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EPIDEMIOLOGY OF OPHTHALMIC DISEASES AMONG SEAFOOD CONSUMERS AND OTHERS

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ABSTRACT

Diet is a major lifestyle factor makes eyes healthy and assists with decreasing the risk of developing eye problems. This severe eye problem is less in people depending on seafood as it contains folic acid and vitamin B complex Omega-3-rich fish diet improves meibomian glands' functions, preventing dry eye formation. The two carotenoid pigments, Lutein, and zeaxanthin are essential for the retina and reduce age-related macular degeneration. For the study, people visiting a Tertiary care hospital studied their seafood and other food habits to find the relationship between their ocular problems and dietary background. Based on the seafood consumption frequency and quantity per week [0-500 g/week], they were further isolated for in-depth study for ocular defects. For comparison, another group of respondents who never or rarely used a seafood diet were also interviewed. In the present study, 164 respondents with some ocular issues (208 eyes) were isolated, and the epidemiology of different eye problems concerning seafood intake was recorded. The results show that the following vision-related complications, macular edema, optic neuropathy, myopia, double vision, dry eye syndrome, and color blindness were present among the respondents. Macular edema was reported less in respondents who consume 400-500 g seafood every week. Optic Neuropathy was also less in respondents consuming seafood above 400-500 g/week. Of the total myopia problem diagnosed in 56.7% of respondents who do not consume any seafood, but in people taking 400-500g of seafood, the incidence of was 10.0%. . Among the people diagnosed with dry eye syndrome, 16.7% was seen in people using 400-500 g of seafood/per week and 33.3% in people whom not using seafood in their diet. Pearson's coefficient of correlation analysis showed that for all the respondents with seafood eating habits, there is a negative correlation between the development of eye problems and the ρ ("rho") factor was less than 1 for all eye problems. All the ocular diseases diagnosed among the respondents showed poor infectivity among good seafood consumers. The present study indicates that a

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regular seafood diet is good for eye health and can prevent the epidemics of several eye diseases.

Key words: Seafood, Ocular problems, Omega- 3, Eyes health, Macular edema, myopia, Optic Neuropathy and dry eye syndrome

INTRODUCTION:

Diet is a major lifestyle factor associated with eye health (Lawrenson, 2019). A well-balanced, healthy diet maintains wholesome health. It also makes eyes healthy and assists with decreasing the risk of developing eye conditions. Persons taking a balanced diet with omega-3 fatty acids suffer less from ocular problems (Liu, 2014). The omega-3sand remediates meibomian gland dysfunction and associated dry eye (keratoconjunctivitis sicca) problems. Also, omega-3 fatty acids prevent macular degeneration. Seafood is a rich source of antioxidants (zeaxanthin, vitamins A, C, and E, Beta-carotene, Omega-3 fatty acids, and Zinc), preventing oxidative stress in the eyes. Also, a diet with Omega 3 fatty acids improves the health of the retinal function. Prevention is always better than cure, which includes exercising, eating well, and quitting smoking; antioxidants, vitamins, and minerals do not appear to help prevent vision problems (Matsumura *et al.*, 2022). Another primary eye disease is optic neuropathy. It causes the death of nerve cells and neurons and affects central visual acuity and contrast sensitivity. This severe eye problem is less in people depending on seafood as it contains folic acid and vitamin B complex (Roda et al., 2020; Sawicka-Pierko *et al.*, 2014).

As Omega-3&6 fatty acids cannot be synthesized in the body, they can be supplemented through food, particularly seafood, and must be obtained from the diet. Because of the deficiency of these nutrients in the eyes, an eye disease epidemic study shows that in India, dry eye disease will increase by 40% in 2030 (6,7). Few studies have proved that seafood with rich omega-3 fats reduces the risk of dry eye (8). Omega-3-rich fish diet improves meibomian glands' functions, preventing dry eye formation. The gland's oily secretions produce the oily part of tears and reduce the risk of dry eye symptoms.Omega-3s provide good blood vessel health and reduce the development of retinal diseases like age-related macular degeneration (9).

Dietary nutrients can minimize the onset of cataract formation and other age-related macular degeneration (10). The retina needs nutrients to get protection from oxidative stress. The free oxygen radicles in the macula region interfere with DNA functions and cause molecular damage in the eyes. Nevertheless, antioxidant-rich seafood can minimize these issues (11). The two carotenoid pigments, Lutein, and zeaxanthin are essential for the retina and reduce age-related macular degeneration (12). In plates of seafood, these elements are available in plenty, so seafood consumption is good for eye health (13). Because of several health-related functions, seafood is regarded as a " heart-healthy diet," and fish must be

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taken at least twice a week (14). Alsbirk et al. (15) reported that seafood with beneficial fatty acids can interfere with the progression of diabetic microangiopathy.

METHODOLOGY

A case-control study was designed to explore fish consumption in preventing the incidence of major ophthalmic complications like Macular Edema, Optic Neuropathy, Myopia, Double Vision, Dry Eye Syndrome, and Colour Blindness. For the study, people visiting a Tertiary care hospital studied their seafood and other food habits to find the relationship between their ocular problems and dietary background.

A random survey was conducted with the 2020 general public visiting an ophthalmic specialty hospital with or without chief complaints like Macular Edema, Optic Neuropathy, Myopia, Double Vision, Dry Eye Syndrome, and Colour Blindness during January 2018-December 2019. Based on the seafood consumption frequency and quantity per week [0-500 g/week], they were further isolated for in-depth study for ocular defects. For comparison, another group of respondents who never or rarely used a seafood diet were also interviewed. The selected respondents were further clinically checked to confirm their eye diseases. The survey data were statistically analyzed for their correlation between the fish consumption frequencies and ophthalmic disease in IBM- SPSS Version 20.

RESULTS:

In the present study, 164 respondents with some ocular issues (208 eyes) were isolated, and the epidemiology of different eye problems concerning seafood intake was recorded. The statistical relationship between the reported five eye ailments and food habits was traced using Pearson's correlation coefficient. The ocular problems and dietary habit of the respondents reported includes Macular Edema – 30 patients (30 Eyes), Optic Neuropathy 30 patients (30 Eyes), Myopia 30 patient (60 Eyes), Double Vision 14 patient (28 Eyes), Dry Eye Syndrome 30 patient (30 Eyes) and Colour Blindness 30 patient (30 Eyes),(Table 1).The results show that the following vision-related complications, macular edema, optic neuropathy, myopia, double vision, dry eye syndrome, and color blindness were present among the respondents. The study participants had an intake of fish once a week, twice a week, thrice a week, and never taken. Macular edema was reported in 30 patients (30 eyes). Among them, 16.75% of respondents consume 400-500 g seafood every week, 26.7 %consume 300-400 g/week, 20 .0% consume less than 200g/week, and36.7% do not use seafood. Optic Neuropathy was less in respondents consuming seafood above 400-500 g/week (13.3%) and among the respondents consuming 300-400 g seafood, the occurrence of optic neuropathy was less (20.0 %). Among the respondents consuming seafood less than 200g/week, the incidence of optic neuropathy was high (23.3), but in non-seafood consumers, the problem of optic neuropathy was significant (43.3%). Of the total myopia problem diagnosed in 60 eyes, 56.7% were seen in respondents not consuming any seafood, but in

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people taking 400-500g of seafood, the incidence of myopia was 10.0%. A positive correlation was seen between myopia development and a seafood diet. Among the 30 eyes diagnosed with dry eye syndrome, 16.7% was seen in people using 400-500 g of seafood/per week. At the same time, the problem of dry eyes was reported in 33.3% of people not using seafood in their diet (Fig.1).

The occurrence of color blindness was not reported in respondents who consume seafood more than 200 g/week. However, in non-seafood consumers, the incidence was 76.6 %). Another ocular problem, double vision, was seen more in people not using seafood (50.0%). However, among people suing seafood, 400-500g /week,300-4000 g/week, and less than 200g/week, the incidence of double vision was 14,29%,14.29%, and 21.43%, respectively. The statistics collected from the metadata from people visiting a tertiary care eye hospital show a positive correlation between seafood intake and the non-occurrence of eye defects.

The linear relationship between the different ocular problems and seafood intake was correlated using Pearson's correlation (also called Pearson's R) coefficient. The statistical analysis of the correlation between seafood consumption and ocular problems confirmed the interrelationship (Table 2). Pearson's coefficient of correlation analysis showed that for all the respondents with seafood eating habits, there is a negative correlation between the development of eye problems and the ρ ("rho") factor was less than 1 for all eye problems (Table 2). In the case of Macular edema, the Pearson coefficient was 0.265 for seafood consumers and 1 for non-seafood consumers. So there is a good correlation between the incidence of Macular edema and a non-fish diet. In respondents with the habit of eating fish, the incidence of "Optic Neuropathy" is less (rho"factor-0.530).

Nevertheless, in non-seafood eaters, the incidence of "Optic Neuropathy" is high, and it is confirmed by Pearson's coefficient factor (rho factor = 1). The results show that the non-inclusion of seafood influence the development of "Optic Neuropathy ."Similarly, in the respondents with myopia, color blindness, double vision, and dry eye syndrome, the Pearson's correlation coefficient factor was around 1 for non-seafood consumers and confirms a positive correlation between food habits and the development of ocular defects

DISCUSSION

The epidemiology of five types of eye diseases among the respondents was checked concerning their seafood diet to determine whether any possible correlation exists between the eye diseases and diet. The respondents chosen based on their ocular complaints were clinically checked to determine the eye problems' actual position. The results of clinical analysis of the eye problems and the dietary habit of respondents show that the regular consumption of seafood above 400-500g /week reduces the risks of ocular defects development. At the same time, the prevalence of ocular problems was high among people not consuming seafood. The primary reasons are beneficial omega-3 fatty acids, vitamins,

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and minerals in seafood. As reported in the previous chapter dealing with the epidemiology of lifestyle diseases and seafood consumption, the epidemiology of eye problems also gets resolved by incorporating seafood into a regular diet. The impact of seafood in protecting the eyes from diseases is quite evident from the progressing development of eye diseases about the quantum of seafood intake. Pearson's correlation between the fish-based diet and non-fish food consumption habits and the prevalence of eye disorders confirms the importance of seafood.

All the ocular diseases diagnosed among the respondents showed poor infectivity among good seafood consumers. Another previous study shows that regular fish in the diet (eaten at least twice per week) reduces retinal problems (16) report that “diets rich in LCn-3 PUFA and fish are associated with a healthy retinal microvasculature profile and CVD prevention.” Myopia is another major eye health issue; dietary seafood intake prevents the myopia epidemic (17). An experimental model proved that supplementing omega-3 polyunsaturated fatty acids (ω-3 PUFAs) reduced myopia formation and improved choroid blood perfusion (18). An alarming report says that the global myopia problem may increase by 49.8% in the global population in 2050, leading to irreversible blindness. During the COVID-19 lockdown period, increased exposure to digital devices has aggravated myopia (19). So as per the present study, the regular intake of seafood can prevent exploding myopia problems. A study in guinea pigs showed that a daily intake of 300 mg DHA and 60 mg EPA reduced myopia development (18).

In addition to eye health, regular seafood intake reduces some cardiac issues like "congestive heart failure, coronary heart disease, ischemic stroke, and sudden cardiac death" (20). According to a WHO report, of the 2.2 billion people suffering from some eye diseases, 196million are related to macular problems, 146 million suffer from diabetic retinopathy (DR), and 76 million have glaucoma (21). Further, globally nearly 200 million eyes are affected by cataracts which cause one-third of worldwide blindness (2021). Reports show that food supplementation can reduce the epidemic burden of eye disorders (22). As reported in the present study, a regular seafood intake of 400g per week reduces the development of many eye disorders. It is reported that the regular consumption of oily fish containing DHA and EPA reduces the risk of developing wet AMD by 69 percent (23). Marine resources have become increasingly interesting in treating and preventing retinal diseases (24). Persons with higher fish intake were less likely to have severe diabetic retina. The higher fish intake widens the retinal vascular calibre and reduces disease impact (25). Studies indicate that a diet with omega-3 fatty acids like DHA enhances the development of photoreceptors. High DHA concentrations in the retina promote the well-functioning of rhodopsin, a pigment in the photoreceptor rod cells. Thus it is evident that Omega-3 supplementation is essential for good eye health. As reported in the present study, the consumption of fishes like sardines, anchovies, and mackerels supplies a good source of omega-3 fatty acids and reduces the risk for eye-related problems (26-28).

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From the available literature and the results of the present study, it is clear that a regular seafood diet is good for eye health and can prevent the epidemics of several eye diseases.

Table 1: Fish consumption and ocular problems reported among the respondents in relation to sea food consumption. Percentage occurrence is given in parenthesis

S.No	Ocular problems	Total No of Eyes	No. of respondents with ocular problems and Frequency of Fish Consumption			
			400-500 g and above /week	200-400g /Week	Less than 200g/week	Non fish diet users
1	Macular Edema	30	5(16.7)	8(26.7)	6(20 .0)	11(36.7)
2	Optic Neuropathy	30	4(13.3)	6(20.0)	7(23.3)	13(43.3)
3	Myopia	60	6(10)	10(16.7)	10(16.7)	34(56.7)
4	Dry Eye Syndrome	30	5(16.7)	7(23.3)	7(23.3)	I0(33.3)
5	Color Blindness	30	-(0)	-(0)	7(23.3)	23(76.67)
6	Double Vision	28	4(14.29)	4(14.29)	6(21.43)	14(50.0)

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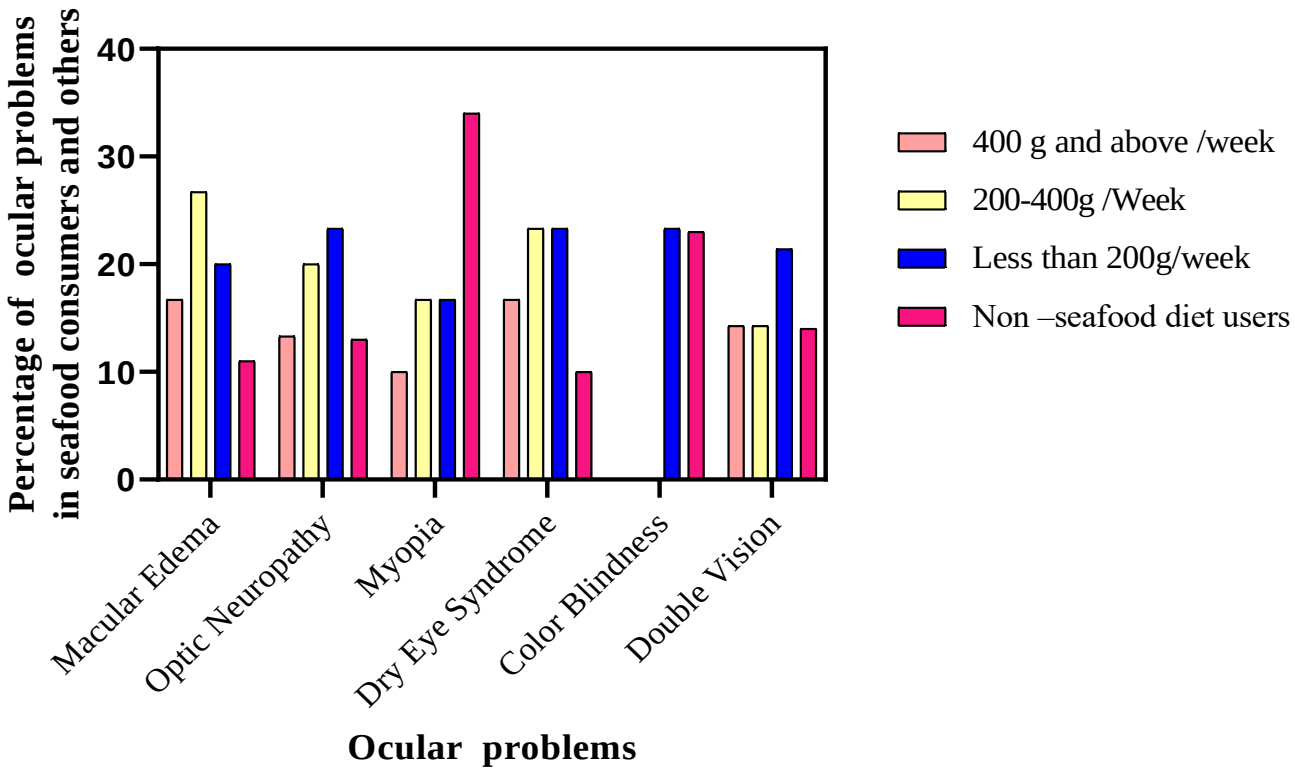

Fig. 1. Prevalence of ocular problems in seafood consumers and others in the study area.

Table2.Pearson's correlation coefficient factor between food habits and the development of ocular defects.

S. No	Presence of Ocular defects	Respondents	Pearson population correlation coefficient] ρ ("rho")
1	Macular Edema	Respondents without sea food eating habits	0.892
		Respondents with sea food eating habits	0.265
2	Optic Neuropathy	Respondents without sea food eating habits	0.916
		Respondents with sea food eating habits	0.530

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3	Myopia	Respondents without sea food eating habits	0.856
		Respondents with sea food eating habits	0.038
4	Dry Eye Syndrome	Respondents without sea food eating habits	0.911
		Respondents with sea food eating habits	0.109
5	Colour Blindness	Respondents without sea food eating habits	0.796
		Respondents with sea food eating habits	0.352

If the ρ ("rho") value is near ± 1, it indicates a perfect correlation. The coefficient value lies between ± 0.50 and ± 1; it is said to be a strong correlation. If the value lies between ± 0.30 and ± 0.49, it is said to be a medium correlation. When the value lies below ± .29, it is said to be a slight correlation and no correlation

Conflicts of interest

All authors declare that there is no any conflict of interests related to this manuscript

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