes could lead to the destabilization of the tear film, consequently resulting in the onset of DED. These findings suggest a complex interplay among dyslipidemia, statin use, and the development of DED (50). Current study showed that the use of statins in dyslipidemia and effect on eyes with significant association found among cholesterol level and OSDI values (P-Value =0.019) alone for dyslipidemia may contribute to the development of dry eyes. It is likely that the disruption in lipid homeostasis caused by statins affects the meibomian glands, leading to an unstable tear film and subsequent dry eye symptoms. In light of these findings, the current study sought to explore potential strategies to enhance outcomes in patients using statins by combining their usage with lubricating eye drops. The results of current study demonstrated improved results in increased tear breakup time with presenting a significant association was found among cholesterol level and OSDI values (P-Value =0.00) These improvements indicate that the combination of statin therapy with lubricating eye drops can alleviate dry eye symptoms and enhance tear film stability. By incorporating a lubricant alongside statin treatment, this study aimed to address the disrupted lipid balance and effect on ocular surface health.

5.2: Conclusion

- The research has determined that a significant correlation exists between elevated levels of cholesterol and the occurrence of dry eyes.
- The study also showed that incorporating lubrication for dry eyes alongside statin therapy for dyslipidemia yielded improved results in terms of OSDI scores and tear breakup time.
- The positive outcomes observed in terms of OSDI scores, tear breakup time, and the Schirmer's test provide support for this combined approach, emphasizing the potential benefits of supplementing statin therapy with appropriate ocular lubrication.
- This study also concluded that there is strong significance in term of patients with dyslipidemia who took statin for the treatment in causing dry eyes as compared with the patient having dyslipidemia who had consumed statin along with lubricant for the treatment of dyslipidemia.
- The mean scores of TBUT test, Schirmer's test were statistically significant among the groups at the last follow-up A statistically significant relationship was observed between cholesterol levels and OSDI scores following the treatment.

5.3: Limitations

The study encountered several notable limitations that should be addressed in future research:

1. Financial Burden: A significant limitation was the lack of financial assistance to cover the costs associated with conducting Schirmer's test and tear break-up time. These tests can be expensive, making it challenging to include a larger sample size and obtain more comprehensive data.
2. Patient Compliance: It was very difficult to ensure the visits of the patient at the follow-ups. Some patient discontinue after two follow-up's which, make it difficult completion of data. It also grant more extra time for completion of data.
3. Small Sample Size: Another limitation was the study's use of a relatively small sample size. The sample size was less because dyslipidemia patients in this age group was less during data collection period. The statistical power of the research analysis and the generalizability of the results may both be constrained by a limited sample size.
4. Schirmer Test: During Schirmer test strips were used for the assessment of tear production rate. These strips are somehow irritant and patients didn't cooperate much during follow up study.

5.4: Recommendations

After considering the results of the study, several recommendations can be made to doctors and society regarding the management of dyslipidemia and dry eye disease:

1. Doctors should adopt a holistic approach when treating patients with dyslipidemia and dry eye disease. Recognizing the potential impact of dyslipidemia on dry eyes, it is crucial to address lipid abnormalities alongside ocular surface health.
2. Considering the positive outcomes observed in the study, doctors may consider combining statin therapy with appropriate ocular lubrication in Patients with dyslipidemia and dry eye disease. This combined approach can potentially alleviate dry eye symptoms and enhance tear film stability.
3. Medical Doctors should emphasize the importance of regular eye examinations, especially in patients with dyslipidemia. Early detection of dry eye symptoms and prompt intervention can lead to better management and improved patient outcomes.
4. Informing patients is crucial and holds utmost importance about the potential effects of dyslipidemia on the eyes and the importance of adhering to both systemic lipid-lowering

treatment and ocular lubrication. Encouraging patients to communicate any ocular symptoms to their healthcare providers can aid in timely intervention.

5. It is recommended that medical practitioners provide guidance to their patients regarding the adoption of a healthy lifestyle, which encompasses a well-balanced diet, consistent physical activity, and appropriate hydration. These lifestyle modifications can have a positive impact on both dyslipidemia and ocular surface health of the individual in age group at risk.
6. Society as a whole should be educated about the potential effect of dyslipidemia and dry eyes. Increasing public awareness can encourage early detection, timely intervention, and better adherence to treatment regimens.
7. In order to know more about dyslipidemia and its effects on eyes specially in causing dry eyes, cohort studies need to be done in future. This was a short duration study to find out association among dry eyes and dyslipidemia.

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