Comparison of efficacy of Omega3 fatty acids with Vitamin A and Vitamin C in the treatment of dry eye syndrome

ABSTRACT

Background: Dry eye is one of major ocular surface disorders affecting millions of people. The chronic discomfort in these conditions interferes with the quality of life for a long period of time. A typical clinical symptoms of dry eye are 'burning sensation', 'irritation', and 'ocular fatigue'. Hence the Aim of this research "To compare the efficacy of Omega3 fatty acids with Vitamin A and Vitamin C in the treatment of dry eye syndrome".

Methods: The present study titled "Comparison of efficacy of Omega3 fatty acids with Vitamin A and Vitamin C in the treatment of dry eye syndrome" was conducted in VIMS & RC, Whitefield, Bangalore between January 2013 and July 2014 on the subjects who attended the outpatient department of Ophthalmology at VIMS & RC. This was a interventional and non-observational l study of 100 clinically diagnosed cases of dry eye syndrome after informed consent which satisfied the inclusion and exclusion criteria. Dry eye syndrome diagnosis and severity level of diseases was determined with OSDI scoring, TBUT, Schirmer's test 1 & 2, Rose Bengal Test and TMH.

Results: Results showed that lesser grade of dry eye is seen in patients with higher education, younger age group and with indoor jobs as compared to patients with outdoor jobs who had higher grade of dry eye in our study groups. Improvement was observed in TBUT, Schirmer'1 & 2, Rose Bengal, OSDI score and grade of dry eye in both 2nd study group (CMC + Omega 3 fatty acids) and 3rd study group (CMC+ Vitamin A&C) as compared to the control group.(P<0.001) This improvement was more significant in 2nd study group as compared to 3rd study group.

Conclusion: It was observed that dry eye syndrome was more significantly improved in group2 (CMC + Omega 3 fatty acids) as compared to groups 3(CMC + Vitamin A&C). It was concluded using oral supplementation of omega 3 fatty acids or vitamin A & C would be beneficial for patients suffering from dry eye syndrome.

Keywords: Dry eye syndrome, Dry eye grading severity scheme, CMC, Omega 3 fatty acids, Vitamin A & C

1. INTRODUCTION

Dry eye is a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tears film instability with potential damage to the ocular surface. According to the 2007 report of the International Dry Eye Workshop, Dry Eye can be defined as a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface [1]. Dry eye is recognized as a disturbance of the Lacrimal Functional Unit (LFU) which is an integrated system comprising of the lacrimal glands, ocular surface (cornea, conjunctiva and meibomian glands, lids) and the sensory and motor nerves that connect them [2]. Disease or damage to any component of the lacrimal functional unit (LFU)

can destabilize the tear film and lead to ocular surface disease that expresses itself as dry eye. The risk factors for dry eye are multifactorial [3]. Dry eye syndrome is of two types - tear deficient and evaporative. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface [1]. Dry eye syndrome affects a significant percentage of the population. It can affect any race, is more common in women, and is one of the most frequent reasons for seeking eye care [4]. Despite progress in determining the etiology, pathogenesis and treatment of dry eye syndrome, current knowledge remains inadequate .Moreover, the most common therapy for dry eye syndrome—artificial tears—provides only temporary and incomplete symptomatic relief. Among the various diseases affecting the ocular surface, dry eye is the most common condition [2]. In standard outpatient clinics, it has been reported that 15–30% of new patients are affected by dry eye. 2 Although a decrease in tear production is a common condition in many types of dry eye, the severity of ocular surface lesions varies greatly from disease to disease [5].

Therefore, identification of modifiable risk factors for dry eye syndrome may suggest avenues for investigation of novel preventive and treatment measures [6,7,8]. Research has shown that dietary intake of omega3 fatty acids affects overall amount of inflammatory activity in the body [9,10]. But efficacy of treatment with Vitamin A and C with Omega3 fatty acids has not been evaluated adequately. Accordingly this study is designed to compare efficacy of omega3 fatty acids with Vitamin A and C in treatment of dry eye syndrome. Hence the Objectives of this research is, To compare the efficacy between omega3 fatty acids with carboxymethyl cellulose eye drops , Vitamin A and Vitamin C with carboxymethyl cellulose eye drops and carboxymethyl cellulose eye drops only as a control group in the treatment of dry eye syndrome to observe correlation between duration of treatment and improvement of dry eye syndrome in the study group.

2. MATERIAL AND METHODS

This is an observational, descriptive & comparative study of patients reporting to the ophthalmology out - patient department, Vydehi Institute of Medical Sciences And Research Centre, Whitefield Bangalore.

MATERIALS includes following items:

Sample size: 100 cases divided in 3 groups

Study Design: interventional and non-observational

TOOLS USED includes following items:

1. Informed consent
2. Dry eye grading severity scheme

The dry eye severity scale proposed by the Delphi Panel Report has proven to Be a practical method of grading the severity of the disease. In the report a severity Scale has been introduced which provides a useful scheme to aid in assessing Severity of dry eye disease.

Grade 1: mild or episodic discomfort with no or minimal conjunctival/corneal staining or eye inflammation.

Grade 2: moderate episodic or chronic discomfort with no or minimal conjunctival/corneal staining or eye inflammation.

Grade 3: severe frequent or constant discomfort, with moderate to marked conjunctival/corneal staining.

Grade 4: very severe and/or disabling and constant discomfort with marked eye Inflammation [11].

3. Tear meniscus height

TMH was measured by a slit-lamp microscope at the center of the lower lid margin. The slit was positioned horizontal to the lower lid with indirect illumination, to exclude invasive

triggers like glaring or heating. The normal average value was taken as 1mm for average eyes.

4. Tear break up time

Break-up time has been defined as the interval between a complete blink and the appearance of the first randomly distributed dry spot on the cornea

5. Schirmer's test (1&2)

It is the test for tear quantity. It is performed by placing a narrow filter-paper strip in the inferior cul de sac. Aqueous tear production is measured by the length in millimeters that the strip wets over a period of 5 minutes. Schirmer test with anesthesia (Schirmer's 2 test), also referred as a basic secretion test has been reported to give more variable results than schirmer without anesthesia (Schirmer's 1). Here basic secretion is measured and results considered as follows: ≥15 mm /9-14 mm /4-8 mm /< 4 mm

6. Rose Bengal test

Rose Bengal is a vital stain taken up by dead and degenerating cells that have been damaged by the reduced tear volume 1.5mg/strip Rose Bengal strips are used to stain the eye

7. Ocular surface index questionnaire (OSDIQ – dry eye questionnaire)

This questionnaire consists of 12 questions asked to the patient. The OSDI is assessed on a scale of 0 to 100, with higher scores representing greater disability. The index demonstrates sensitivity and specificity in distinguishing between normal subjects and patients with dry eye disease. The OSDI is a valid and reliable instrument for measuring dry eye disease (normal, mild to moderate and severe) and effect on vision-related function. Values to determine dry eye severity calculated using the OSDI

Formula:OSDI = (sum of scores) x 25/(# of questions answered).

In the following of patients reporting to the ophthalmology out-patient department diagnosed with Dry eye syndrome, treatment done according to one of three groups of our study and followed up every once a month for 2 months to obtain efficacy of treatment.

Treatment for each group was:

1st group: Carboxymethyl cellulose 1% eye drops (4times/day)

2nd group: Carboxymethyl cellulose 1% eye drops (4times/day) with oral supplementation of Omega 3 Fatty acids (Eicosapentaenoic Acid 360mg + Docasahexaenoic Acid 240mg/day)

3nd group: Carboxymethyl cellulose 1%eye drops (4times/day) with oral supplementation of Vitamin A (25000IU) and Vitamin C (500mg) twice weekly.

Finally, Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. One way analysis of variance was performed the find the significant difference between the TBUT, Schimer's test 1 &2, OSDI Score and TMH with the treatments. Assumed equal variance in each group, done the bonferroni correction to assess the pair wise comparison between the group1 with group2 and group3. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

3. RESULTS

The Statistical software namely SAS 9.2, SPSS 15.0, STATA 11.1, MedCalc 9.0.1 , Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate tables [12-15].

Table 1: Gender distribution of patients studied according to age groups

Age in years	Gender		Total	P-Value
	Female	Male		
21-30	18(33.3%)	13(28%)	31(31%)	
31-40	20(37.3%)	15(33%)	35(35%)	
41-50	12(22%)	14(30%)	26(26%)	0.759
51-60	4(7.4%)	3(7%)	7(7%)	
>60	0(0%)	1(2%)	1(1%)	
Total	54(100%)	46(100%)	100(100%)	

In total number of 100 patients included in this study, in the group 21-30 years of age among 31 patients, 18 were female and 13 were male. In the group of 31-40 years among 35 patients 20 were female and 15 were male. In the group of 41-50 years of age among 26 patients 12 were female and 14 were male. In the group of 51-60 years of age among 7 patients 4 were female and 3 were male and in the group of more than 60 years, 1 patient was male.(table1)

Table 2: Age distribution of patients studied according to grade of dry eye

Age in Years	Grade of Dry Eye			
	Grade 1	Grade 2	Grade 3	Total
21-30	21(42%)	10(22.2%)	0(0%)	31(31%)
31-40	19(38%)	14(31.1%)	2(40%)	35(35%)
41-50	8(16%)	16(35.6%)	2(40%)	26(26%)
51-60	2(4%)	4(8.9%)	1(20%)	7(7%)
> 60	0(0%)	1(2.2%)	0(0%)	1(1%)
Total	50(100%)	45(100%)	5(100%)	100(100%)

P=0.053+, Significant, Fisher Exact test

In total number of 50 patients with grade 1 dry eye, 21(42%) were in 21-30 years age group , 19(38%) in 31-40, 8(16%) in 41-50 and 2 patients (4%) were in 51-60 years age group. In total number of 45 patients with grade 2 dry eye, 10(22.2%) were in 21-30 years age group,

14(31.1%) in 31-40, 16(35.6%) in 41-50, 4(8.9%) in 51-60 and 1 patent was in >60 years age group. In total number of 5 patients with grade 3 dry eye, 2 patients were in 31-40 years age group, 2 in 41-50 and 1 patient was in 51-60 years age group.(Table2)

Table 3: Gender distribution of patients studied according to grade of dry eye

Gender	Grade of dry eye			Total
	Grade 1	Grade 2	Grade 3	
Female	32(64%)	20(44.44%)	2(40%)	50(50%)
Male	18(36%)	25(55.56%)	3(60%)	50(50%)
Total	50(100%)	45(100%)	5(100%)	100(100%)

P=0.114, Not Significant but positive association, Fisher Exact test

In total number of 50 patients with grade 1 dry eye 32 patients (64%) were female and 18(36%) were male. In total number of 45 patients with grade 2 dry eye 20 patients (44.44%) were female and 25 patients (55.56%) were male and in total number of 5 patients with grade 3 dry eye 2 patients were female and 3 were male.(table3)

Table 4: Gender distribution of patients studied according to study groups

Gender/Study groups	CMC	CMC+Omega3 Fatty Acids	CMC+ Vitamin A & C	Total	P-Value
Male	14 (41%)	19 (59%)	13 (38%)	46 (46%)	0.178
Female	20 (59%)	13 (41%)	21 (62%)	54 (54%)	
Total	34	32	34	100	

According to study groups among total number of 34 patients in 1st study group, 14(41%) were male and 20(59%) were female. Among total number of 32 patients in 2nd study group, 19(59%) were male and 13(41%) were female and among total number of 34 patients in 3rd study group, 13(38%) were male and 21(62%) were female.(Table 4)

Table 5: TBUT according to time of presentation in study groups

TBUT (Sec)	1st visit	1st follow up	2nd follow up	% Change	P-Value
CMC group					
≥10	7(20.6%)	25(73.5%)	30(93.8%)	73.2%	**P<0.001
5-9	27(79.4%)	9(26.5%)	2(6.2%)	-73.2%	
<5	0(0%)	0(0%)	0(0%)	0.0%	
CMC + Omega 3 Fatty acids group					
≥10	2(6.3%)	20(62.5%)	30(100%)	93.7%	**P < 0.001
5-9	25(78.1%)	12(37.5%)	0(0%)	-78.1%	
<5	5(15.6%)	0(0%)	0(0%)	-15.6%	
CMC +Vitamin A&C group					
≥10	0(0%)	14(41.2%)	23(71.9%)	71.9%	**P< 0.001
5-9	28(82.4%)	18(52.9%)	9(28.1%)	-54.3%	
<5	6(17.6%)	2(5.9%)	0(0%)	-17.6%	

In 1st study group 79.4% of patients had TBUT of 5-9 sec in 1st visit that in 2nd follow up 93.8% of patients had TBUT of ≥10. . (P value<0.001)
In 2nd study group 78.1% of patients had TBUT of 5-9 sec and 15.6%, TBUT of <5 sec in 1st visit that in 2nd follow up 100% of patients had TBUT of ≥10. (P value<0.001)
In 3rd study group 82.4% of patients had TBUT of 5-9 sec and 17.6% had TBUT of <5 sec that in 2nd follow up 71.9% of patients had TBUT of ≥10 sec. (P value<0.001). (Table 5)

Table 6: TBUT mean values according to study groups/time of presentation

TBUT Mean±SD P values	CMC group	CMC+Omega3 Fatty Acids group	CMC+ Vitamin A & C group
1st visit Mean ± SD	8.03 ± 1.14	6 ± 1.81	5.97 ± 1.59
1st follow up Mean ± SD	9.88 ± 1.30	9.25 ± 1.48	8.12 ± 2.39
2nd follow up Mean ± SD	10.52 ± 0.63	10.84 ± 0.72	10.39 ± 1.45

Comparison of mean values of TBUT in study groups in 2nd follow up showed significant improvement in 2nd study group and 3rd study group as compared to 1st study group .(Table 6)

Table 7: Schirmer's 1 test according to time of presentation in study groups

Schirmer's 1 (mm)	1st visit	1st follow up	2nd follow up	% Change	P-Value
CMC group					
≥15	2(5.9%)	18(52.9%)	28(87.5%)	81.6%	
9-14	32(94.1%)	14(41.2%)	4(12.5%)	-81.6%	
4-8	0(0%)	2(5.9%)	0(0%)	0.0%	**P<0.001
<4	0(0%)	0(0%)	0(0%)	0.0%	
CMC + Omega3 Fatty Acids group					
≥15	0(0%)	15(46.9%)	26(86.7%)	86.7%	
9-14	10(31.3%)	14(43.8%)	4(13.3%)	-18.0%	
4-8	21(65.6%)	3(9.4%)	0(0%)	-65.6%	**P<0.001
<4	1(3.1%)	0(0%)	0(0%)	-3.1%	

CMC + Vitamin A & C group					
≥15	0(0%)	13(38.2%)	24(75%)	75.0%	
9-14	7(20.6%)	17(50%)	8(25%)	4.4%	
4-8	27(79.4%)	4(11.8%)	0(0%)	-79.4%	**P<0.001
<4	0(0%)	0(0%)	0(0%)	0.0%	

In 2nd study group on CMC and Omega 3 fatty acids 65.6% of patients had schirmer's1 of 4-8mm and 31.1%, schirmer's 1 of 9-14mm in 1st visit that in 2nd follow up 86.7% of patients had schirmer's of ≥15. (P value<0.001)
In 3rd study group on CMC and Vitamin A & C 79.4% of patients had schirmer's 1 of 4-8mm and 20.6% had schirmer's 1 of 9-14 that in 2nd follow up 75% of patients had schirmer's 1 of ≥15. (P value<0.001).(Table7)

Table8: Shirmer's 1 mean values in study groups/time of presentation

Schirmer's 1 Mean/SD P values	CMC group	CMC+Omega3fatty acids group	CMC+ Vitamin A&C group
1st visit Mean ± SD	11.82 ± 1.34	8.09 ± 3.14	8.38 ± 2.57
1st follow up Mean ± SD	14.47 ± 1.88	12.75 ± 2.71	11.82 ± 3.44
2nd follow up Mean ± SD	15.32 ± 0.54	15.38 ± 1.21	14.97 ± 1.68

Comparison of mean values of schirmer's 1 test in study groups in 2nd follow up showed significant improvement in 2nd study group and 3rd study group as compared to 1st study group .(Table 8)

Table 9: Schirmer's 2 test according to time of presentation in study groups

Schirmer's 2	1st visit	1st follow up	2nd follow up	% Change	P-Value
CMC group					

≥15	0(0%)	2(5.9%)	10(31.3%)	31.3%	
9-14	11(32.4%)	22(64.7%)	22(68.8%)	36.4%	
4-8	23(67.6%)	10(29.4%)	0(0%)	-67.6%	**P<0.001
<4	0(0%)	0(0%)	0(0%)	0.0%	
CMC + Omega 3 fatty Acids group					
≥15	0(0%)	0(0%)	12(40%)	40.0%	
9-14	8(25%)	18(56.3%)	18(60%)	35.0%	
4-8	18(56.3%)	10(31.3%)	0(0%)	-56.3%	**P<0.001
<4	6(18.8%)	4(12.5%)	0(0%)	-18.8%	
CMC + Vitamin A & C group					
≥15	0(0%)	2(5.9%)	10(31.3%)	31.3%	
9-14	10(29.4%)	18(52.9%)	18(56.3%)	26.9%	
4-8	15(44.1%)	10(29.4%)	4(12.5%)	-31.6%	**P<0.001
<4	9(26.5%)	4(11.8%)	0(0%)	-26.5%	

In 1st study group 67.6% of patients had schirmer's 2 test of 4-8 mm in 1st visit that in 2nd follow up 68.8% of patients had schirmer's 2 test 9-14mm and 31.3% ≥15mm. (P value<0.001)

In 2nd study group 56.6% of patients had schirmer's 2 of 4-8mm and 18.8%, schirmer's 2 of <4mm in 1st visit that in 2nd follow up 60% of patients had schirmer's of 9-14mm and 40%≥15mm. (P value<0.001)

In 3rd study group 44.4% of patients had schirmer's 2 of 4-8mm and 26.5% had schirmer's 2 of <4mm that in 2nd follow up 56.6% of patients had schirmer's 2 of 9-14mm and 31.3%≥15mm. (P value<0.001).(Table 9)

Table 10: Schirmer's 2 test mean values in study groups/time of presentation

Schirmer's 2 Mean/SD P values	CMC group	CMC+Omega3 Fatty Acids group	CMC+ Vitamin A & C group
1st visit Mean ± SD	9.29 ± 1.24	5.97 ± 3.03	5.88 ± 2.52
1st follow up Mean ± SD	11.74 ± 1.81	9.13 ± 2.49	8.91 ± 3.05
2nd follow up Mean ± SD	13.16 ± 0.64	12.88 ± 1.96	12.12 ± 1.86

Comparison of mean values of schirmer's 2 test in study groups in 2nd follow up showed significant improvement in 2nd study group and 3rd study group as compared to 1st study group .(Table 10)

Table 11: Rose Bengal Test according to time of presentation in study groups

Rose Bengal	1st visit	1st follow up	2nd follow up	% Change	P-Value
CMC group					
0	12(35.3%)	22(64.7%)	31(96.9%)	61.6%	
1-3	22(64.7%)	12(35.3%)	1(3.1%)	-61.6%	
4-6	0(0%)	0(0%)	0(0%)	0.0%	P< 0.001
7-9	0(0%)	0(0%)	0(0%)	0.0%	
CMC+ Omega 3 Fatty Acids group					
0	0(0%)	16(50%)	26(86.7%)	86.7%	
1-3	12(37.5%)	11(34.4%)	4(13.3%)	-24.2%	
4-6	15(46.9%)	5(15.6%)	0(0%)	-46.9%	P< 0.001
7-9	5(15.6%)	0(0%)	0(0%)	-15.6%	
CMC + Vitamin A & C group					

0	0(0%)	17(50%)	22(68.8%)	68.8%	
1-3	10(29.4%)	9(26.5%)	10(31.3%)	1.9%	
4-6	18(52.9%)	8(23.5%)	0(0%)	-52.9%	P< 0.001
7-9	6(17.6%)	0(0%)	0(0%)	-17.6%	

In 1st study group 64.7% of patients had rose bengal score of 1-3 in 1st visit that in 2nd follow up 96.9 % of patients had rose bengal score of 0 (Negative staining). (P value<0.001)
In 2nd study group 46.6% of patients had rose bengal score of 4-6 and 15.6%, rose bengal score of 7-9 in 1st visit that in 2nd follow up 86.7% of patients had rose bengal score of 0(Negative staining). (P value<0.001)
In 3rd study group 52.9% of patients had rose bengal score of 4-6 and 17.6% had rose bengal score of 7-9 that in 2nd follow up 68.8% of patients had rose bengal score of 0 (Negative staining) and 31.3%,1-3. (P value<0.001).(Table 11)

Table12: Rose bengal test mean values in study groups/ time of presentation

Study groups	CMC group	CMC+Omega3 fatty Acids group	CMC+ Vitamin A & C group
Mean ±SD 1st visit	1.74 ± 1.48 (3)	4.69 ± 1.87 (5.5)	5.29 ± 1.29 (6)
Mean ±SD 1st follow up	0.47 ± 1.05 (0)	2.09 ± 2.11 (3)	2.91 ± 2.14 (3)
Mean ±SD 2nd follow up	0 (0)	0.72 ± 1.28 (0)	0.74 ± 1.29 (0)

Comparison of mean values of rose bengal score in study groups in 2nd follow up showed significant improvement in 2nd study group and 3rd study group as compared to 1st study group .(Table 12)

Table13: OSDI score according to time of presentation in study groups

OSDI Score	1st visit	1st follow up	2nd follow up	% Change	P-Value
CMC group					
0-12	0(0%)	16(47.1%)	28(87.5%)	87.5%	

Study groups	CMC group	CMC+Omega3 Fatty Acids group	CMC+ Vitamin A & C group		
13-22	20(58.8%)	18(52.9%)	4(12.5%)	-46.3%	**P<0.001
23-32	14(41.2%)	0(0%)	0(0%)	-41.2%	
33-100	0(0%)	0(0%)	0(0%)	0.0%	
CMC + Omega 2 Fatty acids group					
0-12	0(0%)	9(28.1%)	23(76.7%)	76.7%	
13-22	10(31.3%)	17(53.1%)	7(23.3%)	-8.0%	**P<0.001
23-32	21(65.6%)	6(18.8%)	0(0%)	-65.6%	
33-100	1(3.1%)	0(0%)	0(0%)	-3.1%	
CMC + Vitamin A & C group					
0-12	0(0%)	8(23.5%)	20(62.5%)	62.5%	
13-22	12(35.3%)	18(52.9%)	10(31.3%)	-4.0%	**P<0.001
23-32	20(58.8%)	6(17.6%)	2(6.3%)	-52.5%	
33-100	2(5.9%)	0(0%)	0(0%)	-5.9%	

In 1st study group 58.8% of patients had OSDI score of 13-22 and 41.2%,23-32 in 1st visit that in 2nd follow up 87.5% of patients had OSDI score of 0-12 .(P value<0.001)

In 2nd study group 65.6% of patients had OSDI score of 23-32 and 31.3%, OSDI score of 13-22 in 1st visit that in 2nd follow up 76.7% of patients had OSDI score of 0-12. (P value<0.001)

In 3rd study group 58.8% of patients had OSDI score of 23-32 and 35.3% had OSDI score of 13-22 that in 2nd follow up 62.5% of patients had OSDI score of 0-12 and 31.3%, 13-22. (P value<0.001) (Table13)

Table 14: OSDI mean values in study groups /time of presentation

Mean ± SD 1st visit	20.65 ± 4.55	25.22 ± 4.51	26.14 ± 4.26
Mean ± SD 1st follow up	12.55 ± 4.30	17.13 ± 5.00	19.52 ± 4.75
Mean ± SD 2nd follow up	10.33 ± 0.82	12.96 ± 2.59	14.71 ± 2.38

Table 15: Grade of dry eye in study groups according to time of presentation

Comparison of mean values of OSDI score in study groups in 2nd follow up showed significant improvement in 2nd study group and 3rd study group as compared to 1st study group .(Table 14)

Study groups/Grade of dry eye	CMC group	CMC+Omega3 Fatty Acids group	CMC+ Vitamin A & C group	Total	P-Value
1st visit					
1	34 (100%)	10 (31%)	6 (18%)	50 (50%)	
2	0	18 (56%)	27 (79%)	45 (45%)	**P<0.001
3	0	4 (13%)	1 (3%)	5 (5%)	
1st follow up					
0	20 (59%)	8 (25%)	6 (18%)	34 (36%)	
1	14 (41%)	21 (66%)	19 (56%)	52 (55%)	
2	0	3 (9%)	8 (23%)	11 (12%)	*P=0.001
3	0	0	1 (3%)	1 (1%)	
2nd follow up					
0	30 (93.75%)	27 (89.01%)	27 (84.4%)	84 (89.36%)	
1	2(6.25%)	3 (10.99%)	5 (15.6%)	10 (10.63%)	*P=0.004

In 1st study group or our control group all patients had grade 1 dry eye. According to AAO treatment guidelines all patients with grade 2 or more need to receive supportive treatment in addition to artificial tears and hence are not included in this group.[106] Hence, in 2nd follow up 93.75%(30) of patients had no dry eye.
In 2nd study group 53% of patients had grade 2 dry eye and 4 patients had grade 3 dry eye that in 2nd follow up 89.01% of patients had no dry eye.
In 3rd study group 79% of patients had grade 2 dry eye and 1 patient had grade 3 that in 2nd follow up 84.4% of patients had no dry eye.
This showed in 2nd and 3rd study groups though there were more patients with higher grade of dry eye the improvement in 2nd follow up was more significant as compared to our control group.(P=0.004)(Table 15)

4. DISCUSSION

Dry eye disease is highly variable ocular surface disorder. The unpredictability of this disorder lies in its pathogenesis, as the clinical manifestations can be dramatically modified by external stimuli. Few studies have highlighted the efficacy of vitamin A and vitamin C in treatment of dry eye and comparison of their efficacy with omega 3 fatty acids.
Miljanovic B, et al. showed women with a higher intake of omega3 fatty acids tended to have a lower risk of dry eye syndrome than did women with a lower intake [5].
Creuzot C, et al. in a double-masked study of 71 patients with mild to moderate dry eye syndrome demonstrated a significant improvement in the Schirmer test, tear break-up time test, and fluorescein and lissamine green staining with the oral administration of polyunsaturated fatty acids [16].
Macsai MS, also showed omega-3 dietary supplementation in blepharitis and meibomian gland dysfunction patients improved TBUT and schirmer score values significantly as compared to placebo [17].
Drouault-Holowacz S, et al. showed that after 12 weeks of supplementation with anti-oxidant combination, tear film break up time(TBUT) scores (27.3%±8.4% with anti-oxidant combination versus 3.61%±4.3% with the placebo, p=0.017) and the Schirmer scores (26.9%±14.2% with anti-oxidant combination versus –4.7%±3.4% with the placebo, p=0.037) were significantly improved [18].

5. CONCLUSION

Dry eye syndrome is a disorder of the tear film, leading to excess dryness of the cornea and conjunctiva that leads to ocular discomfort, blurred vision, and damage to the ocular surface. It is diagnosed by obtaining a thorough history, including a review of symptoms, medications, social history, and a comprehensive eye examination with diagnostic testing. There are several treatment options that range from artificial tears to autologous blood serum drops. The best treatment option for each patient must be individualized for the type of dry eye state. The appropriate treatment of this highly prevalent condition may require modifying or adding additional treatments based on how they respond, but it ultimately can improve their quality of life and prevent ocular damage. In this study we compared efficacy of omega 3 fatty acids with Vitamin A & C in treatment of dry eye.This improvement was more significant in 2nd study group as compared to 3rd group. These results are in agreement with those of previous studies which highlighted the efficacy of Omega3 fatty acids in the improvement of dry eye.

The strength of our study was the evaluation and follow up of dry eye patients by employing different dry eye diagnostic tests. The weakness of this study was less number of patients for study as most of them were not available for follow up.

Consent:

As per international standard or university standard written patient consent has been collected and preserved by the author(s).

Ethical: NA

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