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Prevailing practices for the management of dry eye disease in India: A questionnaire based survey 2023

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ABSTRACT

Background: Dry eye disease is a common ophthalmic condition which is chronic in nature, It is major health issue especially in the current digital era. Dry eye disease is one of the most common reasons for visiting eye care practitioners.

Purpose: To understand the treatment pattern of medical management of dry eye disease across India.

Materials and Methods: This single visit, cross-sectional, non-interventional, interview-based ophthalmologist survey on dry eye disease (DED) was conducted between 10-13 May 2023 at 81st Annual Conference of All India Ophthalmological Society, Kochi–AIOC 2023.

A total of 71 registered ophthalmologist from all over India attending AIOC 2023 who were willing to provide their written consent participated in the survey and completed structured questionnaire on dry eye disease management.

Results: Approximately 39.44% ophthalmologist have 20-40% of patients who visiting to daily OPD are suffering from DED, and 40.85% ophthalmologist said the percentage is even more i.e. between 40-60%. 88.73% ophthalmologist responded environmental factors such as digital use specially increased usage of computers and mobile are responsible for dry eye. 49.30% patients suffered from aqueous - deficient dry eye (ADDE) and remaining 50.70% evaporative dry eye (EDE). Artificial Tears (AT) is the first line in management of DED said by all ophthalmologist & in certain cases, depending on type, severity, and cause of dry eye other drugs like cyclosporine, corticosteroids, antioxidant supplements and other medications might be used. Viscosity, pH and osmolarity are important for artificial tear said by 77.46% of ophthalmologist & 23% ophthalmologist opine that viscosity is major factor. 50% ophthalmologist believes that carboxymethylcellulose is the most suitable ingredient followed by sodium hyaluronate (29.58%). 61.43% Ophthalmologists replied, AT should provide continues relief from dry eye symptoms. 42.86% said AT should be used for long terms, it should be preservative free replied by 58.57% Ophthalmologists and 40% replied acceptance from patient should be there in terms of cost.

Conclusion: Tear substitutes are the most commonly prescribed medications for the management of dry eye disease. Artificial tears are amongst the first-line agents in the management options for the management of dry eye disease, because of their ease for usage, with a better safety and tolerability profile and their availability in various formulations.

1. Introduction

Dry eye disease (DED) is a common ophthalmic condition which is chronic in nature, It is major health issue globally especially in the current digital era. Dry eye disease is one of the most common reasons for visiting eye care practitioners

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and represents a considerable health and economic burden. It's prevalence ranges from 5% to 33% and is increasing in the younger population in this digital era.[1]

Dry eye disease (DED) is an inflammatory condition of the ocular surface which includes the surface of the cornea, bulbar and tarsal conjunctiva, and extending to the lid margin. It occurs mainly because of the hyperosmolarity of the tear and is of chronic nature.

Dry eye disease leads to discomfort in the eyes associated with pain. It also limits the vision causing a reduction in the productivity of an individual. It thus impact the quality of life of an individual. Due to the increase in the life expectancy of the population in the modern era and the increase in the aging population, there is a substantial growth in the social and the economic aspects of dry eye disease. The various treatment modalities for the management of dry eye disease include lifestyle modification, topical ocular preparation including artificial tears as well as oral formulation like nutraceutical, omega 3 fatty acid etc.[2]

To understand the treatment pattern of medical management of dry eye disease across India, survey was conducted among ophthalmologist who are experienced in treating dry eye disease during 81st Annual Conference of All India Ophthalmological Society at Kochi- AIOC 2023.

2. Materials and Methods

This single visit, cross-sectional, non-interventional, interview-based ophthalmologist survey on dry eye disease was conducted between 10th and 13th May 2023 at 81st Annual Conference of All India Ophthalmological Society, Kochi - AIOC 2023.

A total of 71 registered ophthalmologist across India attending AIOC 2023 and willing to provide their written consent participated in the survey. The ophthalmologist, across India were asked to complete a structured questionnaire on dry eye disease management. The aim of this survey is to understand the treatment pattern of medical management of dry eye disease across India.

Due to non-interventional nature of the survey, no proper sample size was intended. Descriptive statistics was used to analyse the survey results. The survey did not require an institutional ethics committee approval as it did not involve a direct participation of any patient.

3. Results and Discussion

Total 71 ophthalmologist across different geographical locations of India, participated in the survey who understand the treatment pattern for medical management of dry eye disease in India.

3.1. Prevalence of dry eye disease

The prevalence of dry eye disease is greatly predisposed by geographic location, environments, and lifestyle of the individuals and varies from 5% to 35%. The prevalence of DED in India is greater than the worldwide prevalence and ranges from 18.4% to 54.3%.[1]

In this survey approximately 39.44% ophthalmologist have 20-40% of patients visiting to daily OPD suffered from DED, and 40.85% ophthalmologist said the percentage is even more i.e., between 40-60%. (Figure 1)

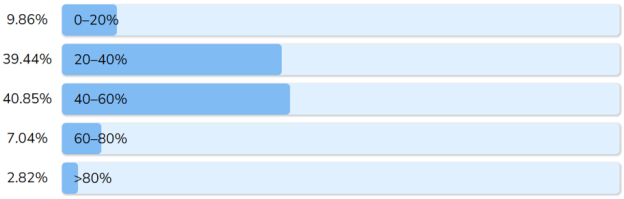

Figure 1: Percent of patient suffering from DED

3.2. Class of dry eye disease patients in clinical practice

Dry eye disease patients are classified into two groups:

1. Aqueous - deficient dry eye (ADDE) and
2. Evaporative dry eye (EDE) seen in clinical practice.

Aqueous - Deficient dry eye (ADDE) occurs due to a pathology or dysfunction of the lacrimal gland. The result is reduction in the tear volume and increase in the tear hyperosmolarity.

The common causes of ADDE are Sjögren Syndrome, Senile Lacrimal Gland Deficiency, Lacrimal Gland Duct Obstruction.

Evaporative dry eye (EDE) disease is a condition where the lacrimal glands are functioning normally but there is an increased evaporation from the tear film.

The main cause of EDE is Meibomian gland dysfunction (MGD) where the tear film lipid layer is deficient which is the major barrier preventing the evaporation of tears.

The other reason which increase the evaporation of tears are a prolonged blink interval or a widened palpebral aperture. They are also responsible for EDE.

The pathology of the exposed ocular surface causes an issue related to the surface wetting, hyperosmolarity of the tear, shortening of the tear film break-up time, and finally the dry eye.

Most DED is a combination of subtypes due to factors that promote ocular surface inflammation. The major factors responsible for this are the deficiency of vitamin A and the longer use of topical anaesthetics and preservative containing ocular preparations.

The regular and frequent use of the Contact lenses leads to increase in the loss of water from the eyes.[2]

In survey, according to ophthalmologist, 49.30% patients suffered from aqueous - deficient dry eye (ADDE) and remaining 50.70% evaporative dry eye (EDE).(Figure 2)

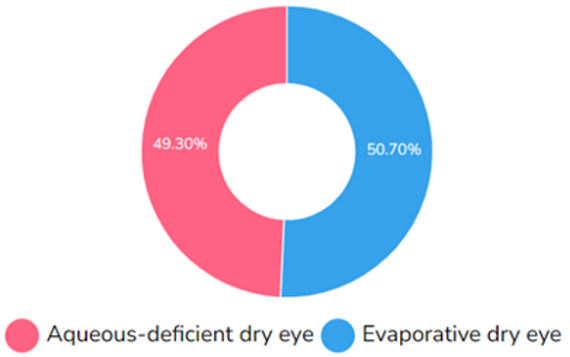

Figure 2: Percentage of Class of dry eye disease

The common symptoms of dry eye disease include discomfort in the eyes, limitation in the vision in the form of blurring and fluctuation of vision, and tiredness in the eyes.

3.3. Most common causes of dry eye disease

There are challenges to define the etiology of dry eye due to number of different causative risk factors as listed below.[2,3]

Intrinsic risk factors	**Extrinsic risk factors**
Aging population	Contact lens wear
Gender	Environmental factors (low humidity or airflow on the eye)
Ophthalmic disorders	Topical or systemic medications
Certain underlying systemic and autoimmune diseases	Lack of hygienic practices for eyelids and eyelashes
	Eye beauty trends
	Eye cosmetic product/ingredients

Types of patients commonly suffered from dry eye disease.[4]

1. Aging population
2. Patients with systemic disease
   (a) Joint diseases
   (b) Cataract surgery
   (c) Post refractive surgery
   (d) Glaucoma
   (e) Diabetes—DED is 2 times more common in diabetic patients.
3. Contact lens wearers
   (a) Causes discomfort.
   (b) Many contact lens wearers stop wearing them due to DED.

Per survey, 88.73% ophthalmologist responded environmental factors such as digital use specially increased usage of computers and mobile are responsible for dry eye. Further, 22.54% believes that autoimmune disease is responsible for DED followed by systemic medication use, eye/eyelid injury and Lasik or other ocular surgery in their clinical practice.(Figure 3)

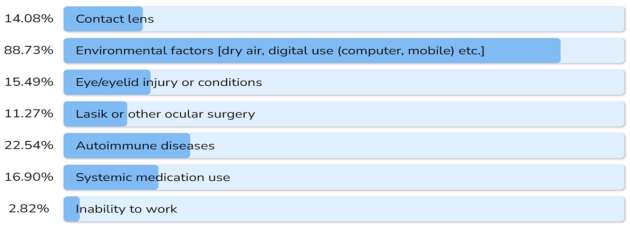

Figure 3: Percent of causative risk factors for DED

3.3.1. Digital use and dry eye disease

One of the common and an alarming extrinsic risk factor for the development of the DED is the use of digital devices (e.g, computer, laptop, smartphone), as it affects the dynamics of blinking.[3]

In a meta-analysis, authorCourtin R et al. found the prevalence of DED to be in the range of 9.5% to 87.5% in digital screen users.[5]

The usage of digital screen has increased significantly in the current era due to increased demand and use of personal computers and smartphones.

Several large cross-sectional studies have revealed a relationship between digital screen use and dry eye. The association between digital screen use and DED has also been found in school-age children, specifically smartphone user. Among a group of 288 children in Korea (age range=10–12 years), the prevalence of smartphone use was 71.4% in children suffering from DED as compared to 50% in children with no DED.

The duration of daily use of smartphone (OR=1.86) and the digital screen use (OR=1.82) were also associated increased risk of DED.[6]

In a comparative study of digital devices, reading on a smartphone was associated with lower gaze angle and lower extent of exposed ocular surface whereas reading on a computer resulted in increased conjunctival redness, increased osmolarity, and lower tear meniscus height. Thus, digital screen use results in an acute deterioration of tear film quality.[7]

The aqueous component of the tear film reduces according to the usage of digital screen use as evident from some recent data. The digital screen use have an impact on the blinking dynamics. It reduces the rate of blinking and

the completeness of blinking, thus increasing the dryness of the ocular surface.

The aqueous layer of the tear film evaporate in between each blink. Reloading of the tear film during full blink occurs by the distribution of tears released from the lacrimal gland and the lipids released from the Meibomian gland over the ocular surface. The reduction of the blinking rate and the partial and incomplete blink leads to greater loss of aqueous tear due to evaporation resulting in the dryness of the ocular surface. This process over the time leads to initiation of the DED cycle.[8]

3.3.2. Contact lens usage and dry eye disease

It was observed that 50% of contact lens users report dry eye symptoms. This was 12 times and 5 times more likely in emmetropes and spectacle wearers respectively. The usage of contact lens for a longer duration being a reason for DED results in the increased expression of the markers of inflammation (HLA-DR and ICAM-1) and also induces epithelial changes.[2]

3.3.3. Laser-assisted in situ keratomileusis and dry eye disease

The ocular surgical procedures which are done to improve the refractive errors also increase the risk of dry eye disease. These include laser-assisted in situ keratomileusis (LASIK), photorefractive keratectomy (PRK) and small incision lenticule extraction (SMILE).[9]

The most common complication of LASIK is dry eyes, with virtually all patients developing some degree of dryness in the immediate postoperative period. The prevalence of dry eye symptoms prior to undergoing LASIK is estimated to be between 38% and 75%.[10]

Post-LASIK dry eye usually peaks in the first few months after surgery, and then symptoms begin to improve in the vast majority of patients at 6–12 months after surgery.[11]

3.3.4. Dry eye post cataract surgery

As per study published by Saba Ishrat et al. 42% patients developed dry eyes in the early postoperative period.[12]

3.3.5. Other causes of dry eye disease

The use of systemic medications which are responsible for the development of dry eye are namely the beta blockers, the histamine antagonist, diuretics, and antidepressants. Topical medications containing preservatives particularly benzalkonium chloride can induce an inflammatory response at the ocular surface, when used for longer duration like in patients suffering from glaucoma leading to dry eyes.

Identifying preoperative dry eyes, and conscientious attention and treatment in the perioperative time period, can lead to enhanced patient satisfaction and more accurate visual outcomes.

Table 1: Factors involved in dry eye disease after cataract surgery include:[13]

Factor involved	Reason
Decrease tear film break-up time	Due to surface irregularity at the site of the incision
Decrease corneal sensation	Due to surgical incision which disrupts the cornea-lacrimal gland loop leading to reduced tear secretion
Decrease mucin production from the conjunctiva	Secondary to placement of incision
Prolonged use of antibiotic-steroid eye drops	
Poor tear film production and stability	Due to surgically induced ocular inflammation and exposure to light from the operating microscope

3.4. Important criteria of successful treatment in patients

In the healthcare, there has to be more emphasis on the disease prevention. The clinician should develop more skill and excel in the management of the ailments related to any disease. The progression of any disease process also need to be halted by the use of an advanced knowledge and techniques.

Only a handful of therapies are available for DED patients and are used according to the disease severity. Artificial tears provide palliative relief to eye irritation and other symptoms in patients with aqueous tear deficiency.

The lifestyle trends and the newer revolutionized technologies in the current era have increased the burden of DED globally. To reduce the suffering because of the DED, a balance has to be made between the preventive and the curative measures.[14,15]

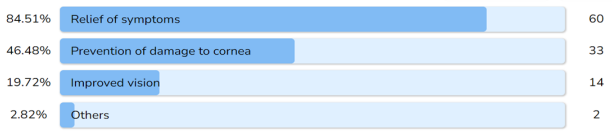

Figure 4: Important criteria of successful treatment

Around 85% ophthalmologists believes that relief of symptoms is important criteria for the treatment of DED while 46.48% says prevention of damage to cornea should be managed with the medication. Improved vision is considered by 20% of ophthalmologist as a third criteria for successful treatment. (Figure 4)

3.5. First-line therapy for the management of dry eye disease

According to ophthalmologists' survey, everyone reported that Artificial Tears is the first line in management

of DED.(Figure 5) In certain cases, depending on type, severity, and cause of dry eye other drugs like cyclosporine, corticosteroids, antioxidant supplements and other medications might be used.

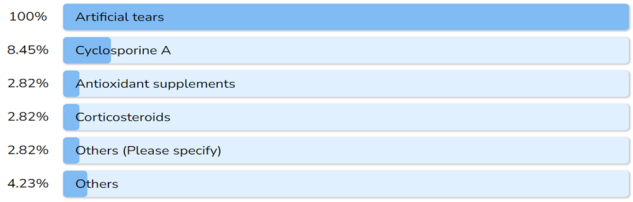

Figure 5: First-line therapy for the management of dry eye disease

3.6. Management of dry eye Disease

The mainstay treatment of dry eye or dysfunctional tear syndrome (DTS) is tear replacement with artificial tears (AT). Artificial tear drops are similar to natural tears secreted by the ocular tissue.

Recently, a rationalized classification of tear substitutes has been pronounced by Barabino et al. and consists of three types based on their degree of interaction with the eye: wetting agents, multiple-action tear substitutes and ocular surface modulators.

Though wetting agents only lubricate the ocular surface with a limited residence time, multiple action tear substitutes can recover tear film quality and quantity without interfering with the ocular surface. As the name recommends, ocular surface modulators relate with and influence the ocular surface in order to counteract DED signs.[16]

Different varieties of artificial tear preparations are available currently. Depending on the mode of action and their physical properties, artificial tear formulations lubricate the ocular surface.

Artificial tear (AT) consists of an active ingredient that promotes ocular surface wetting, buffering agents, preservatives, electrolytes, and other factors that vary extensively from product to product.

The artificial tear formulation should ideally be able to take care of the ocular surface and guard it. It should also be able to reduce the signs and symptoms of dry eye effectively, and promote the wetting of the ocular surface.

According to Marquardt (1986) there are four requirements for artificial tears:

1. No irritation to eye.
2. Good lubricating effect
3. Long retention time
4. No disturbance to the optics of the eye.

The various artificial tear preparation which are available commercially are buffered solutions which are either hypotonic or isotonic in nature. They also contains excipients such as surfactants, viscosity agents, and electrolytes. Their mainly target the aqueous layer or the lipid layer of the tear film. There is no available guideline or consensus to understand which artificial tear formulation is better therapeutically.

Qualities of the best artificial tear preparation[17] are:

1. Uniform and even spread over the ocular surface.
2. Diminish friction during blinks
3. Minimal blurring upon instillation
4. Safe and convenient for use
5. Improves the signs and symptoms of dry eye effectively.

Qualities of an ideal artificial tear preparation[18] are:

1. Have potential to restore deficiencies in both, aqueous and lipid layers of the tear film.
2. Address patient's dry eye symptoms, regardless of the deficiency (lacrimal or meibomian gland) within the tear film.

Artificial tears dosing depends on the symptoms reported by patients, but in mild cases of DED, the typical artificial tears dose is twice a day. However, there are different conditions that may require 3 to 4, or even more instillations during the day. If the dosing is >4 times a day, the unit-dose is typically given that is non-preserved.[19]

Cyclosporine is not a curative therapy for dry eye disease. It only takes care of the inflammatory component of the dry eye disease. It inhibits the activity of the T-cells and thus inhibits the release of IL-1. In the experimental murine model, cyclosporine has been found to protect the loss of the goblet cell and reduce the apoptosis of the epithelial cells of the conjunctiva.

The other therapies used in the management of dry eye disease include the omega-3 fatty acids, and the tetracycline derivatives. They are found to be efficacious in the conditions such as meibomian Gland Dysfunction and rosacea due to their anti-inflammatory activity and lipid-regulation activity.[2]

3.7. Preference of artificial tear preparation in clinical practice

3.7.1. Different types of artificial tears

1. Lipid-based artificial tears
   (a) Used when the dry eye is definitely due to a problem with meibomian glands
2. Gel/ointment-based artificial tears:
   (a) Used when patient does not have activities that require immediately clear vision

(b) Ideal for plastic surgery patients who have had work done on their lids and do not close their eyelids completely when they sleep.[19]

In our survey more than 50% ophthalmologist believes that carboxymethylcellulose is the most suitable ingredient which has most of the properties for an ideal artificial tear followed by sodium hyaluronate (29.58%).(Figure 6)

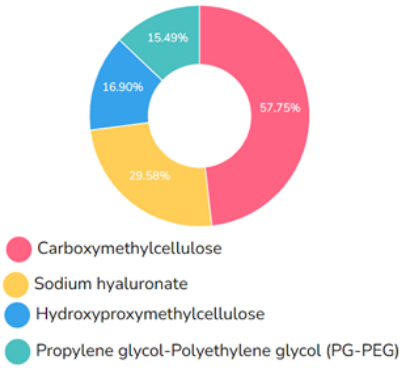

Figure 6: Preference of artificial tear preparation

3.7.2. *Other therapeutic functions of artificial tears*

Artificial tears can also be utilised in various other conditions such as:

1. Anterior eye trauma.
2. Infection.
3. Inflammation and disease as well as contact lens management.

3.8. *Parameters for the artificial tear preparations*

Ocular lubricants are considered as the first "line of defense" for the management of dry eye disease. All modern ocular lubricants are buffered solution which are either hypotonic or isotonic in nature. They also contains excipients such as surfactants, viscosity agents, and electrolytes.

During survey, it was observed that viscosity, pH and osmolarity is important for the ideal artificial tear amongst those around 23% ophthalmologist opine that viscosity is major factor which should be considered for AT.(Figure 7)

Factors need to be considered while selecting specific eye drop product are type of DED (aqueous deficiency, evaporative or mixed), viscosity of solution (highly liquid eye drops: induce minimal blurring; preferred before driving). Viscous eye drops are better suited for environments such as air-conditioned rooms etc.

3.8.1. *Choosing an artificial tear product*

Use an artificial tear product that has been scientifically proven in clinical trials to be composed of molecules that

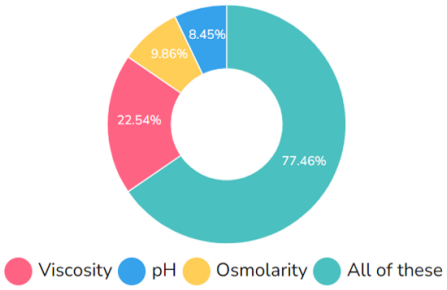

Figure 7: Parameters selection for artificial tears formulation

have been demonstrated to be effective in replenishing the deficient tear film layer for protection of the ocular surface.

3.8.2. *General aspects of tear substitutes*

3.8.2.1. Viscosity. It is also known as fluid thickness. It is one of the most important property of any artificial tear preparation. The higher the viscosity of an artificial tear the longer is the retention time on the ocular surface. The benefit is that it helps relieve the signs and symptoms of the dry eye disease or the dysfunctional tear syndrome. The drawback of the higher viscosity artificial tear preparation are that they cause blurring of vision following instillation in the eyes. They may also leave some residues on the eyelash/eyelid as the solution dries off.

Low-viscosity tears (1–10 cPs)	Indicated for patients with occasional discomfort or for use with contact lenses
Mid-viscosity tears (10–50 cPs)	Chronic dry eye conditions in patients who will tolerate some degree of blur after instillation
High-viscosity tears (>50 cPs)	Reserved for nighttime use and for special cases such as lagophthalmos and diagnostic procedures

Differences in viscosity

1. Viscosity is not the gold standard criteria by which to judge the quality of the artificial tear product.
2. More important is the resiliency of the eye drop on the ocular surface.
3. Must adapt the artificial tears to the specific type of DED—aqueous-deficient, evaporative, or mixed — For example, in a patient with evaporative DED, it is not recommended to use very viscous artificial tears because it will not dilute inflammatory molecules on the ocular surface — For aqueous-deficient DEO, it is important to rinse the cornea.[20]

In clinical practice as a general rule, patients with mild symptoms or signs should initially be given artificial tears with low viscosity, whereas those with a moderate to severe

dry eye condition will require a more viscous product. Some patients will need to try formulations with different viscosities in order to find one that is acceptable.[2]

Improvements in precorneal retention time are typically seen with increasing viscosity up to about 15–30 cps after which there is a diminishing benefit (Patton and Robinson 1975).

Demulcent agents: Demulcents are lubricating compounds contained in AT that have a mucilaginous consistency, which provides lubricity for protecting and smoothing the ocular surface, thereby minimizing abrasive actions of the eyelids.(Table 2)

1. Polyethylene glycol (PEG): Polyethylene glycol (PEG) preserves the microenvironment of the ocular surface. It help relieve the ocular surface inflammation and irritation by forming a protective layer over the ocular surface.
2. Propylene glycol: Propylene glycol is a humectant and has demulcent properties. Because of its humectant property it holds up to three times its own weight in water. The viscosity of the eye drops increases due to propylene glycol. It help relieve the ocular surface inflammation and irritation by forming a protective layer over the ocular surface.
3. Glycerin: Glycerin is a humectant and has demulcent properties. It stimulates the ocular epithelial cell growth. It also lessen the damaging effects of high osmolarity cellulose derivatives on the ocular surface.
4. Carboxymethylcellulose (CMC): Carboxymethylcellulose (CMC) is a polymeric viscosity agent. It is one of the most commonly used agent in the United States. It is widely used in various foods and pharmaceuticals. It is also used in various non-food preparations such as tooth paste and detergents. When instilled in the eyes it bind to the epithelial cells of the cornea and is retained there. They also increase the viscosity and the clearance time of the eye drops.
5. Hydroxymethylcellulose (HMC), hydroxypropylcellulose (HPC), and hydroxypropylmethylcellulose (HPMC, aka. hypromellose): They are the polymers that are hydrophilic in nature. They coat and protect the ocular surface. When they are instilled into the eyes they form the crosslink and increase the tear clearance time. As they are highly viscous, they need to be mixed with other compounds. HMC have been demonstrated to restore the protective effect of the mucous layer of the tears.[21]

Osmolarity/Osmolality: The osmolarity of freshly produced tears is about 300 mOsm/L and about 305–310 mOsm/L in the tear film. Most artificial tear preparations are iso-osmolar. Some patients with an aqueous deficiency have a tear osmolarity higher than normal (about 329 mOsm/L), which can lead to a decrease in goblet cell density and in corneal glycogen levels and this, in turn, can cause epithelial defects and poor wetting of the ocular surface.

Table 2: Ocular lubricant properties

Component/ Characteristic	Claimed effect/benefit
Electrolytes	Potassium: 1. Maintenance of corneal thickness 2. Increase the density of the goblet cells of conjunctiva 3. Increase the glycogen content of the cornea Bicarbonate: 1. Help restore the function of the damaged ocular epithelium 2. Maintain the ultrastructure of the normal ocular epithelium 3. Maintain mucin layer
Compatible solutes(e.g., glycerin)	1. Increase the cellular osmolarity2. Protect from damage due to hyperosmolar tears
Viscosity agents	1. Increases the residence time 2. Provides comfort to the patient 3. Protects the damaged epithelium of the ocular surface 4. Increase the lipid layer of the tear film
Preservatives	1. Protection from contamination by the microbes 2. Toxic to ocular epithelium

pH: The mean pH of the healthly human eyes lies between 7.5 to 7.6 as per the data from some research studies. The patients with dry eye disease have a higher tear film pH. Artificial tear formulations should fall within the normal ocular comfort range (pH range of 6.6 to 7.8).

3.9. Selection of artificial tear for dry eye

In this survey, 61.43% Ophthalmologists consider, AT should provide continuous relief from dry eye symptoms. 42.86% said AT should be used for long terms, it should be preservative free replied by 58.57% and 40% replied acceptance from patient should be there in terms of cost.(Figure 8)

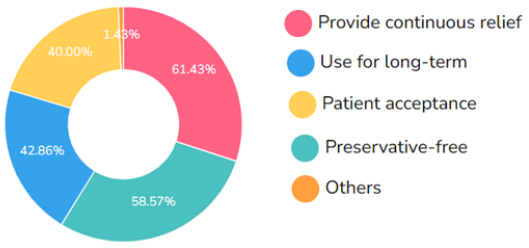

Figure 8: Key parameters for selection of treatment for dry eye

3.9.1. Treatment goals

Once a diagnosis of dry eye has been made, the following specific treatment goals are desirable and measurable in a general clinic setting.

The specific treatment goals that are desirable in the clinical setting include:

1. Symptomatic relief
2. Enhance lubrication
3. Stabilize tear film
4. Retard evaporative tear loss
5. Suppress inflammation
6. Support meibomian gland function
7. Maintain adequate secretion

Choosing the right artificial tear product (AT) is most important while treating dry eye disease. Eliminating pain and irritation and improving quality of vision for patients is extremely important. Not all AT products are same. It is important to choose a product based on symptoms and diagnostic exam results, as well as how well it works for an individual patient. Improving the patient's quality of life is key.(Table 3)

The reason for adding preservatives in artificial tear preparation is to prevent the growth of microbes. The preservatives used in the artificial tear preparation are classified into three types namely, detergent, oxidative, and, ionic-buffering preservatives. One of the most commonly used preservative in the artificial tear preparation is benzalkonium chloride (BAK). It has a good antimicrobial activity but it has a toxic effect on the ocular surface.

The oxidative preservatives act by altering the DNA, lipid, and protein components of bacterial cells. They seem to be less toxic then the detergent preservatives. The commonly used oxidative preservatives are sodium perborate and stabilized oxychloro complex (SOC). They are neutralized by the tear proteins and the UV exposure respectively.

The ocular surface of the patients with dry eye disease are already damaged due to dryness. Therefore, using artificial tears with added preservatives can cause more harm to the ocular surface when used for several times in a day.

The artificial tear substitutes with added preservatives can aggravate the ocular surface inflammation. The introduction of the preservative- free preparations helps patients to use the tear preparations more often with less toxicity to the ocular surface.[2]

4. Conclusion

Dry eye disease (DED) is a common ophthalmic condition which is chronic in nature. It is considered a key health alarm during modern digital era and among the most common reasons for visiting eye care practitioners. Artificial Tears is the first line in management of DED said by all ophthalmologist & in certain cases, depending on type, severity, and cause of dry eye other drugs like cyclosporine, corticosteroids, antioxidant supplements and other medications might be used.

Table 3: Selection of eye drops as per type of DED

Aqueous deficient DED	Evaporative DED	Mixed DED
Recommended to use eye drops that improve the persistence of water in front of the ocular surface	Recommended to use lipid-containing eye drops to help replenish the deficient lipid layer	Artificial tear based on ophthalmologist recommendation
Frequency of instillation depends on level recommended to used lipid containing of tear insufficiency	Frequency of instillation is typically as per needed.	

The majority of artificial tear products are aqueous-based preparations. They contain viscosity-enhancing agents such as carboxymethyl cellulose (CMC), sodium hyaluronate, hydroxypropyl guar (HP-guar), hydroxypropyl methylcellulose (HPMC hypromellose), polyvinyl alcohol, polyvinylpyrrolidone and polyethylene glycol. These viscosity enhancing agents lubricate the ocular surface and also increase the retention time of the tear film. The other ingredients which are present in the artificial tear preparation include osmo-protectants, antioxidants, osmotic agents, preservatives and inactives such as pH buffers, electrolytes and excipients.[17]

The main target of the aqueous-based artificial tears is the muco-aqueous phase of the tear film. They also improve the symptoms of the dry eye in all subtypes of dry eye disease (DED).[22]

There are evidences that AT improve symptoms of DED within a month of regular use, applied approximately four times a day, but signs usually take some months. Not all patients with DED benefit from artificial tears, so if there is no benefit over a month, alternate management should be considered. Combination formulations are more effective than single active ingredient artificial tears e.g.

The effect of CMC is enhanced incorporation of glycerine. The efficacy of artificial tear drops is enhanced by the use of lower osmolarity drops. Carboxymethylcellulose (CMC) when used in higher concentration (viscosity) effectively decreases the staining of the conjunctival and the corneal cells but leads to visual disturbance in the form of blurring of vision.

In about one third of the patient the use of artificial tear substitute does not benefit much, but to predict it the artificial tear preparation has to be used properly for at least a month.

To summarize, irrespective of the severity of the dry eye disease (DED), it is appropriate to prescribe a preservative free or a soft preserved artificial tear preparations in any patient with dry eye disease. To determine whether an artificial tear preparation can help to take care of the symptoms of the patients with dry eye disease for a longer time, the individual has to use the preparation regularly for one month with four times a day application. The individual need to be patient while using artificial tear preparation as the signs of ocular surface disease take at least four months to show improvement. The artificial tear preparation with multiple active ingredients seem to outperform more than the basic previous generation eye drops.

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None.

6. Conflict of Interest

Dr. Abhijit Trailokya, Dr. Amar Shirsat & Dr. Shaijesh Wankhede are associated with Indoco Remedies ltd. Mumbai.

7. List of Ophthalmologists Across India Participated

Dr. Mohammed Muzamil, Dr. Pravin Dubey, Dr. Sudha, Dr. Sudheena An, Dr. Kalpana Suresh, Dr. Sankalp Sharma, Dr. Vijay Deshmukh, Dr. S Pattanayak, Dr. Ranjit Have S, Dr. Bharathi N, Dr. Prasad, Dr. Ganesh Mhaske, Dr. Prathibha, Dr.Shiney, Dr. Avi, Dr.Chitrangshu Samanta, Dr.Manoj Bhakat, Dr.Gaurav Mahajan, Dr.Champaign Dutta, Dr.Jayantatamuli, Dr. Rupeswar Baishya, Dr. Charu Goel, Dr. Sindhun M, Dr. Cindy N V, Dr. Geetha Kumari P V, Dr. Laly, Dr. Praveen Saluja, Dr. Fasna, Dr. Sangeeta, Dr.Archana Pandey, Dr. Geetha, Dr. Radhika T, Dr.Sita S, Dr.Leema, Dr.Vidyasankar, Dr.Puneet Kumar Srivastava, Dr. Varsha, Dr.Jitender Singh, Dr.Rajvanth, Dr. T. Lingam Goud, Dr.Vaishali, Dr. Anju Pavithran, Dr. Prashanth.B, Dr. Parvathi. Mps, Dr.Nilesh Panchal, Dr. Lakshmi M S, Dr.Sanket Bhatnagar, Dr.Nagabhushan, Dr.Rajesh K K, Dr.Vrinda, Dr. Rajalakshmi S, Dr. Thungappa K S, Dr. Vivek Singh, Dr. Shivanand, Dr. Me Albanuddin, Dr. Nilotpal Saikia, Dr. Mayur Dutta Bharali, Dr. G. Suneetha, Dr. Kunal Mandlik, Dr. Pankaj Varshney, Dr. Rahul Choubey, Dr.Pranab Sikdar, Dr. Raj Eel Bhattacharjee, Dr.Namrata Shree, Dr.Gaurav Gupta, Dr. A Deka, Dr. Minija, Dr.Prof Swapan K Samanta, Dr.Sunil Soni, Dr. Umesh Singh, Dr. Vyayshree.

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