

2023-2025

IQRA SHAHZAD

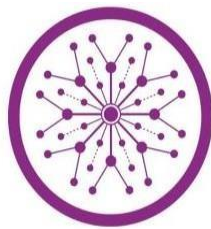
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The effect of omega 3 supplements comparison with warm compression in patients with dry eye disease

A Thesis Submitted by

Iqra Shahzad

SU91- MSAHW-S23 -048



SUPERIOR UNIVERSITY

MS Allied Health Sciences

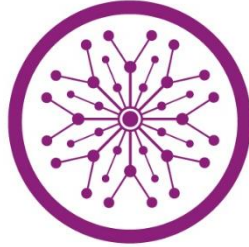
Department of Allied Health Science

Faculty of Allied Health Sciences

Superior University Lahore

2023-2025

**The Effect of Omega-3 Supplements Comparison with Warm Compression in
Patients with Dry Eye Disease**



SUPERIOR UNIVERSITY

Thesis Submitted to

The Superior University Lahore

In Partial Fulfillment of the

Requirement for the Degree of

MS Allied Health Sciences

By

Iqra Shahzad

SU91- MSAHW-S23 -048

Session: 2023-2025

Faculty of Allied Health Sciences

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No part of this thesis has been submitted anywhere else for any other degree. This thesis is submitted to the Faculty of Allied Health Sciences, The Superior University, Lahore in partial fulfillment of the requirements for the degree of Master of Philosophy in the field of “**Optometry**” in the Faculty of Allied Health Sciences at The Superior University, Lahore.

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DEDICATED TO

My Mother,

Dear Father,

And

Family

ACKNOWLEDGEMENT

In the name of Allah, the most Gracious, the most Merciful.

I am extremely thankful to Almighty ‘Allah’ Who is the entire source of knowledge and wisdom endowed to mankind, for providing me with the acumen and vision to complete this endeavor.

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LIST OF ABBREVIATIONS

SPSS	Statistical Package for Social Sciences
SD	Standard Deviation
BSV	Binocular Single Vision
VA	Visual Acuity
TBUT	Tear Break-Up Time
WHO	World Health Organization
RE	Right Eye
LE	Left Eye
BCVA	Best Corrected Visual Acuity
OSDI	Ocular Surface Disease Index
DED	Dry Eye Disease
MGD	Meibomian Gland Dysfunction

ABSTRACT

Objective: To determine the optimal treatment for dry eyes in terms of cost-effectiveness and time efficiency by comparing omega-3 supplements versus warm compression.

Methods: The RCT research of this work was a hospital-based study carried out in three months after getting approval of the synopsis with proper consideration of ethical issues and patient consent. The total of the sample sizes was 140, with 70 samples within each group. A Sampling technique that employed random selection within each of the identified layers or strata of the study population was used. Patients who were 20-39 years and complaining of dry eyes were included for the study. Following the completed questionnaire and ophthalmic examination, TBUT and Schirmer test were conducted and fluorescein staining performed. One group of patients after diagnose of DED consumed omega 3 supplements (EPA) 500mg and (DHA) 250 mg of for a one month duration. Other groups with warm compressions along hot soaked technique for 1 week, Objective findings were noted in 2nd visit to include, OSDI score along with TBUT and Schirmer testing to check, dry eye signs in 2 groups, Both groups were statistical analyzed using SPSS 27 Version.

Results: This study targeted 140 (100%) study participants Of these, 99 were male (70.7%) while 41 were Female (29.3%). With a mean baseline OSDI of 25.58 and an SD of 5.091, all 48 eyes in the study sample had mild to moderate symptoms of ocular surface disease, ranging from 18 to 37. The mean date of completion of treatment was 27.567 days The mean OSDI score after therapy was 12.86 ± 3.972 showing a statistically significant reduction from baseline signifying reduced symptoms. Likewise, Schirmer test raised up from an average of 9.58 mm (SD = 3.246) to an average of 14.74 mm (SD = 3.282) which also showed an improvement in tear production. The TBUT also increased from an average of 6.24s (SD =2.151) to 12.26s (SD = 2.830) – a sign of improved tear film stability. The results show significant changes and trends in three parameters analyzed by the Wilcoxon Signed Rank test, and no sign of deterioration or stability in participants' performance. In conclusion, the Omega-3 group achieved a better result on all parameters: the mean total OSDI score of the Omega-3 group was 18.69 (SD = 8.357) as compared to 19.74 (SD = 7.266) for the warm compression group. Likewise, the total mean

Schirmer test scores and TBUT were few units more in the Omega-3 group (12.26 and 9.89) than that of warm compression group 12.05 and 8.61. Compared to warm compression therapy these findings highlight the superior desiccation relief Omega-3 supplementation provides for the ocular surface.

Conclusion: The Omega-3 groups were found to have a lower OSDI score and increased Schirmer's tear test indicating higher tear production and the TBUT showed better tear film stability. The mean OSDI score in the current study was 18.69 while in the warm compression group it was 19.74. The total mean Schirmer test scores and TBUT were also higher for the Omega-3 group compare to warm compression group. This study shows that Omega-3 supplementation can increase comfort in dry eye patients and is supportive of ocular surface well being.

Keywords: Dry Eyes, OSDI, Ocular Surface Disease Index, TBUT, Schirmer, Omega 3, Warm Compression, Tear Film Stability

Chapter 1

INTRODUCTION

Dry eye is a complex condition with impaired vision and damage to the ocular surface makes for a terrible quality of life. It is linked with short term fluctuation in the tear volume which causes dry eye. DED is an irregularity of the tear film, which is a layer that spreads over the eye each time we blink to smooth, clear and improve vision. In fact, the cornea is part of the most important refractive tissues of the eye as well as important in protecting the eye from ultraviolet light and various infections and other harm substances. It has an important function of vision; it refracts the light towards the lens and enables a concentration on the retina. Of which converts it into impulses and sends it through the optic nerve to the brain where it is converted to visuals. The corneal epithelium is very sensitive and fulfils the role in supplying moisture on the eye even and has capacity to repair it in superficial injuries to the eye. In simple injuries such as abrasion the corneal cells reproduce after 24 hours and the healing takes 7-10 days. Case of repeated trauma in DED causes keratoconjunctivitis, and if the deep corneal layers are involved then you will have pain and blurred vision in addition to light sensitivity. The visibility of features can be troubled by the scarring of the cornea.^[1]

Human tear contains water, proteins, electrolytes and lipids, which afford protection to the cornea from mechanical injury and infection. The tear film is layer situated on the cornea of the eye whose function is to lubricate and protect the said layer from harm or contracting diseases. Three layers of tear film are as follows: First one is topical lipid layer of oils which are secretory products of meibomian glands and help in stabilization and lubrication of ocular surfaces, second which contains 90% thickness of tear film this layer is produced from lacrimal glands helping eye to remain hydrated last layer which shows ability to resist microbial infection is called mucin layer. There seems to be two vectors through which dysfunction of any layer leads towards hyperosmolarity either decreased tear production or increased tear evaporation due to compromise in oil production from meibomian gland or decrease mucin from goblet cells (Systemic Conditions Associated with Severity of Dry Eye Signs and Symptoms in the Dry Eye Assessment and Management Study).^[2]

Tear formation represents a function of the lacrimal functional unit, which includes the lacrimal gland, ocular surface (corneal and conjunctival), the meibomian glands, the eyelids and the neural structures. The lacrimal gland secretes tears for the purpose of providing stoichiometric balance of the corneal epithelium, acts as a method of lubrication and defense against bacterial invasion. Tears physiologically are produced through two mechanisms first constantly produced at slow st disparity and essential for the nascent lubrication of the eye. The second kind of secretion is made when the eyes are irritated or when an individual is feeling emotional. In our eyes behind the lids above and lateral to the ball lacrimal glands produce tear drops of tear film every fifteen minutes. Irritation and foreign body, dryness causes excessive tearing.^[3]

DED has a negative effect on quality of life such as reading, using computer, and driving and is reported to affect the United States economy more than \$55 billion yearly ,It is also characterized by ocular surface inflammation(Systemic Conditions Associated with the Severity of Dry Eye Signs and Symptoms in the Dry Eye Assessment and Management Study) it has been described as aqueous tear deficient and evaporative. Keratoconjunctivitis sicca is because of a reduced production of aqueous tears, for instance, Sjogren syndrome. Dry eye secondary to evaporation occurs where the tear breakup film is compromised through any cause including meibomian gland dysfunction. It has been seen that some people have both tear deficient and evaporative dry eye with no cause.^[4]

DED can present in forms of severe eye discomfort or pain, eye inflammation, or the feeling of a foreign body present in the eye, variations in vision, stinging and burning sensations, and the general feeling that the eyes appear small, shut tight or have been sewn together. Some patients also present with one or more symptoms of dry eye, and these may include reduced mean aqueous tear production, reduced TT , vital dye staining of the ocular surface using fluorescein or lissamine green, raised tear osmolarity and histopathological features of MGD. The Risk factors of DED related to the population are Demographics, Systemic & Environmental factors and Medication. Pattern can vary due to changes in physical surroundings or hormonal changes and also due to the advancement in the disease. Catalog clinical manifestations of DED are usually long-standing, and the severity of the symptoms does not always predefine the clinical picture, therefore, patients should be examined thoroughly.^[5]

The epidemiology subcommittee in the Dry Eye Workshop (DEWS II) held in 2017 classified risk factors based on clinical and research data. The DEWS framework has been pivotal in standardizing the understanding of dry eye disease globally. By integrating scientific advances, it provides clinicians with evidence-based strategies to improve patient outcomes and guide future research into this complex and multifactorial disease. Major risk factors include increased age, female gender, Asian race, MGD, and connective tissue diseases such as (RA)rheumatoid arthritis. Another large, RCT (randomized clinical trial) study was conducted to check the efficacy and safety of oral omega-3 supplements named Dry Eye Assessment and Management (DREAM). Participants of this study provide their information using standardized protocols. Some factors include diabetes and thyroid disease.^[6]

Today, globally 5% and 34% of people are affected with dry eye and its rate is rising each day. The difference in prevalence figures is attributable to differential studies applied to the subject, geographical locations, and types of definitions available at the end of 2007 of dry eyes.^(5,6) In Japan in 1977 there was a study which estimated dry eye to affect 11.7% of Germans or 9 million people. A limited number of papers report on dry eye prevalence in Pakistan such as the study by Jehangir and colleagues. Another study find out that most of them experience dry eye at different age of 31-40. Another study also revealed that the refractive condition Influenced dry eye rate differently, including Hypermetropes (18.9 %), Myopes (16.2 %) and Emmetropes (15.2%)respectively.^{[7],[8]}

Decreased aqueous tear production, decreased tear film break-up time (TBUT), staining of the ocular surface with vital dyes such as fluorescein and lissamine green, tear hyperosmolarity, and evidence of MGD. In a study of the population, the Risk factors of DED include demographic characteristics, systemic and environmental conditions along medications. Symptoms can fluctuate depending on environmental conditions, hormonal changes, or the progression of the disease. DED is often chronic, and the severity of symptoms does not always correlate with clinical findings, emphasizing the need for thorough patient evaluation.^[9]

Omega-3 supplementation is associated with changes in the lipid composition of oils produced by the Meibomian glands and an improvement in dry eye symptoms caused by malfunction of these glands. Supplemental omega-3 fatty acid consumption has an effect on meibomian gland

oil in Sjogren syndrome patients. Dry eye disease is predicted by a low dietary intake of n-3s and a high n-6 index, as well as by metabolic syndrome or both, according to another women's health study.^[10]

Multiple advantages of omega-3 supplementation in vascular and cardiac illnesses have been discovered. Management of dry eye disease (DED) is multifaceted and patient-specific, depending on factors such as the condition's origin, symptoms, and response to treatment. LLPs are commonly used as eye lubricants for moderate cases of dry eye, which can alleviate some of the associated discomfort. It is possible to make these even more biocompatible by repeatedly using reformulations that are free of preservatives to reduce a rough-in. Eye drops containing cyclosporine A (Restasis) or lifitegrast (Xiidra) can reduce inflammation on the eye's surface and increase tear production; patients with mild to moderate inflammatory ocular manifestations of Sjögren's disease are treated with both topical and systemic corticosteroids. Because steroids might induce side effects such as an increase in intraocular pressure, they should only be used for short-term exacerbations. People who have excessive tear drainage may find relief by sealing the tear drainage duct with punctal plugs, which allow them to keep more of their natural tears.^[11]

Multiple advantages of omega-3 supplementation in vascular and cardiac illnesses have been discovered. Management of dry eye disease (DED) is multifaceted and patient-specific, depending on factors such as the condition's origin, symptoms, and response to treatment. LLPs are commonly used as eye lubricants for moderate cases of dry eye, which can alleviate some of the associated discomfort. It is possible to make these even more biocompatible by repeatedly using reformulations that are free of preservatives to reduce a rough-in. Eye drops containing cyclosporine A (Restasis) or lifitegrast (Xiidra) can reduce inflammation on the eye's surface and increase tear production; patients with mild to moderate inflammatory ocular manifestations of Sjögren's disease are treated with both topical and systemic corticosteroids. Because steroids might induce side effects such as an increase in intraocular pressure, they should only be used for short-term exacerbations. People who have excessive tear drainage may find relief by sealing the tear drainage duct with punctal plugs, which allow them to keep more of their natural tears.^[12]

Tear drops are available as a therapy for dry eye. Artificial tears improve ocular surface stress, tear film stability, contrast sensitivity, and optical quality, which in turn improves quality of life,

according to most of the reviewed literature, which mostly consisted of small randomized trials on small groups of patients. For moderate to severe cases of dry eyes, another option is to use inflammatory drops, which work by breaking the vicious cycle of surface damage followed by inflammation. Essential for ocular surface illnesses, omega-3 and omega-6 fatty acids are also available in food. The anti-inflammatory and cytokine effects of omega-3 fatty acids are due to their ability to block the production of eicosanoids derived from omega-6 fatty acids. Omega-3 fatty acid action was examined in a randomized controlled trial (RCT) with 26 patients who received systemic linoleic acid and gamma-linolenic acid, which significantly reduced dry eye symptoms, inflammation of the eye's surface, and surface staining. Eye drops containing omega-3 fatty acids are currently available and undergoing clinical testing.^[13]

Patients still have dry eyes following phacoemulsification, despite the change in the environment of the ocular surface. Dry eyes could be a side effect of using topical anesthetic, many eye drops, and the operating microscope's light beams. The goal of the operation is to address pathologic alterations in the cornea associated with dry eyes by restoring or altering typical corneal innervation. Combinations of fluoroquinolones and topical artificial tear drops are common, and inflammation is treated with low-potency steroids. There was a need for alternative treatments, such as omega-3 anti-inflammatory fatty acids, as steroids have long-term adverse effects and artificial tears only provide temporary relief from inflammation and dry eye.^[14]

A crucial omega-3 polyunsaturated fatty acid, docosahexaenoic acid (DHA) aids in the improvement of cognitive functioning, the reduction of acute and chronic inflammations, and the reduction of risk factors for cardiovascular illnesses. "Considering the idea of a randomized clinical trial, we examine the effects of adjuvant omega-3 fatty acid supplementation on dry eye syndrome following cataract surgery." Three kinds of fatty acids make up omega-3 fatty acids: alpha-linolenic acid, which is present in many vegetable oils, eicosatetraenoic acid, which is prevalent in fish oil, and docosahexaenoic acid, which is also present in fish oil. The more active eicosatetraenoic acid comes from fish.^[15]

The anti-inflammatory and antimicrobial properties of omega-3 polyunsaturated fatty acids, as well as their ability to reduce risk factors for disorders like cardiovascular disease, make them essential for the development of neuro-psychological processes. From what we can tell, it also

leaves visible marks on the human eye. These fatty acids are an additional option for treating dry eyes, in addition to eye drops, which can be helpful but only provide a short-term solution. In dry eyes syndrome, multiple studies show the effectiveness of anti-inflammatory omega-3 polyunsaturated fatty acids. Many studies assessed changes in tear film osmolarity, In Sjogren syndrome dry eyes due to meibomian gland dysfunction are treated with intake of omega-3 fatty acids. Warm compresses are another inexpensive, easy, effective, and self-care option for the treatment of people with mild dry eyes. The application of heat on closed eyes allows the melting of wax in glands after 15 minutes. It can be performed manually with cotton cloth or with the help of an optic care instrument it shows a positive effect on the lipid layer , blink pattern, and MG function.^[16]

Treatment for MGD is approached by many practitioners in a very diverse manner. Underdiagnosis and frequent clinical follow-up are common and important, according to a small number of practitioners. When it comes to warming and cleaning the lids, there are a lot of recommendations, but different methods for how long and how often to do it vary. The majority of professionals in the field have noted that evaporative dry eye and aqueous-deficient dry eye, the two main forms of dry eye, are not adequately taught.^[17]

Lid hygiene is the sole clinical application of MGD. There are two components to lid hygiene. Using heat and mechanical massage on the eyelids is known as thermotherapy. There is an investigation on the evidence about eyelid warming in MGD applications of warm moisture. Reducing sebum secretion is associated with obstructive meibomian gland dysfunction, according to the International Workshop on Meibomian Gland Dysfunction. Profile of a subcommittee on meibomian gland dysfunction from the International Workshop on Meibomian Gland Dysfunction. As part of the 2004 Symposium on Tear Film, a subcommittee report was presented to the Tear Film Instigators and Thinkers Conference.^[18]

The pathologically altered meibomian lipids were re-solidified by eyelid warming therapy, which improved MG secretion. To do this, you can use a heated compress (such as a heated cloth or a rice bag) or an infrared or hot air bulb. Patients with inconsistent compliance for the treatment of MGD are treated with warm compress therapy. "Consensus of the Subcommittee on Management and Treatment of Meibomian Gland Dysfunction" was the title of the international workshop on

such a condition. the eleventh Although warm compresses have gained popularity as a treatment, nothing is known about how well they work when combined with omega-3 supplements. We can find a better long-lasting, cost-effective treatment in less time and come up with new treatment plans if we compare these two therapies. Which are still key source of discomfort in eyes internationally and is on rise day by day because of its no feasibility and affordability even after so many therapeutic discoveries in the world.^[19]

Warm compresses are a common treatment but their efficacy is not extensively studied along with omega 3 supplements. Comparison of these two interventions will help to determine which is a more durable cost effective treatment in less duration of time and it will also contribute to new treatment recommendations. Despite existing treatments dry eyes are still the persistent cause of ocular discomfort worldwide which is increasing day by day due to no feasibility and affordability. The goal of this study is to find a quick and easy way to treat dry eyes, which will save money and time and lessen the severity of dry eye problems.^[20]

PROBLEM STATEMENT

Reduced tear production, tear breakdown, and ocular pain are signs of dry eye disease, a prevalent ocular surface condition that affects millions of people worldwide and makes it difficult for them to go about their everyday lives. There are currently a lot of treatments available, including pharmaceutical and non-pharmaceutical options, omega-3 treatment, warm compression therapy, etc., but research on their relative effectiveness is lacking. When it comes to managing dry eye illness and its symptoms, such as impaired meibomian gland activity and inflammation, there hasn't been a ton of research that directly compares the therapeutic profiles, clinical effectiveness, and patient-perceived benefits of the two treatments. Few large-scale trials have compared the effects of warm compression with those of omega-3 supplements for the treatment of dry eye illness, including the alleviation of symptoms, restoration of the eye's surface, and maintenance of relief over time. Therefore, a systematic review is necessary to fill this knowledge vacuum and provide proper therapy recommendations for patients suffering from dry eye illness.

Chapter 2

LITERATURE REVIEW

The tear film and the surface of the eye are both affected by dry eye disease (DED), which is also called keratoconjunctivitis sicca. The condition is chronic and can affect both eyes, causing pain and mild vision impairment. Some have proposed using omega-3 fatty acids, which reduce inflammation, to treat erectile dysfunction. By downregulating the action of pro-inflammatory molecules, omega-3 fatty acids are known to improve tear formation and reduce inflammation. The non-drug method of heated compaction, in contrast, improves meibomian gland function and, by extension, the tear film and lipid layer. Since omega-3 fatty acids decrease systemic inflammation and warm compresses alleviate localized irritation of the tear film, research has shown that both treatments can help mend DED to a certain extent. However, additional large-scale randomized control trials are required to compare the efficacy of various therapies.

Y. Eom et colleagues. performed a randomized clinical trial in 2024 on the topic of re-esterified triglyceride ω -3 fatty acids in dry eye disease associated with meibomian gland dysfunction. This study set out to assess how rTG ω -3 fatty acid affects MGD-related DED. From 2020–2023, researchers at 7 different sites conducted this randomized, double-masked, parallel-group study. Participants in the ω -3 group, who had both DED and MGD, were given 1680 mg of eicosapentaenoic acid and 560 mg of docosahexaenoic acid daily, whereas the 3000 mg of grape-seed oil daily regimen was administered to the grape-seed group. The OSDI was the primary outcome measure after 6 and 12 weeks of intervention completion relative to baseline. So, improvements in visual acuity and changes in intraocular pressure were the safety outcomes. One hundred thirty-two patients were a part of the research (mean [SD] age: 50.6 [13.8] years; 103 [78.0%] female). In terms of baseline OSDI scores, the ω -3 group had an average of 43.5 (16.5) and the grape-seed group 44.1 (16.6). Inflammation, which can cause pain and blurred vision. The anti-inflammatory effects of omega-3 fatty acids have led to their investigation as a potential treatment for erectile dysfunction. Research indicates that taking omega-3 supplements can modulate the production of pro-inflammatory mediators, which in turn improves tear formation and reduces inflammation. In contrast, the non-pharmacological method of warm compress therapy improves the function of the meibomian glands, which in turn improves the quality of

the lipid layer and the durability of the tear film. While omega-3s work systemically to reduce inflammation, warm compresses work locally to improve tear film dynamics; however, comparative studies show that both treatments can reduce DED symptoms. But to determine how effective these treatments are relative to one another, more large-scale randomized controlled trials are required. ^[21]

In 2023, Iaccheri B et al. used confocal scanning laser microscopy to evaluate the efficacy of topical cyclosporine and warm compresses in treating meibomian gland dysfunction. Three fatty acids have been investigated as a potential treatment for erectile dysfunction due to their anti-inflammatory characteristics. Research indicates that taking omega-3 supplements can modulate the production of pro-inflammatory mediators, which in turn improves tear formation and reduces inflammation. In contrast, the non-pharmacological method of warm compress therapy improves the function of the meibomian glands, which in turn improves the quality of the lipid layer and the durability of the tear film. While omega-3s work systemically to reduce inflammation, warm compresses work locally to improve tear film dynamics; however, comparative studies show that both treatments can reduce DED symptoms. But to determine how effective these treatments are relative to one another, more large-scale randomized controlled trials are required. In this prospective, randomized, double-masked study, patients were randomized to two treatments: AT plus WC (group A), and AT plus WC plus CsA 0.05% ophthalmic emulsion (group B). At baseline and 1, 3, and 6 months, Ocular Surface Disease Index (OSDI) questionnaire was completed, and tear evaluation (BUT, Schirmer and osmolarity test), ocular surface evaluation (fluorescein and lissamine green staining), clinical (Shimazaki grading) and in vivo confocal microscopy (IVCM) evaluation of rete ridges (RRs) were performed. A total of 40 eyes, 20 in each group, completed the study. Analysis of OSDI, tear test, ocular surface evaluation, and clinical grading of MG showed significant improvement at 6 months, whereas no difference was found between the two groups at 6 months. The analysis of IVCM showed significant improvement in both groups, but significantly better results in group B were found compared to group A at 6 months. WC performed 3 times daily during the 1st month and once daily afterward, in addition to AT, was useful in managing the obstruction of MG and related signs and symptoms. Additional effects of CsA were visible in IVCM only at 6 months. IVCM is an effective tool for monitoring treatments in MGD. ^[22]

A Survey Study" was published in 2023 by Aljuhani GA, Afandi R, Alkayyal AA, Alharbi J, Alharbi AS, Alsaedi M, and others. They characterized complementary and alternative medicine (CAM) as an all-encompassing system of healthcare practices that does not include mainstream medicine. The reasoning behind this is that DED is the most common reason patients visit an ophthalmology clinic. Since CAM is becoming increasingly popular for treating eye conditions, more and more patients are turning to self-treatment CAM for their eye complaints. Previous research has indicated that 20% of patients use CAM. Finding out what percentage of patients with (DED) use CAM was the driving force behind this research. The data was collected using online questionnaires. The first part of the questionnaire collected demographic information. The second portion included the ocular surface disease index (OSDI), which was translated into Arabic and validated. In the third section, we covered non-medical techniques that can aid with DED. There were 221 girls and 61 males in the overall sample size of 282. Half of the people who took part in the survey were young adults (25–44 years old), and 90% of them were Saudi nationals (only 10% were from outside Saudi Arabia). Nearly three quarters of those who took the survey had earned a bachelor's degree or above. Roughly 85% of individuals suffering from dry eye used some form of complementary or alternative medicine. By far the most popular kind of complementary and alternative medicine (CAM) among the participants, at 41%, was faith healing, also known as Ruqyah. This was overcome by warm compressors with a 37% accuracy. With a p-value of 0.909, there was no statistically significant difference in the distribution of CAM usage across patients with varying degrees of OSDI. Patients suffering from dry eye syndrome would benefit most from CAM, according to this study's findings. The two most common complementary and alternative medicine practices are warm compressions and faith healing. Nevertheless, patients may use CAM for reasons other than symptom-related ones, as there is no correlation between patients' CAM use and the severity of OSDI. To better understand the characteristics of CAM use and its effectiveness in treating dry eye disease, more large-scale studies are needed.^[23]

A Prospective, Multicenter Noninterventional Study for the Treatment of Evaporative Dry Eye Disease: A Water-Free Omega-3 Fatty Acid Eye Drop Formulation for the Treatment of Evaporative Dry Eye Disease was carried out in 2022 by Christina Jacobi et al. When administered as directed, NovaTears+Omega-3 (0.2%) eye drops reduced clinical signs and

symptoms of DED, and the study also assessed the safety and tolerability of the product. This was the first post-market clinical follow-up (PMCF) study of its kind. Patients experiencing symptoms of evaporative DED were the subjects of a prospective, multicenter, single-arm, uncontrolled, open-label descriptive cohort research. For 8 weeks, patients were given the medication four times a day on both sides as directed. At baseline and follow-up, they were evaluated for standard-of-care clinical end goals. The trial took place at two research locations across Europe and Germany. Thirty-three out of forty-six patients were able to finish the trial. During the 8-week treatment period, NovaTears+Omega-3 (0.2% of the total) demonstrated improvement in multiple clinical signs, including total corneal staining, tear film break-up time, and Meibomian gland dysfunction (MGD) score. Additionally, symptoms were measured using the Ocular Surface Disease Index (OSDI¹⁷) and visual analog scales, and all of the change from baseline P values were less than 0.0001. The trial did not record any adverse events and there was no worsening of any safety parameter, including intraocular pressure, slit-lamp examination, or visual acuity. Everyone who took NovaTears+Omega-3 did so without incident in this observational PMCF trial. Patients suffering from evaporative dry eye saw a marked improvement in both objective and subjective symptoms after 8 weeks of treatment.^[24]

"Improved dry eye symptoms and signs of patients with meibomian gland dysfunction by a dietary supplement" was the subject of a 2021 research by Liu K, Chan YK, Peng X, Yuan R, Liao M, Liang J, et al. The authors of the study aimed to determine the therapeutic effects of a food supplement on MGD, a prevalent illness that causes dry eye. This prospective, randomized, placebo-controlled trial included sixty patients with dry eye symptoms associated to MGD. The patient used in the study was this one. Eye hot compresses, artificial tears, and antibiotic ointment were given to all of the individuals. Twelve weeks following the conclusion of the scans, the patients continued to take either the nutritional supplement or a placebo orally. At 4, 8, and 12 weeks post-treatment, patients' visual quality, MG function, and symptoms of dry eye were assessed. The nutritional supplement group had a notable improvement in dry eye symptoms (IODSES and TBUT) after 12 weeks of treatment, in comparison to the placebo group ($P < 0.05$). The dietary supplement and placebo groups had higher MG functions of meibum quality, MG exclusion, and MG blockage scores ($P < 0.05$). The dietary supplement group showed a larger percentage difference in MG functions compared to the placebo group. Based on the

improvement of the MG structure in terms of acinar diameter and acinar density ($P < 0.05$), the administration of the dietary supplement was determined to be better than placebo. In comparison to the placebo group, the group that took dietary supplements exhibited less inflammatory cells surrounding the MG ($P < 0.05$). The results showed that the group using the dietary supplement had better objective visual quality compared to the placebo group ($P < 0.05$).^[25]

The impact of omega-3 supplements on meibomian gland dysfunction was the subject of a comprehensive review by Al-Namaeh M. M. in 2020. Consequently, the purpose of this meta-analysis is to determine if omega-3 supplementation is beneficial for MGD patients. In order to compile all randomized clinical trials (RCTs) involving omega-3 as a treatment for MGD, this systematic review reviewed the two main databases, PubMed and Clinicaltrial.gov. For the systematic review and meta-analysis, researchers combed through MEDLINE and found one randomized controlled trial (RCT) and six clinical trials totaling 350 individuals. In comparison to the placebo group, the studied treatment group (omega-3 group) successfully protected against MGD in the invasive sodium fluorescein-tear break-up time (NaFl-TBUT) score (odd ratio = 8.72, 95% confidence interval: 4.73, 16.09; $p < 0.001$). The statistics also suggest that the treatment intervention group had a higher chance of getting the better stated ocular outcome of tear break-up time (TBUT) compared to the control group, which is supported by the odds ratios of the omega-3s group. Nevertheless, neither the funnel plot analysis nor Egger's test for funnel symmetry revealed any publication bias ($p=0.2944$).malfunction of the n gland. The purpose of this meta-analysis is to find out whether omega-3 supplements help patients with MGD. This meta-analysis incorporated all randomized clinical trials (RCTs) using omega-3 fatty acid treatment for MGD that were found by an electronic search of PubMed and Clinicaltrials.gov. The systematic review and meta-analysis study drew 350 individuals from one randomized controlled trial (RCT) and six clinical trials that were found using the MEDLINE database search. In comparison to the placebo group, the studied treatment group (omega-3 group) successfully protected against MGD in the invasive sodium fluorescein-tear break-up time (NaFl-TBUT) score (odd ratio = 8.72, 95% confidence interval: 4.73, 16.09; $p < 0.001$). According to these results, the probability that the treatment group would get the enhanced stated endpoint tear break-up time (TBUT) was higher in the omega-3 group compared to the control group due to the odd ratios of the two groups. The funnel plot inspection and Egger's statistical test did not

reveal any signs of publication bias ($p = 0.2944$). Oral supplementation with a moderate dose of omega-3 fatty acids on a daily basis may aid in the management of MGD, as this nutrient has been shown to have some health benefits. This latest systematic study has strengthened the shield that omega-3 gives against age-related macular degeneration, adding to its list of benefits for numerous disorders, including heart attacks and AMD. In addition, the accuracy of NITBUT compared to NaFl-TBUT is the main topic of this review, which could suggest NITBUT's function in clinical practice.^[26]

The topic of Omega-3 and omega-6 polyunsaturated fatty acids for dry eye illness, also known as short dry eye, was the subject of a 2019 paper by Downie LE et al. Their study looked at the symptoms and indications of dry eye in relation to omega-3 and omega-6 PUFA supplementation. In February 2018, we checked references and searched CENTRAL, Medline, Embase, two other databases, and three trial registries. In October 2019, a top-up search was also conducted, but the results have not been integrated. Researchers found only weak evidence that long-chain omega-3 significantly reduced dry eye symptoms as compared to placebo in a meta-analysis of 34 randomized controlled trials (RCTs) comprising individuals with dry eye. However, compared to placebo, long-chain omega-3 supplements were found to increase aqueous tear production with a moderate confidence. Despite this, most people did not think this variation was important from a therapeutic standpoint. There was insufficient evidence to definitively rule out the possibility of a decrease in tear osmolarity. The sample size was too big to permit the combination of information about adverse effects and tear break-up time (TBUT). The Schirmer test yielded a moderate level of confidence in indicating the absence of an intergroup difference. There was a considerable degree of assurance regarding the effect of the PUFA intervention on TBUT improvement compared to placebo because of this. There was just a single small study available for both tear osmolarity effects and adverse event data. The low value evidence of symptoms across the two groups indicated that the omega-3 group benefited more from the combination of omega-3 and conventional therapy than from conventional therapy alone. Based on intermediate certainty evidence, it is likely that dry eye symptoms can be improved with long-chain omega-3 supplementation as compared to omega-6 supplementation. It was not possible to do a meta-analysis on data related to TBUT, Schirmer's test, or ocular surface staining.^[27]

Researchers Smith, McMahon, and Nymark (2018) looked at a new combination treatment for dry eye patients in a pilot research. Roughly 25% of the US population that participated in this study reported dry eye or an abnormality of the external eye surface. Research on effective management options for several of these disorders is a priority. For patients with dry eye caused by an ocular surface condition, this study set out to determine how well a daily, standardized protocol using a warm, moist ocular application and omega-3 oral supplements worked. An open-label, multicenter, clinically based, 4-week cohort study was intended to answer these questions. The research was conducted at six different private eye care clinics across the US: the main ones are in Beverly Hills, CA; San Diego, CA; Sunnyvale, CA; Park City, UT; Tarpon Springs, FL; and Kennewick, WA. The participants were adults (ranging in age from 18 to 75 years) who were randomly assigned to the study and had depressive effects from standardized OSDI tests and clinical examinations consistent with ocular surface disease. The first intervention was to apply a moist, warm, and eye compress once a day for the next 30 days. The second intervention was to take an oral triglyceride form of omega-3 supplements based on nutritional therapy. Two of these assessments were the OSDI and the TBUT, or tear break-up time. Only 33 of the 35 patients who started the 4-week program were able to complete it. After beginning treatment with the unique Dry Eye Protocol, participants showed significant improvement, with 49% fewer OSDI scores ($P = .0015$) and 46% no longer experiencing any dry eye symptoms. So, TBUT efficiency went up from 3.0 to 5.4 s as well. Participants' overall OSDI and TBUT improved significantly after using a moist, heated compress daily in conjunction with the unique Dry Eye Protocol and a high dosage of triglyceride omega-3. This treatment is advised as a first line of defense for individuals with DED.^[28]

In 2018, a study question was investigated by Lauren JA. Are individuals able to experience a less severe case of dry eye syndrome after taking a daily dosage of omega-3 fatty acids? Finding out whether taking omega-3 fatty acid supplements orally once a day helps alleviate DES symptoms in adults is the goal of this specific evidence-based review. In this paper, we take a look at three randomized controlled trials that came out in 2013, 2016, and 2017. The author of this report searched PubMed, Embase, and the Cochrane Library systematically to find relevant articles to review and to conduct the research. After patients have been treated for dry eyes for at least one month and no more than twelve weeks, they complete out a 12-item questionnaire that measures

the subjective severity of their symptoms. All of the studies used the Ocular Surface Disease Index (OSDI) scale developed by Allergan, Inc. to measure subjective results. Along with calculating group means, we also looked at the difference in scores from day one to day two of the study.^{1, 2, and 3.} Deinema et al. (2017) observed that after three months of using krill oil supplements, patients' dry eye symptoms improved by 18.6 $\pm$ 2.4 (mean change from baseline per OSDI scores).⁴ Symptoms improved by 17.0 $\pm$ 2.6 points after three months of treatment in the treatment group of Petropoulos et al. (2016).⁵ If you're Kangari It follows that adults suffering from mild to moderate dry eye syndrome (DES) after a 90-day period may find relief with the regular consumption of omega-3 essential fatty acids.^[29]

A study titled "All warm compresses are not equally efficacious" was carried out in 2015 by Murakami DK, Blackie CA, and Korb DR.s. Therefore, the purpose of their investigation was to identify the most effective WC for heating the inner eyelids to enhance treatment for meibomian gland dysfunction based on a limited case series. The following were considered inclusion criteria: In order to be eligible to participate in the study, participants must be at least 18 years old, have no history of ocular inflammation or disease, and not have had any kind of ocular surgery within the past six months. Five patients could be enrolled after receiving their full permission. We tested a variety of dry, wet/moist, and chemically activated dry heat ways, as well as touch and non-contact WC heating methods. The research team used a contralateral cross-over design, meaning that each participant had both a treated and untreated eye. Both the test and control eyes had their external upper, external lower, and internal lower lid temperatures taken at baseline, as well as at 2, 4, 6, 8, and 10 minutes into the application. Every one of the eight therapies that were being studied was administered to all of the subjects. Two of the compresses warmed independently in the microwave and were not under the investigator's control, while the others were heated to 47 $\pm$ 1.0°C. Patients in the study had an average age of 42.2 years with a standard deviation of 20.3. Of the eight compresses that were evaluated, the only one that succeeded in increasing the temperature of the exterior upper lid, external lower lid, and internal lower lid to 40°C or higher was the concurrent wet/moist towel technique. The compresses that caused the inner palpebral surface to heat up the least were the ones containing chemically activated Hygiene, Madrox Eye Bag, and Medi Beads. While all of the measured sections during the WC application were within the therapeutic range, the Bundle approach increased lid

temperatures beyond that limit and was the most time-consuming. Hence, this WC application approach can be recommended as an additional home treatment for meibomian gland dysfunction or any other ailment that calls for the application of therapeutic heat to the meibomian glands, which is 40°C.^[30]

Research at Korb Associates in Boston, MA, USA, examined the efficacy of a combination of lid wipes, eye drops, and omega-3 supplements in treating evaporative dry eye and lipid deficiency in 2015. This study set out to compare the effectiveness of warm compresses with that of a combination treatment approach for lipid-deficient/evaporative dry eye disease (LDDE) that included eyelid cleansing wipes, omega-3 vitamin supplements, and lipid emulsion eye drops. Patients with dry eye symptoms at screening and a clinical diagnosis of LDDE (defined as having 6 or fewer functional meibomian glands, also known as MGYLS) were included in this randomized, open-label, investigator-masked study. The participants had to be 18 years old or older. For three months, patients were randomly assigned to either use warm, wet compresses once daily for eight minutes or to get a combination treatment that included lipid emulsion eye drops, omega-3 supplements, and eyelid cleanliness wipes. The number of meibomian gland lymph nodes (MGYLS) was used as the primary outcome, while the SPEED and OSDI questionnaires were used as secondary outcomes to examine patient-reported subjective evaluations. The safety outcomes that were evaluated were adverse events (AEs) and visual acuity. With 26 total patients and 13 in each group, the average age was 41.7. After three months of treatment, the mean $\pm$ SD number of MGYLS was significantly higher with combination treatment compared to warm compresses (9.3 ± 2.7 vs. 4.7 ± 2.3 ; $p = 0.006$), although there was no statistically significant difference between the groups at baseline (3.5 ± 1.5 for combination treatment and 4.2 ± 1.4 for warm compresses, $P > 0.5$). Both groups also saw a decrease in dry eye symptoms, while the third group showed a statistically significant improvement across the board. Both groups had the same BCVA at week 12, compared to baseline; this is one of two non-treatment-related adverse events. Both trials found that patients' dry eye symptoms were considerably decreased and meibomian gland functions improved with the combination therapy regimen. So, there was no documented safety issue.^[31]

in The study conducted at the Advanced Eye Centre, Department of Ophthalmology, Post Graduate Institute of Medical Education and Research, Chandigarh, India, examined the effects of oral

omega-3 fatty acid supplementation on contrast sensitivity in patients with moderate meibomian gland dysfunction. The results were published in 2015 by Malhotra et al., and the trial was a prospective placebo controlled trial. This study was designed to evaluate the correlation between the use of ω -3 FAs oral supplements and contrast sensitivity in patients with moderate MGD. There was a random assignment of 60 patients with moderate MGD to either a treatment or control group in this prospective clinical study. Warm compresses, massaging of the eyelids, and the use of artificial tears were all part of the treatment for both groups. In addition, the treatment group was given 1.2 g of ω -3 FAs orally once a day. All of the aforementioned metrics, which comprise the Ocular Surface Disease Index (OSDI), conjunctival examination at 3, 6, 12, and 18 cycles per degree (cpd), tear break-up time, Schirmer test I without topical anesthesia, corneal and conjunctival damage scores, meibum quality and expressibility, and baseline and 12-week data were obtained. At the end of the 12-week treatment period, the treatment group showed a significant improvement in CS across seven of the eight testing conditions (3, 6, 12, and 18 cpd photopic and 6, 12, and 18 cpd mesopic). In comparison, the placebo group showed improvement across three of the eight testing conditions (3 cpd photopic and 6 and 18 cp OSDI score, tear break-up time, ocular surface staining, and meibum quality and expressibility), but the difference was more apparent in the treatment group. Neither group saw an improvement in their Schirmer scores. The results show that ω -3 FAs can improve CS in patients with mild to moderate impairment of retinal function, and this is in addition to improving photopic and mesopic visual performance in patients with moderate MGD. There was no effect on the formation of water-based tears, however tear film stability was improved.^[32]

Some information regarding the efficacy of omega-3 fatty acid supplements in comparison to warm compress therapy is missing from this DED systematic study. To date, no randomized controlled experiment has compared the efficacy of warm-compress therapy with that of omega-3 supplements in alleviating symptoms or improving established tear film characteristics. Criteria for participant selection, dosage of omega-3 supplements, method of warm compress application, and overall consistency are the at least four areas where prior studies can differ. Finding solid conclusions about their respective superiority is made more difficult by these factors. Few studies have examined the efficacy of omega-3 supplements compared to warm compresses in treating chronic dry eye, and even fewer have examined the supplements' long-term impact on patients.

Subtypes of DED, such as evaporative or aqueous-deficient DED, have not had their comparative effectiveness studied in depth. No biomarker studies that have examined the tear film's lipid layer or evaluated the efficacy of these treatments utilizing inflammatory cytokines have been reported as far as the authors are aware. Quality of life and treatment satisfaction are examples of patient-reported outcomes that have been under-emphasized in prior research compared to clinical endpoints. For patients with DED, there has been little research on the possible additive and synergistic advantages of using omega-3 supplements and warm compress therapy simultaneously. If these questions can be answered, maybe more light may be shed on the best course of treatment .treat individuals suffering from dry eye disease and offer recommendations for clinical practice based on scientific data.

OBJECTIVES

To determine the optimal treatment for dry eyes in terms of cost-effectiveness and time efficiency by comparing omega-3 supplements versus warm compression.

To compare the effectiveness of treatment between omega-3 supplements and warm compression in dry eye disease patients.

HYPOTHESIS

Alternate Hypothesis

There is a non-significant difference in the effectiveness of treatment between omega-3 supplements and warm compression in dry eye disease.

Null Hypothesis

There is no difference in the effectiveness of treatment between omega-3 supplements and warm compression in dry eye disease.

OPERATIONAL DEFINITIONS

DRY EYE

Dry eye is a multifactorial disease of tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability along with damage to the ocular surface, it is the main cause seen in ophthalmology clinics. Redness, pain, irritability to light watering are some symptoms along with less tear film volume. Less tear film break-up time and meibomian gland dysfunction.^[33]

OMEGA 3

Omega-3 fatty acids, also termed n-3 fatty acids or ω -3 fatty acids (n-3 FAs), are defined as a heterogeneous group of fatty acids with a double bond between the third and fourth carbon atoms from the methyl end (from the ω -1 carbon atom). Chain omega-3 fatty acids are important for health in protection against several diseases, including cardiovascular diseases, rheumatoid arthritis, and chronic and antimicrobial inflammations.^[34]

WARM COMPRESSION

Warm compresses (WCs) are supplementary therapy for MGD and have good outcomes. Heat helps to soften the secretions in obstructed glands, allowing to increase in the lipid layer thickness for a short duration of time. They stabilize tear film and protect against excessive evaporation of the aqueous layer. Precise temperature for optimal warm compresses is not defined, the assumption is of high temperature higher or equal to 40-C. may be raised for more obstructions.^[35]

Chapter 3

MATERIALS AND METHOD

3.1 Research Design:

Comparative Study

3.2 Clinical Settings:

A hospital-based study was done for two months with proper ethical consideration and consent from patients.

3.3 Sample Size:

By utilizing the formula

$$N = \frac{2 \times (Z_{1-\alpha} + Z_{1-\beta})^2 \times \sigma^2}{d^2}$$

There was a total of 140 sample size 70 in the omega 3 supplementation group and 70 in warm compressions.^[36]

3.4 Sampling Technique:

A Stratified random sampling technique was used.

3.5 Duration of Study

3 months after approval of synopsis

3.6 Selection Criteria

3.6.1 Inclusion Criteria

Both genders included

Young adults (20-39) years diagnosed with dry eyes

Willing to participate with

No ocular surgery or infection in the last 2 weeks

3.6.2 Exclusion Criteria

Age group less than 18 years and more than 40 years

Patients having diet with omega 3 for 1 month

Patients who have undergone glaucoma treatment

Already receiving treatment for dry eyes

Patients with any ocular surgery

Contact lens wear

Lacrimal drainage

Eye abnormality

Pregnant women

Lactating women

3.7 Ethical considerations

- Obtained informed consent from all the participants.
- All the pros and cons were discussed with the participants.
- Ensured confidentiality and data protection during the complete process.
- Provide participants with the option to withdraw from the study at any time.

3.8 Data Collection Procedure

During regular visits of patients in the ophthalmology department baseline assessment was carried out to diagnose disease, ocular findings, and cause of visit. After proper consent, Ocular Surface Disease Index assessment Performa should be used which has psychometric testing and is approved by the US Food and Drug Administration with a sensitivity of 77%, and specificity of 83% when Schirmer and BUT is less than 10 sec. This questionnaire consists of 12 questions.

All four conditions are ranked from 0 (none) to 4 (all) OSDI scale ranging from 0 -100 higher scores representing disability and lower scores moderate to low and the cutoff value for diagnosis of DED is $s \geq 35$. After the questionnaire and ophthalmic assessment, the patient underwent TBUT and Schirmer tests along with fluorescein staining. Schirmer test is an invasive method to measure dry eyes a filter paper is used to measure tear secretion, a strip is inserted into the temporal lower conjunctival sac and the length of wetting is noted in mm after 5 minutes, wetting ≤ 6 mm is considered as Dry eye disease for TBUT test a sterile strip of fluorescein is injected in the lower fornix and then removed. The patient is asked to blink 3 times and to look forward to assessing under a slit lamp under a cobalt blue filter appearance of the first break in the tear film has to be recorded with a stopwatch for less than a second considered as DES.

After the diagnosis of DED one group received omega 3 supplements (EPA) 500mg and (DHA) 250mg dose for 1 month, and other groups with warm compressions along the hot soaked technique for 1-week Follow-up was done on the second visit to record findings, OSDI score along TBUT and Schirmer testing to check dry eye signs in 2 groups results of both groups were compared with SPSS.

3.9 Data Analysis procedure

Data was analyzed through SPSS 27 and the ANOVA test was used for comparison.

1. Gantt Chart

Research Activity	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
Submission of Proposal										
Completion of chapter one										
Working on Literature review										
Development of research questionnaire										
Chapter three – research methodology completion										
Data collection										
Data analysis										
Discussion, conclusion and recommendations										
Finalization of thesis report										

Chapter 4

RESULTS

This study included 140 (100%) participants, 99 were male (70.7%), and 41 were female (29.3%). A mean baseline OSDI of 25.58 with an SD of 5.091 indicates mild to moderate symptoms of ocular surface disease in the range of 18 to 37. After treatment, the OSDI score decreased to 12.86 ± 3.972 with a significant reduction, indicating symptom improvement. Similarly, the Schirmer test increased from an average of 9.58 mm (SD = 3.246) to 14.74 mm (SD = 3.282), indicating improved tear production. The TBUT improved from an average of 6.24 seconds (SD = 2.151) to 12.26 seconds (SD = 2.830), reflecting better tear film integrity. Wilcoxon Signed Rank test indicates significant and consistent improvements across all three parameters, with no cases of worsening or unchanged outcomes among the participants. Overall, the Omega-3 group improved significantly across all measures, with a total mean OSDI score of 18.69 (SD = 8.357) compared to 19.74 (SD = 7.266) for the warm compression group. Similarly, total mean Schirmer test scores and TBUT were slightly higher for the Omega-3 group (12.26 and 9.89, respectively) than for the warm compression group (12.05 and 8.61). Compared to warm compression therapy, these results underscore the enhanced efficacy of Omega-3 supplementation in improving dry eye symptoms and ocular surface health.

Table 4.1: Descriptive statistics

Descriptive Statistics				
	N	Range	Mean	Std. Deviation
OSDI Scoring 1	140	15	25.83	4.353
Schirmer Test 1	140	7	6.38	2.114
TBUT 1	140	4	6.99	1.235
OSDI scoring 2	140	17	12.86	3.972
Shirmer Test 2	140	15	14.74	3.282
TBUT 2	140	11	12.26	2.830

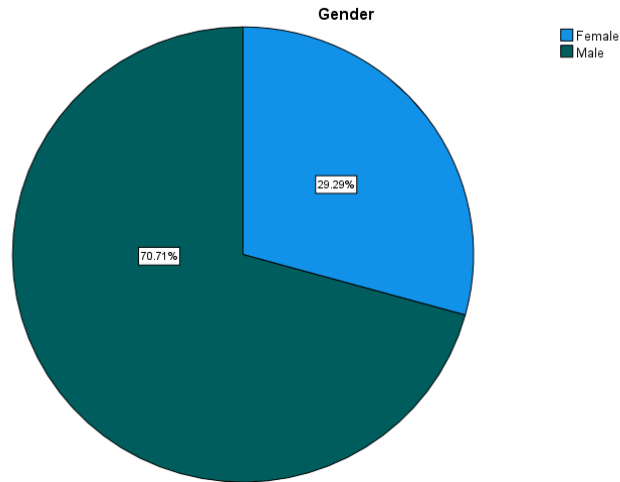
The descriptive statistics summarize the data collected for three ocular tests (OSDI scoring, Schirmer test, and TBUT) performed at two time points (1 and 2) on 140 participants. For the Ocular Surface Disease Index (OSDI) scoring at time 1, the range was 15, with a mean score of 25.83 ± 4.353 , indicating moderate variability in ocular discomfort or dry eye symptoms. At time 2, the OSDI range increased slightly to 17, but the mean decreased to 12.86 ± 3.972 , suggesting an improvement in symptoms over time. The Schirmer test, which measures tear production, showed an initial range of 7 with a mean of 6.38 ± 2.114 at time 1, increasing to a range of 15 and a mean of 14.74 ± 3.282 at time 2, reflecting improved tear production. Tear Break-Up Time (TBUT), assessing tear film stability, had a range of 4 and a mean of 6.99 ± 1.235 at time 1, which expanded to a range of 11 and a mean of 12.26 ± 2.830 at time 2, indicating enhanced tear film stability. Overall, the data suggest significant improvements in all parameters from time 1 to time 2, highlighting positive changes in ocular surface health and tear dynamics.

Table 4.2: Gender Statistics

Genders				
	Frequency	Percent	Valid Percent	Cumulative Percent
Female	41	29.3	29.3	29.3
Male	99	70.7	70.7	100.0
Total	140	100.0	100.0	

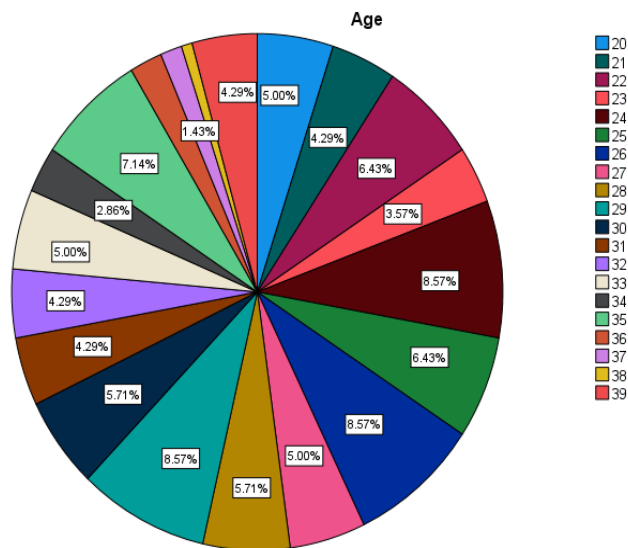
The gender distribution of the study population indicates that out of 140 participants, 99 were male (70.7%), and 41 were female (29.3%).

Graph 4.1: Gender Statistics



This Pie chart represents gender distribution in the data with blue color for females and green color for males. 70.71 % were male while 29.29% females.

Graph 4.2: Age Statistics



This pie chart illustrates the distribution of individuals across different age groups. Each segment represents a specific age, with its size corresponding to the percentage of individuals in that group. The chart includes a wide range of ages from 20 to 39, with several age groups, such as 23, 29, and 34, having the highest proportions at 8.57%. Other ages, like 21 and 38, have smaller proportions at 1.43% and 2.86%, respectively. The diversity in segment sizes highlights the

variation in population representation across these age groups. The color coding effectively differentiates each age group for clarity.

Table 4.3: Normality Test Statistics

Tests of Normality				
Study Group		Kolmogorov-Smirnov ^a		
		Statistic	df	Sig.
OSDI Scoring 1	Omega 3	0.092	70	.200*
	Warm Compression	0.087	70	.200*
Schirmer Test 1	Omega 3	0.106	70	0.050
	Warm Compression	0.108	70	0.041
TBUT 1	Omega 3	0.191	70	0.000
	Warm Compression	0.186	70	0.000
OSDI scoring 2	Omega 3	0.140	70	0.002
	Warm Compression	0.132	70	0.004
Shirmer Test 2	Omega 3	0.139	70	0.002
	Warm Compression	0.098	70	0.095
TBUT 2	Omega 3	0.118	70	0.017
	Warm Compression	0.199	70	0.000
*. This is a lower bound of the true significance.				
a. Lilliefors Significance Correction				

The table presents the results of Kolmogorov-Smirnov tests for normality, evaluating whether the distributions of various clinical parameters (OSDI scoring, Schirmer Test, and TBUT) in two study groups (Omega 3 supplementation and Warm Compression) deviate significantly from normality. The significance value (Sig.) indicates whether the data follow a normal distribution for most parameters. Values of Sig. below 0.05 suggests a significant departure from normality, while higher values imply the data do not significantly differ from a normal distribution. For instance, OSDI Scoring 1 in both groups shows a Sig. of 0.200, indicating normal distribution. However, Schirmer Test 1 and TBUT 1 have Sig. values of 0.041 and 0.000, respectively, indicating non-normal distribution. Similarly, OSDI Scoring 2 and TBUT 2 show significant deviations from normality in most cases, while Schirmer Test 2 is normal only for the Warm Compression group

(Sig. = 0.095). The results are adjusted using the Lilliefors correction to provide a more accurate significance value.

Table 4.4: ANOVA Significance Test Statistics

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
OSDI Scoring 1	Between Groups	0.457	1	0.457	0.024	0.877
	Within Groups	2633.429	138	19.083		
	Total	2633.886	139			
Schirmer Test 1	Between Groups	0.179	1	0.179	0.040	0.842
	Within Groups	620.757	138	4.498		
	Total	620.936	139			
TBUT 1	Between Groups	0.029	1	0.029	0.019	0.892
	Within Groups	211.943	138	1.536		
	Total	211.971	139			
OSDI scoring 2	Between Groups	216.257	1	216.257	15.096	0.000
	Within Groups	1976.886	138	14.325		
	Total	2193.143	139			
Shirmer Test 2	Between Groups	70.007	1	70.007	6.769	0.010
	Within Groups	1427.214	138	10.342		
	Total	1497.221	139			
TBUT 2	Between Groups	288.579	1	288.579	48.292	0.000
	Within Groups	824.643	138	5.976		
	Total	1113.221	139			

The ANOVA table compares variance between groups and within groups for the parameters measured at two-time points. For time 1 (baseline), the results show no statistically significant differences between groups for any variables. Specifically, for OSDI Scoring 1, the F-value is 0.024 with a p-value (Sig.) of 0.877, indicating no significant difference in the ocular surface disease index scores between groups. Similarly, for Schirmer Test 1 and TBUT 1, the F-values are

0.040 ($p = 0.842$) and 0.019 ($p = 0.892$), respectively, suggesting that tear production and tear film stability are comparable between the groups at baseline. These results confirm that the initial conditions for all participants were statistically equivalent, which is crucial for assessing changes over time.

At time 2 (follow-up), significant differences emerge in all three parameters, indicating improvements in ocular health. For OSDI Scoring 2, the F-value is 15.096 with a p-value < 0.001 , showing a statistically significant reduction in dry eye symptoms between groups. The Schirmer Test 2 demonstrates a significant increase in tear production, with an F-value of 6.769 and a p-value of 0.010. TBUT 2 reflects the most substantial improvement, with an F-value of 48.292 and a p-value < 0.001 , indicating markedly enhanced tear film stability. These findings suggest that the intervention or changes implemented between time 1 and time 2 led to significant improvements in ocular surface health and tear dynamics, with noticeable differences between groups at the second time point. This highlights the effectiveness of the intervention or treatments administered.

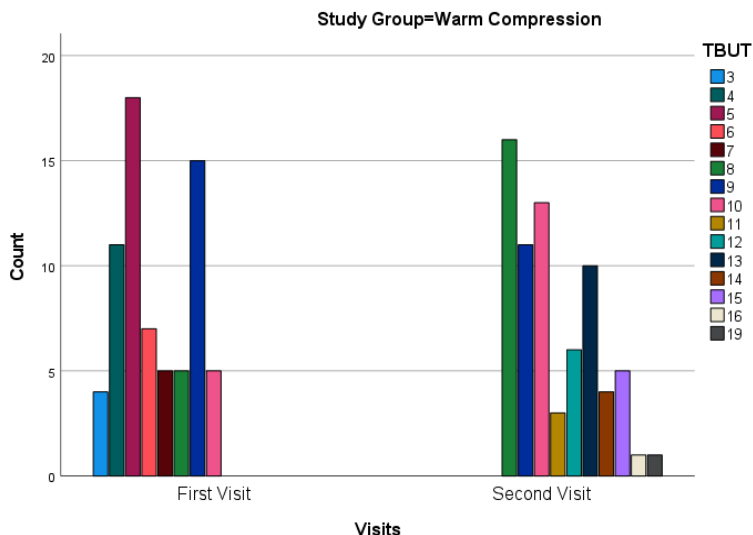
Table 4.5: Comparative Statistics

Report					
Study Group			OSDI Scoring	Schirmer Test	TBUT
Omega 3	First Visit	Mean	25.77	6.41	6.97
		Std. Deviation	4.381	2.123	1.227
	Second Visit	Mean	11.61	15.44	13.70
		Std. Deviation	3.432	3.348	2.330
	Total	Mean	18.69	10.93	10.34
		Std. Deviation	8.114	5.322	3.853
Warm Compression	First Visit	Mean	25.89	6.34	7.00
		Std. Deviation	4.356	2.119	1.251
	Second Visit	Mean	14.10	14.03	10.83
		Std. Deviation	4.108	3.079	2.554
	Total	Mean	19.99	10.19	8.91
		Std. Deviation	7.264	4.670	2.776
Total	First Visit	Mean	25.83	6.38	6.99
		Std. Deviation	4.353	2.114	1.235
	Second Visit	Mean	12.86	14.74	12.26
		Std. Deviation	3.972	3.282	2.830
	Total	Mean	19.34	10.56	9.63
		Std. Deviation	7.715	5.011	3.426

The results compare the effects of two interventions—Omega-3 supplementation and warm compression—on OSDI scoring, Schirmer test, and TBUT across two visits. At the first visit, both groups displayed similar baseline values for OSDI (mean ~25.8), Schirmer test (~6.4), and TBUT (~7.0), with comparable standard deviations, indicating no initial differences. By the second visit, significant improvements were observed in both groups, but the Omega-3 group demonstrated slightly better outcomes. For OSDI scoring, the Omega-3 group showed a greater reduction (mean 11.61 vs. 14.10), reflecting better relief in symptoms. Schirmer test results, which measure tear production, were higher in the Omega-3 group (mean 15.44 vs. 14.03), indicating improved tear secretion. Similarly, TBUT, measuring tear stability, was substantially higher in the Omega-3

group (mean 13.70 vs. 10.83), suggesting a more stable tear film. While both interventions improved ocular health, Omega-3 supplementation consistently outperformed warm compression in all parameters, showing greater efficacy in improving dry eye symptoms and tear dynamics.

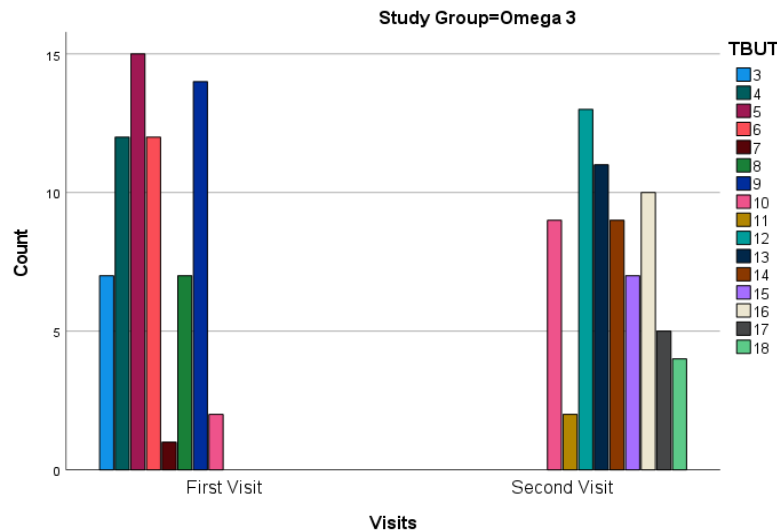
Graph 4.3: Warm compression versus TBUT statistics



This bar graph compares tear breakup time (TBUT) values distribution in a study group subjected to warm compression therapy across two visits (first and second). The x-axis represents the visit numbers, while the y-axis shows the count of individuals for each TBUT value, indicated by different colors in the legend. The first visit shows a higher concentration of participants with lower TBUT values, particularly at TBUT values of 4 and 5, reflecting shorter tear stability. By the second visit, there is a noticeable shift, with higher TBUT values (e.g., 7, 8, and 10) being more prevalent, suggesting an improvement in tear film stability after the intervention. This distribution highlights the effectiveness of warm compression therapy in improving tear breakup time over the study period. The results between the first and second visits reveal a clear improvement in tear breakup time (TBUT) for participants in the warm compression group. During the first visit, the distribution of TBUT values is skewed toward lower values (e.g., 4 and 5), indicating shorter tear stability and a higher prevalence of dry eye symptoms. In contrast, the second visit shows a noticeable shift toward higher TBUT values, with peaks around 7, 8, and 10, and a reduction in the count of individuals with lower TBUT values. This indicates that warm compression therapy

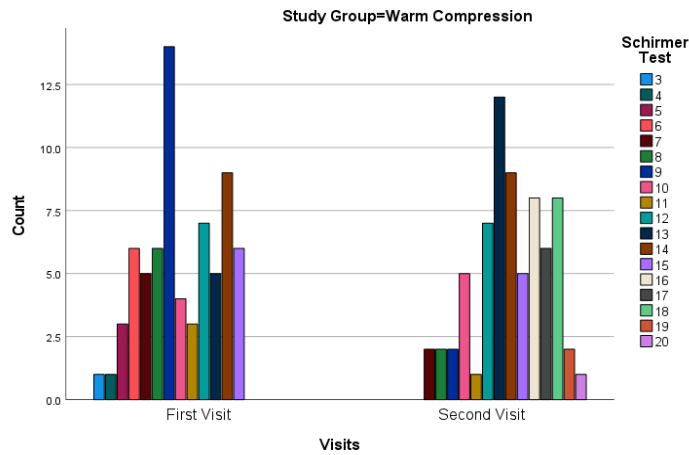
significantly enhanced tear film stability over time, as more participants demonstrated longer TBUT by the second visit.

Graph 4.4: Omega-3 versus TBUT statistics



This bar graph illustrates the distribution of tear breakup time (TBUT) values in participants who underwent omega-3 supplementation, comparing the first and second visits. In the first visit, most participants exhibited lower TBUT values, particularly concentrated around 4 and 5, reflecting poorer tear stability. By the second visit, the distribution shifts towards higher TBUT values, with prominent peaks at 7, 9, and 10, indicating improved tear film stability. Additionally, some higher TBUT values (e.g., 13 and 17) appear in the second visit, which were absent or minimal in the first visit. This shift suggests that omega-3 supplementation led to an overall improvement in tear stability and reduced symptoms of dry eye over the study period, although the improvement appears less pronounced compared to the warm compression group.

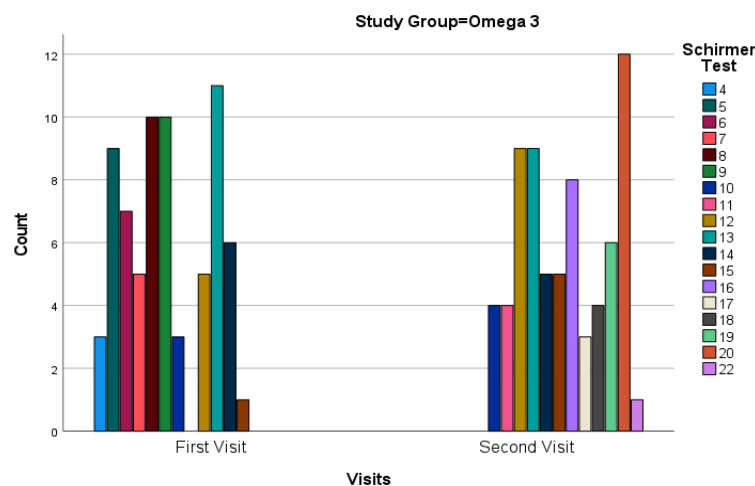
Graph 4.5: Warm compression versus Schirmer Test Statistics



This bar graph displays the distribution of Schirmer test values for participants in the warm compression study group, comparing results from the first and second visits. The Schirmer test measures tear production, with values indicated by different colors in the legend. During the first visit, there is a pronounced peak at a Schirmer value of 5, indicating a significant number of participants with lower tear production. Other lower values, such as 4 and 6, also appear with moderate frequencies, suggesting compromised baseline tear secretion.

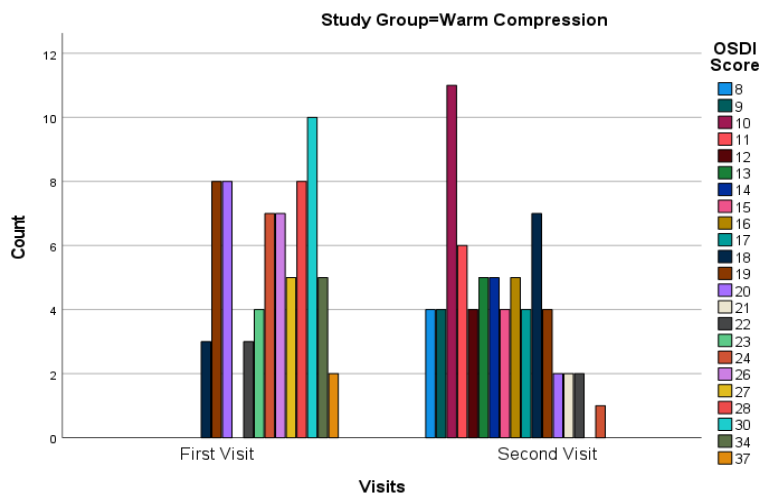
By the second visit, the distribution shifts noticeably, with higher Schirmer values (e.g., 10, 12, and 15) becoming more prominent, while the lower values decrease in frequency. The peak observed at a Schirmer value of 5 in the first visit diminishes significantly. This shift suggests that warm compression therapy led to improved tear production over time, as evidenced by the increased prevalence of higher Schirmer test values during the second visit.

Graph 4.6: Omega-3 versus Schirmer Test statistics



This bar chart compares the Schirmer test results of participants in the Omega-3 study group across two visits: the first and second visits. The Schirmer test scores, ranging from 4 to 22, are color-coded, with the count of participants shown for each score. In the first visit, lower scores (4–10) dominate, indicating reduced tear production in most participants. By the second visit, there is a noticeable shift towards higher scores (15–22), with a peak at 22, suggesting improved tear production following the intervention. This comparison highlights a positive trend in tear production, likely due to the effect of Omega-3 supplementation, as participants moved from lower to higher Schirmer test scores over time.

Graph 4. 7: Warm Compression versus OSDI Statistics



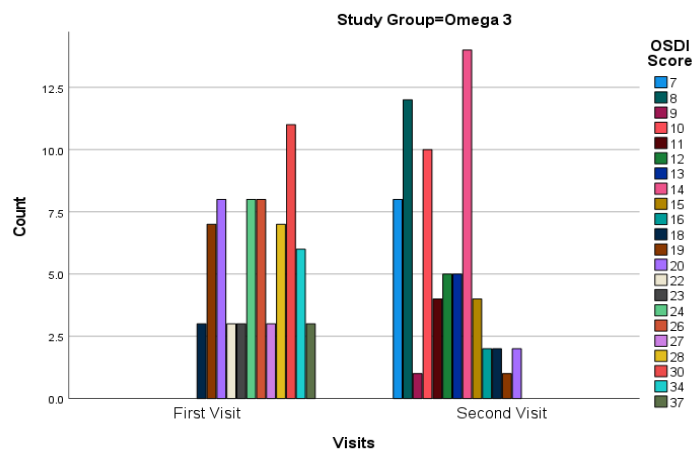
This bar chart displays the results of the Ocular Surface Disease Index (OSDI) scores for participants in the warm compression study group during two visits: the first and second. The OSDI score, which measures the severity of dry eye symptoms, ranges from 8 to 37 and is color-coded, while the y-axis indicates the count of participants achieving each score.

In the **first visit**, higher OSDI scores (indicative of more severe symptoms) dominate, with many participants scoring between 26 and 37. This distribution reflects a baseline condition of significant dry eye symptoms among the group before the warm compression intervention.

By the **second visit**, there is a noticeable shift in the distribution of scores. Lower OSDI scores (8–20) are more frequent, while higher scores (26–37) diminish significantly. The peak participant count shifts to lower score ranges, highlighting a reduction in symptom severity. For instance, scores around 15–18, which indicate mild symptoms, show a marked increase compared to the first visit.

Overall, the results suggest a positive impact of warm compression on reducing dry eye symptoms over time. Participants transitioned from higher to lower OSDI scores, indicating an improvement in ocular surface health and comfort due to the intervention.

Graph 4.8: Omega-3 versus OSDI statistics



The bar chart illustrates the distribution of Ocular Surface Disease Index (OSDI) scores across two visits (First Visit and Second Visit) for the Omega-3 study group. Each bar represents the count of patients corresponding to a specific OSDI score, with scores ranging from 7 to 37. At the first visit, the scores are more evenly distributed across the range, with higher counts observed in mid-range OSDI scores (e.g., 13–17). In contrast, there is a noticeable shift at the second visit, with higher counts concentrated at lower OSDI scores (e.g., 7–11), indicating an overall improvement in symptoms. The decrease in counts for higher OSDI scores and the increased clustering around lower scores in the second visit suggest that Omega-3 supplementation may have positively reduced ocular surface disease symptoms over time.

Chapter 5

DISCUSSION

Talking about A total of 140 people (100%) took part in the survey; 99 of them people were male (70.7%) and 41 were female (29.3%). An average baseline OSDI of 25.58 ± 5.091 in this study indicated mild to moderate symptoms of ocular surface disease, with a range of 18 to 37. The severity of the symptoms, measured in OSDI scores, fell from 21.43 ± 5.216 before treatment to 12.86 ± 3.972 after treatment, with a notable change. Similarly, the Schirmer test demonstrated that tear production improved when the average increased from 9.58mm (SD = 3.246) to 14.74 (SD = 3.282). The tear break-up time was increased from 6.24 ± 2.151 sec to 12.26 ± 2.830 sec, indicating that the tear film is now more stable. Using the Wilcoxon Signed Rank test to analyze the data, we find that all three parameters have consistently improved, and there have been no negative changes in the participants' outcomes. The average OSDI total score for the Omega-3 group was 18.69 (SD= 8.357), whereas for the warm compression group it was 19.74 (SD= 7.266), indicating a statistically significant improvement across the board. The Omega-3 group had somewhat higher total mean Schirmer test scores (12.26 and 9.89) compared to the warm compression group (12.05 and 8.61). When it came to treating dry eye symptoms and ocular surface features, both studies found that Omega-3 supplementation was more effective than warm compression therapy.

Laureni JA conducted a study in 2018 to determine the effectiveness of daily supplementation with omega-3 fatty acids in reducing the severity of dry eye syndrome in adult patients. The study included three randomized controlled trials published in 2013, 2016, and 2017. The Ocular Surface Disease Index (OSDI) scale measured subjective outcomes in all studies. Results showed that daily omega-3 essential fatty acid supplementation effectively reduces the severity of dry eye syndrome in adults, especially those with mild-moderate DES after 90 days. The study found that patients taking krill oil supplementation experienced an improvement in dry eye symptoms over three months per OSDI scores. The results suggest that daily omega-3 essential fatty acid supplementation may be a promising treatment option for adult patients with dry eyes syndrome.^[37] In our study, post-intervention, significant differences emerged favoring the Omega-3 group. For OSDI scoring 2, the difference between groups was highly significant ($F = 15.096$, p

= 0.000), reflecting better symptom improvement in the Omega-3 group. Schirmer test 2 also showed a significant difference ($F = 6.769$, $p = 0.010$), indicating greater tear production improvement in the Omega-3 group. TBUT 2 exhibited the most pronounced difference between groups ($F = 48.292$, $p = 0.000$), with the Omega-3 group achieving substantially better tear film stability. These results confirm that the Omega-3 supplementation was significantly more effective than warm compression in improving dry eye parameters after the intervention.

In 2015, author Murakami DK investigated whether warm compress treatments were beneficial in treating meibomian gland dysfunction. Five adults (18+) without a history of ocular surgery in the preceding six months and no current inflammatory or disease conditions in the eyes were included in the study. Dry, wet/moist, and chemically activated dry heat compresses were the ones utilized in this research. At 50 and 60 seconds, the inside surface of the lid was 40°C or higher in the wet/moist towel scenario, and all three surfaces of the lid were increased. The inner palpebral surface showed the least increase in temperature when exposed to Medi Beads, Hygiene, and Madrox Eye Bag, among other investigated chemical actividades. Although it was inconvenient, the Bundle approach successfully raised lid temperatures over therapeutic levels, making it an excellent supplementary home treatment for meibomian gland dysfunction and any other condition requiring a therapeutic heat of 40°C.^[38] The Z-values for all three parameters in our study are quite negative: TBUT has a Z-value of -10.314, OSDI has a Z-value of -10.290, and the comparison of the mean values for Schirmer and OSDI was shown to differ greatly by Chen and colleagues. Because the findings of the Asymptotic Significance (2-tailed) test are all less than 0.000, we may conclude that the changes we saw are statistically significant and not happening by chance. Since all subjects showed improvement (lower score after the intervention), the Z-value for OSDI scoring is derived from the positive ranks. Since all individuals achieved better scores, indicating improved tear secretion and tear film stability, respectively, the Z-scores for the Schirmer test and TBUT are from negative rankings. Taken together, the current study's findings provide compelling evidence that the intervention improved the benefit indicators in question.

Eom Y conducted a randomised controlled experiment in 2024 to determine the effect of rTG ω -3 fatty acid on DED caused by MGD. The trial was simple, included three groups, and used a parallel design. A total of 132 individuals with MGD-related DED participated in the trial; 58 patients were assigned to the ω -3 group and 57 patients were assigned to the grape-seed group. Initially,

the Ocular Surface Disease Index (OSDI) at 6 and 12 weeks compared to the start of the research was the primary focus of the results. There was no difference in the groups' adherence to the suggested supplement intake during the intervention. Nevertheless, the ω -3 group had an OSDI improvement of -10.5/-22.7 from baseline to 6 weeks and 12 weeks, whereas the grape-seed control group had an improvement of -15.1/-18.8. Despite classifying less than sixty patients in each group, the study could not provide evidence that the rTG version of ω -3 may reduce indications of DED related to MGD.^[39] In our research, we found that the Omega 3 group achieved a significantly better mean physical rating OSDI score of 18.69 (SD = 8.357) compared to the warm compression group's 19.74 (SD = 7.266). Similarly, the omega-3 group had a cumulative mean of 12.26 for the Schirmer test and 9.89 for TBUT, compared to 12.05 and 8.61 for the warm compression groups, respectively. In light of these findings, omega-3 fatty acid supplementation should be considered alongside warm compogram therapy for the treatment of ocular stress and overall wellness.

A pilot study was conducted in 2018 by Smith W, McMahon D, and Nymark M to ascertain the efficacy of a proprietary dry eye protocol. This protocol included employing a heated ocular compress, ocular surface wet, and an omega-3 supplement in the diet. Patients with proven ocular surface disease through clinical examination and the OSDI were enrolled in the study, which took place at six private eye care offices in the US. Participants ranged in age from 18 to 75 years. Participants followed a two-step daily routine for 21 days: first, they wore a warm, moist eye mask; second, they took omega-3 triglyceride supplements orally. In addition to better OSDI scores and TBUT, 46% of participants reported a complete disappearance of dry eye symptoms after following the program. As a first line of defense against dry eye illness, the South Florida practice's Dry Eye Protocol is highly recommended.^[40] Our research evaluated two intervention groups—one that used warm compression and one that used Omega-3 supplements—using the OSDI, Schirmer test, and TBUT scores. In addition, there was no difference in the groups' conditions based on the baseline assessments. Results from the post-intervention study demonstrated a statistically significant difference, favoring the children of the Omega-3 group, despite the fact that no interaction effects of fetal sex and Omega-3 intervention were noted during the perinatal period. Groups supplementing with omega-3 fatty acids showed more rapid symptom improvement, more consistent tear film thickness, and higher increases in tear output. A significant difference was found in the Schirmer test, suggesting that the Omega-3 group saw a larger rise in

tear production. These results corroborate the hypothesis that, as compared to warm compression therapy, Omega-3 supplementation significantly improves dry eye symptoms.

CONCLUSION

The study compared the effectiveness of warm compression therapy and Omega-3 supplementation in improving dry eye symptoms and ocular surface health. The Omega-3 groups showed a significant reduction in OSDI score and improved tear production, while the TBUT showed better tear film integrity. The overall mean OSDI score was 18.69, compared to 19.74 for the warm compression group. The study also found that the total mean Schirmer test scores and TBUT were slightly higher for the Omega-3 group compared to the warm compression group. These findings highlight the efficacy of Omega-3 supplementation in improving dry eye symptoms and ocular surface health.

LIMITATIONS

This study had the following limitations

There was a small duration of study. There was a limited age group included in this study.

Blood serum analysis for omega 3 is not monitored

This study did not differentiate between different types of dry eye diseases.

RECOMMENDATIONS

Conduct studies with larger, more diverse populations to ensure the results are generalizable across different demographics, including age, gender, and ethnicity.

Evaluate the long-term effects of both treatments to determine sustained efficacy in reducing DED symptoms and improving quality of life.

Investigate the combined effects of omega-3 supplements and warm compress therapy to explore potential synergistic benefits.

Investigate patient adherence to omega-3 supplementation and warm compress therapy to understand real-world applicability and barriers to compliance.

Chapter 6

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APPENDICES -I

CONSENT FORM

I ----- hereby consent to participate in this research study of comparing the efficacy of omega 3 versus warm compression in patients with dry eyes disease, understand purpose ,procedure ,benefits and risk of the study and I am willing to participate. I understand that I may withdraw from the study at any time

Participant Signature-----

Date -----

Researcher signature-----

Date-----

رضامندی کا فارم

میں ----- اس طرح خشک آنکھوں کی بیماری والے مریضوں میں اومیگا 3 کی افادیت بمقابلہ گرم کمپریشن کا موازنہ کرنے کے اس تحقیقی مطالعہ میں حصہ لینے کے لیے رضامندی دیتا ہوں ، مقصد، طریقہ کار، فوائد اور خطرے کو سمجھتا ہوں۔ مطالعہ اور میں حصہ لینے کے لیے تیار ہوں۔ میں سمجھتا ہوں کہ میں کسی بھی وقت مطالعہ سے دستبردار ہو سکتا ہوں۔

----- شرکاء کے دستخط

----- تاریخ

----- محقق کے دستخط

-----تاریخ

APPENDICES-II

QUESTIONNAIRE

- Name
- Age
- Gender
- Socio Economic Status
 - ☐ Poor
 - ☐ Good
- Past Ocular History
 - ☐ Infection
 - ☐ Surgery
 - ☐ Trauma
 - ☐ Medication
- Diet History
 - ☐ Sea Food
 - ☐ Peas
 - ☐ Nuts
 - ☐ Plant Oil
- Medical History
 - ☐ Present
 - ☐ Absent
- OSDI Scoring
- Date-----
- Researcher Signature-----
- Participant Signature -----

HAVE YOU EXPERIENCED ANY OF THE FOLLOWING DURING THE LAST WEEK:

	All of the time	Most of the time	Half of the time	Some of the time	None of the time
1. Eyes that are sensitive to light?	4	3	2	1	0
2. Eyes that feel gritty?	4	3	2	1	0
3. Painful or sore eyes?	4	3	2	1	0
4. Blurred vision?	4	3	2	1	0
5. Poor vision?	4	3	2	1	0

HAVE PROBLEMS WITH YOUR EYES LIMITED YOU IN PERFORMING ANY OF THE FOLLOWING DURING THE LAST WEEK:

	All of the time	Most of the time	Half of the time	Some of the time	None of the time	
6. Reading?	4	3	2	1	0	N/A
7. Driving at night?	4	3	2	1	0	N/A
8. Working with a computer or a bank machine (ATM)?	4	3	2	1	0	N/A
9. Watching TV?	4	3	2	1	0	N/A

HAVE YOUR EYES FELT UNFORTABLE IN ANY OF THE FOLLOWING SITUATIONS DURING THE LAST WEEK:

	All of the time	Most of the time	Half of the time	Some of the time	None of the time	
10. Windy conditions?	4	3	2	1	0	N/A
11. Places or areas with low humidity (very dry)?	4	3	2	1	0	N/A
12. Areas that are air conditioned?	4	3	2	1	0	N/A