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Prevalence and Classification of Dry Eye Disease (DED) in Cataract Camp Patients

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Abstract

Aim: To determine the prevalence, severity, and classification of Dry Eye Disease (DED) among patients attending cataract screening camps and to highlight the importance of routine ocular surface evaluation before cataract surgery. **Methods:** This cross-sectional study included 170 patients aged above 35 years who were diagnosed with cataract during community-based screening camps and referred for further evaluation. All participants underwent comprehensive preoperative assessment, including subjective evaluation using the Ocular Surface Disease Index questionnaire (OSDI-12) and objective tests such as Tear Film Break-Up Time (TBUT), Schirmer's Test I and II, and ocular surface staining. Dry Eye Disease was classified based on severity using combined symptom and clinical test findings. Statistical analysis was performed to assess the association between dry eye parameters and disease severity. **Results:** The mean age of participants was 61.45 ± 9.68 years, with 51.2% males and 48.8% females. The overall prevalence of Dry Eye Disease among cataract camp patients was 72.4% (123/170). Moderate-to-severe DED was most common: 12.4% mild, 24.1% moderate, 29.4% severe, and 6.5% very severe cases. Severe DED was the most frequent category ($p < 0.001$). The mean OSDI score was 47.51 ± 15.59, indicating high symptom burden, and showed significant association with disease severity ($p < 0.001$). Both TBUT and Schirmer's test values demonstrated statistically significant correlation with increasing DED severity ($p \leq 0.001$), indicating worsening tear film instability and reduced tear secretion with disease progression.
Conclusion: Dry Eye Disease is highly prevalent among cataract camp patients, with the majority presenting moderate-to-severe disease. Both subjective and objective assessments showed strong correlation with severity. Routine preoperative dry eye screening in cataract outreach programs is essential to improve surgical planning, optimize visual outcomes, and enhance patient satisfaction

Keywords: Dry Eye Disease, Cataract Camp, OSDI, Tear Film Break-Up Time, Schirmer's Test, Ocular Surface Evaluation, Prevalence, Cataract Surgery.

Introduction

Dry Eye Disease (DED) is a common, multifactorial disorder of the ocular surface characterized by loss of tear film homeostasis and accompanied by ocular symptoms, tear film instability, hyperosmolarity, inflammation, and neurosensory abnormalities, as defined by the TFOS DEWS II report.[1] DED significantly affects visual function and quality of life, causing symptoms such as irritation, foreign body sensation, burning, fluctuating vision, and photophobia.[2] The global prevalence of DED varies widely, ranging from 5% to 50%, depending on geographic region, population characteristics, and diagnostic criteria used.[3] Population-based studies in India have reported prevalence rates ranging from 18% to 40%.[4] Higher prevalence has been observed among elderly individuals and females.[5] Increasing age is a major risk factor due to physiological changes in the lacrimal functional unit, hormonal alterations, systemic diseases, and medication use.[6] Cataract remains the leading cause of reversible blindness worldwide.[7] According to the World Health Organization, cataract accounts for nearly half of global blindness, particularly in low- and middle-income countries.[8] In India, cataract camps are conducted to reduce avoidable blindness in rural and underserved populations.[9] The majority of individuals attending these camps belong to older age groups, which overlap with the high-risk population for Dry Eye Disease.[10] The coexistence of Dry Eye Disease in cataract patients is clinically significant.[11] An unstable tear film interferes with accurate keratometry measurements.[12] It also affects intraocular lens power calculations.[13] This may lead to refractive errors postoperatively.[14] Cataract surgery can exacerbate dry eye symptoms due to corneal nerve damage.[15] Exposure to operating microscope light further contributes to ocular surface stress.[16] Irrigating solutions used during surgery may disturb tear film stability.[17] Postoperative medications can also worsen dry eye symptoms.[18] Preoperative identification and management of Dry Eye Disease are essential for optimal surgical outcomes.[19] Dry Eye Disease is classified into aqueous-deficient and evaporative types.[20] Aqueous-deficient dry eye results from reduced tear secretion and may be associated with Sjögren syndrome.[21] Evaporative dry eye is commonly associated with meibomian gland dysfunction.[22] Environmental factors such as sunlight, dust, and low humidity increase the risk of Dry Eye Disease.[23] These environmental conditions are common in rural populations.[24]
Limited data are available on Dry Eye Disease among cataract camp patients.[25] Most outreach programs focus mainly on cataract detection and overlook ocular surface evaluation.[26]
Therefore, this study aims to determine the prevalence and classification of Dry Eye Disease among cataract camp patients and to highlight the importance of routine ocular surface evaluation in outreach screening programs.[27]

Methodology

This cross-sectional study was conducted at Dr. Shroff's Charity Eye Hospital Meerut, Ethical approval for the study was obtained from the Internal Scientific Committee of Dr. Shroff's Charity Eye Hospital New Delhi. The study population comprised patients aged above 35 years who were diagnosed with cataract during community-based camp screenings. A total of 170

participants were included in the study, which included 87 males and 83 females. Patients identified with cataract at the camp locations were referred to the hospital for further evaluation. At the hospital, all patients underwent a comprehensive outpatient department (OPD) workup, including detailed ocular examination, fundus evaluation, and preoperative assessment prior to cataract surgery. Inclusion criteria were patients aged more than 35 years with a confirmed diagnosis of cataract during camp screening. Exclusion criteria included patients younger than 35 years, those with a history of ocular surgery (except cataract surgery in the fellow eye), and patients with active ocular infections or ocular allergies and any ocular trauma or traumatic cataract. During the OPD workup, detailed dry eye–related data were collected from all participants. Cataract diagnosis was reconfirmed through clinical examination. To assess ocular surface status, standardized dry eye evaluation was performed in every patient prior to surgery. Subjective assessment of dry eye symptoms was carried out using the Ocular Surface Disease Index questionnaire (OSDI-12) , which evaluates the frequency of symptoms and their effect on visual function and quality of life. Objective clinical tests for dry eye evaluation included Tear Film Break-Up Time (TBUT) to assess tear film stability, Schirmer's Test I and II are used to measure tear production, and ocular surface staining to detect corneal and conjunctival epithelial damage. These tests were performed using standard clinical protocols to ensure uniformity of data collection.

All assessments were conducted before cataract surgery to determine the prevalence and severity of dry eye among patients with cataract. DED severity is classified using a combination of both symptoms and clinical signs, not either alone. In our study, we used OSDI-12 for subjective assessment which evaluates the frequency of symptoms and their impact on visual function. The severity of dry eye based on OSDI score was classified as: normal (0-12), mild (13-22), moderate (23-32), and severe (33-100) and TBUT, Schirmer's, and ocular surface staining for objective evaluation. TBUT was used to assess tear film stability and was interpreted as: normal (>10 seconds), mild (8-10 seconds) moderate (5-7 seconds) and severe (<5 seconds). Tear secretion was evaluated using both Schirmer's Test I and Schirmer's Test II and was interpreted as: normal (>15mm), mild dry eye (10-15mm), moderate dry eye (5-10mm), and severe dry eye (<5mm) after 5 minutes. Ocular surface staining with fluorescein was used to detect corneal and conjunctival epithelial damage. Based on the correlation of these findings, we categorized patients into mild, moderate, severe, and very severe. We also found a significant association between symptom scores and clinical test values. So, a combined approach gives a more accurate and clinically relevant classification, especially since signs and symptoms may not always correlate. The collected data were analysed to evaluate ocular surface status and to explore the association between cataract and various dry eye parameters in this study population.

Result

A total of 170 participants from cataract screening camps were enrolled in the study.

Demographic Distribution

The demographic profile of the study population is presented in Figure 1. Among them, 87 (51.2%) were male and 83 (48.8%) were female, resulting in a male-to-female ratio of 1.04:1.

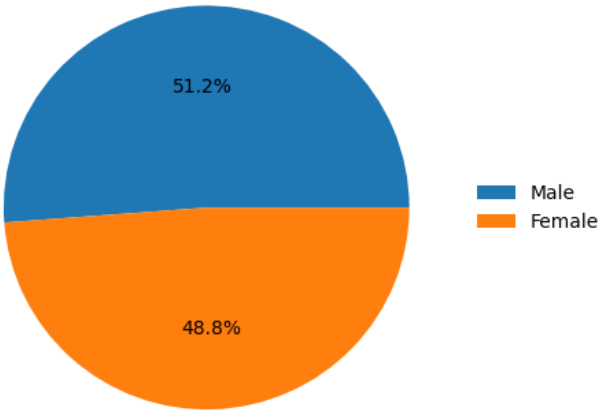


Figure 1: Shows distribution of patients on the basis of gender.

The age of the participants ranged from 40 to 82 years, with a mean age of 61.45 ± 9.68 years. The majority of the participants, 99 (58.2%), were in the 60–82 years age group, followed by 51 (30.0%) in the 50–59 years age group, and 20 (11.8%) in the 40–49 years age group. This indicates that the study population was predominantly elderly, as shown in figure 2.

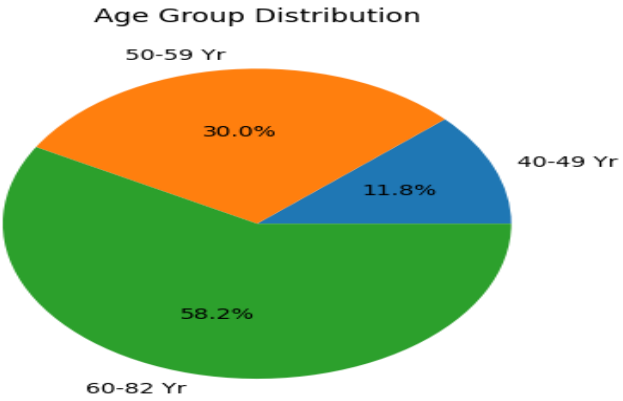
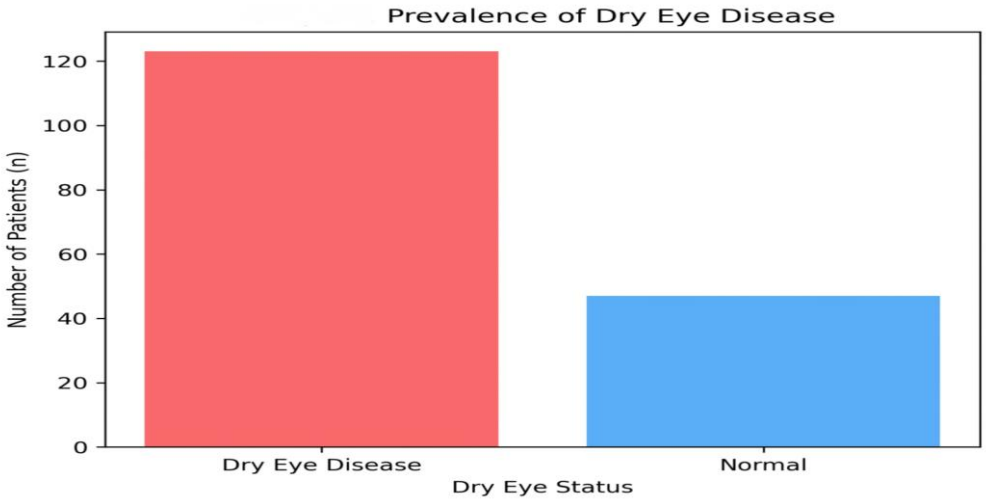


Figure 2: Shows distribution of patients on the basis of age.

Prevalence of Dry Eye

The overall prevalence of Dry Eye Disease (DED) among cataract camp patients was 72.4% (123/170). Only 47 patients (27.6%) were found to have normal tear film parameters (Graph 1). This finding suggests that nearly three-quarters of cataract patients had evidence of Dry Eye Disease.

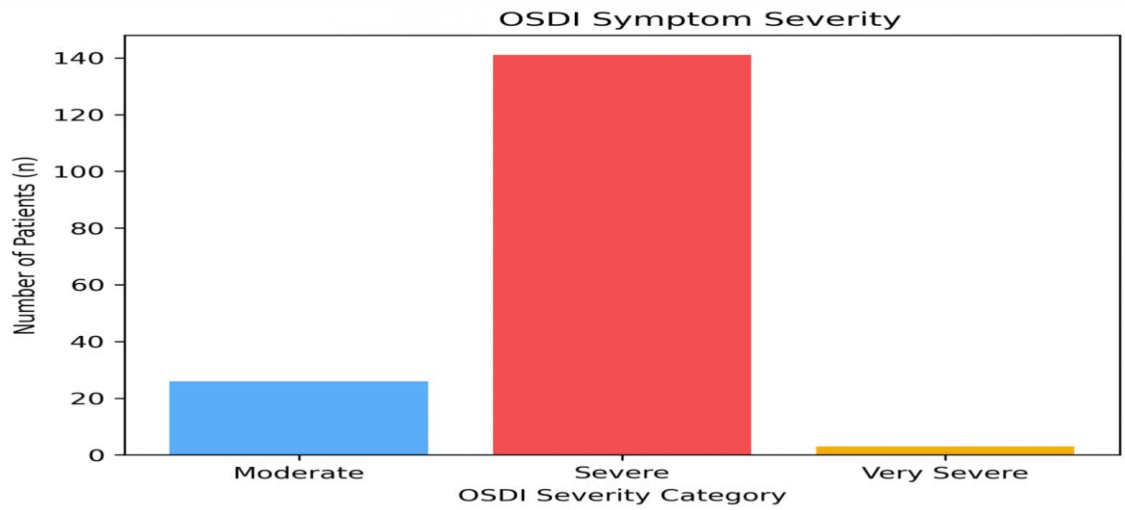


Graph 1: Shows prevalence of Dry Eye Disease among cataract Camp patients

Ocular Surface Disease Index (OSDI) Assessment

Table1: Shows the symptom severity of Dry Eye Disease was evaluated using the Ocular Surface Disease Index (OSDI) questionnaire

OSDI Score Range	Severity Level	Frequency (n)	Percentage
0-12	Normal	-	-
13-22	Mild Dry Eye	-	-
23-32	Moderate Ery eye	26	15.3%
33-100	Severe Ery eye	141	82.9%
>33 (extreme cases)	Very severe Dry Eye	3	1.8%



Graph 2: Shows the symptom severity of Dry Eye Disease was evaluated using the Ocular Surface Disease Index (OSDI) questionnaire

The symptom severity of Dry Eye Disease was evaluated using the Ocular Surface Disease Index (OSDI-12) questionnaire, and the results are presented in Table 1. Out of 170 participants: 141 patients (82.9%) had severe symptoms 26 patients (15.3%) had moderate symptoms 3 patients (1.8%) had very severe symptoms. The mean OSDI score was 47.51 ± 15.59, indicating a high level of symptom severity among the participants. The association between OSDI score and Dry Eye Disease severity was found to be statistically significant ($p < 0.001$).

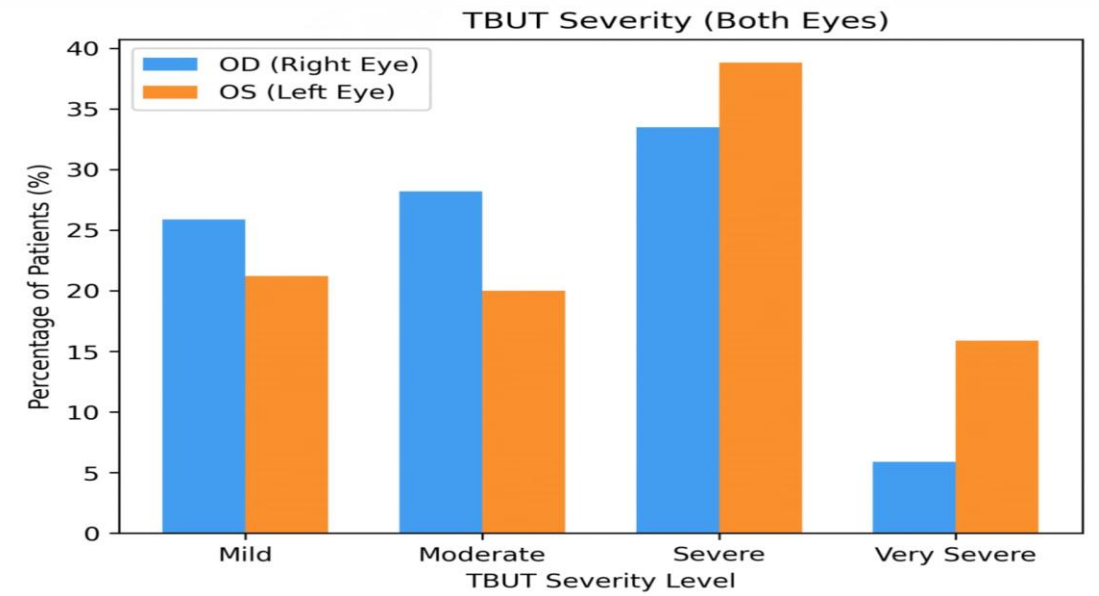
Association between Tear Film Break-Up Time (TBUT) and Dry Eye Disease Severity

Table 2: Shows Severity of TBUT severity in both eyes

Severity	OD %	OS%
Mild	25.9	21.22
Moderate	28.2	20
Severe	33.5	38.8
Very severe	5.9	15.9

Test	P value
TBUT OD Severity	0.001
TBUT OS Severity	0.001

The Tear Film Break-Up Time (TBUT) test demonstrated a significant association with Dry Eye Disease severity in both eyes (Table 2)



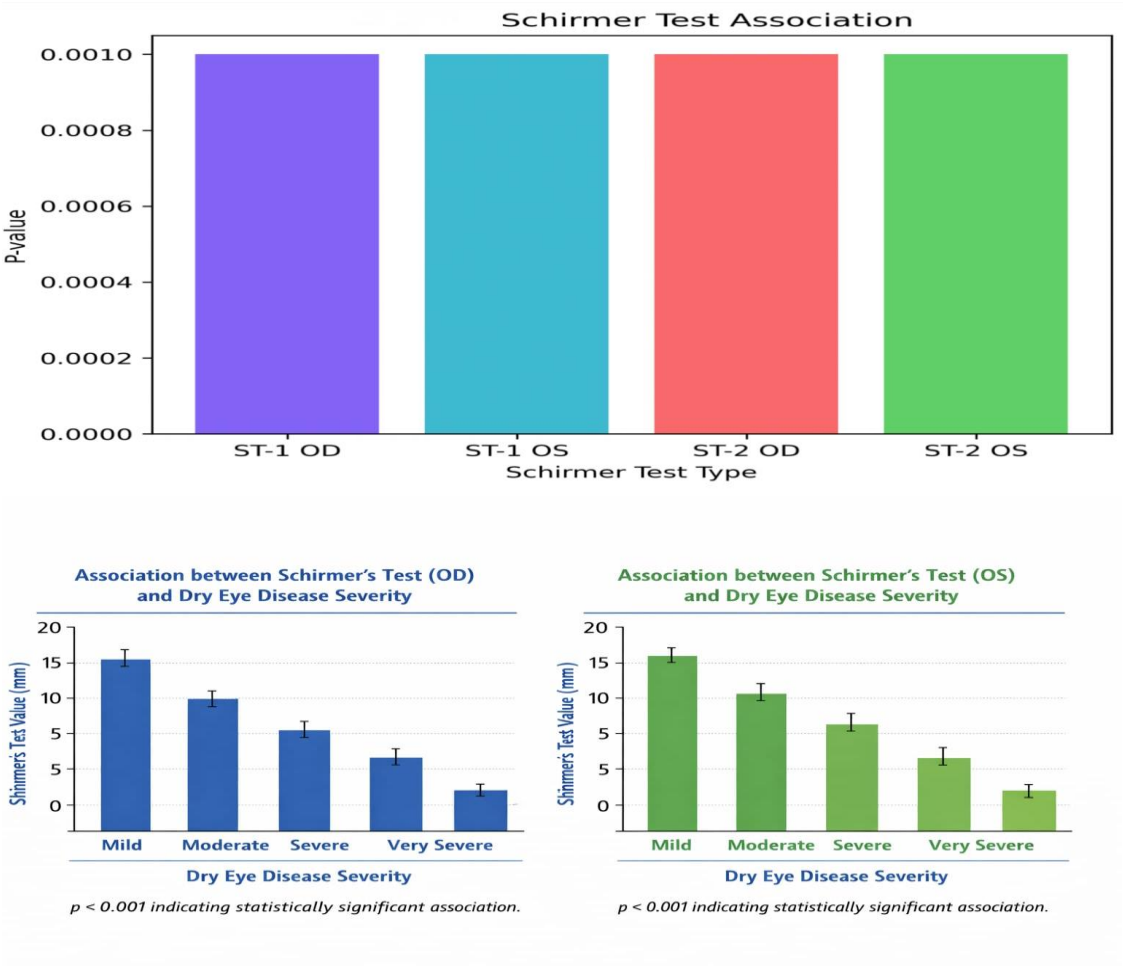
Graph 3: Shows the Tear Film Break-Up Time (TBUT) severity in both eyes .

In the right eye, the proportion of patients increased with increasing severity, with 33.5% of severe cases and 5.9% of very severe cases showing abnormal TBUT values, and the association was statistically significant (p = 0.001). Similarly, in the left eye, 38.8% of severe cases and 15.9% of very severe cases showed abnormal TBUT values, with a statistically significant association (p = 0.001). These findings indicate that tear film instability worsens with increasing severity of Dry Eye Disease.

Association between Schirmer's Test and Dry Eye Disease Severity

Table 3: Shows Severity of Schirmer's test severity in both eyes

Test	P value
ST-1 OD	< 0.001
ST-1 OS	< 0.001
ST-2 OD	< 0.001
ST-2 OS	< 0.001



Graph: 4 Shows Association between Schirmer's Test and Dry Eye Disease Severity in both eyes.

Schirmer's Test was used to assess tear secretion, and the results are summarized in Table 3.Schirmer's Test I and II showed a highly statistically significant association with Dry Eye Disease severity in both eyes ($p < 0.001$). Lower Schirmer's test values were observed in patients with moderate, severe, and very severe Dry Eye Disease, indicating reduced tear production with increasing disease severity. The study demonstrated a high prevalence of Dry Eye Disease (72.4%) among cataract camp patients. The majority of affected participants had moderate-to-severe disease. Both subjective assessment (OSDI) and objective clinical tests (TBUT and Schirmer's test) showed statistically significant correlation with disease severity.

Discussion:

Dry Eye Disease (DED) is a common ocular surface disorder that frequently coexists with cataract in elderly populations. In the present study, the prevalence of Dry Eye Disease among cataract camp patients was 72.4%, indicating a high burden of ocular surface abnormalities in this population. Similar findings have been reported in previous studies evaluating patients undergoing cataract surgery, a prospective study by Prevalence of ocular surface dysfunction in patients presenting for cataract surgery evaluation [28] reported that approximately 80% of patients presenting for cataract surgery had at least one abnormal tear film parameter, suggesting that ocular surface dysfunction is highly prevalent but often undiagnosed in cataract candidates. Objective clinical tests also supported the findings of the present study. Tear Film Break-Up Time (TBUT) and Schirmer's test showed statistically significant associations with disease severity, indicating worsening tear film instability and reduced tear production in more severe cases. Similar observations have been reported in several clinical studies evaluating ocular surface changes in cataract patients. For instance, a study examining dry eye following cataract surgery reported that tear film instability and reduced TBUT were commonly observed after surgery and were associated with increased dry eye symptoms [29] Furthermore, cataract surgery itself has been shown to influence tear film stability. A clinical study investigating dry eye after cataract surgery found that approximately 42% of patients developed dry eye symptoms one week after surgery, largely due to tear film instability and disruption of corneal nerves during the procedure. These findings highlight the importance of identifying and managing Dry Eye Disease before cataract surgery [30]

A study conducted in a Norwegian cataract clinic reported a prevalence of 55.5% based on DEWS II criteria . Although lower than the 72.4% observed in our study, both findings confirm that DED is highly prevalent in cataract populations. The higher prevalence in our study may be due to rural camp settings, where environmental factors such as dust, sunlight, and low humidity contribute to tear film instability. Objective findings in our study showed a strong association between Tear Film Break-Up Time (TBUT), Schirmer's Test I and II, and disease severity ($p \leq 0.001$). Similar results have been reported in previous studies, where reduced tear secretion and tear film instability were commonly observed among cataract patients . These findings suggest that both aqueous deficiency and evaporative mechanisms play a role in disease progression. n important observation in this study was the significant association between OSDI scores and DED severity ($p < 0.001$), indicating a high symptom burden. In

contrast, earlier studies have reported poor correlation between subjective symptoms and objective signs . The use of a combined classification approach in our study may explain this difference, providing a more accurate representation of disease severity. The high prevalence of moderate-to-severe DED has important clinical implications. Tear film instability can affect preoperative measurements such as keratometry and intraocular lens (IOL) power calculation, leading to suboptimal postoperative outcomes . Additionally, cataract surgery may further exacerbate dry eye symptoms. Overall, the findings highlight the need for routine dry eye screening in cataract camp settings. Early detection and management of DED are essential to improve surgical outcomes and enhance patient satisfaction [31]

Conclusion:

This study demonstrated a high prevalence (72.4%) of Dry Eye Disease among cataract camp patients, with the majority of cases classified as moderate to severe. These findings indicate that Dry Eye Disease is highly prevalent in the cataract population, particularly among elderly individuals attending outreach screening programs. The high burden of disease suggests that Dry Eye Disease is an important but often under-recognized condition in cataract patients. Both subjective and objective assessments played a crucial role in diagnosis. The Ocular Surface Disease Index (OSDI) questionnaire showed that most patients experienced severe symptoms, reflecting a significant impact on visual comfort and quality of life. Objective clinical tests, including Tear Film Break-Up Time and Schirmer's Test, demonstrated a strong association with disease severity, confirming their usefulness in evaluating tear film stability and tear production. The presence of Dry Eye Disease in cataract patients has important clinical implications. Tear film instability can affect preoperative measurements such as keratometry and intraocular lens power calculation, which may lead to inaccurate refractive outcomes after surgery. In addition, cataract surgery itself may worsen Dry Eye Disease due to surgical trauma and postoperative medications. Therefore, early detection and management of Dry Eye Disease are essential to improve surgical accuracy, visual outcomes, and patient satisfaction. This study emphasizes the need to incorporate routine dry eye evaluation into cataract camp screening and preoperative assessment protocols. Simple and cost-effective tools such as symptom questionnaires and basic clinical tests can help identify patients at risk. Early treatment with lubricating eye drops, eyelid hygiene, and appropriate management strategies can improve ocular surface health before surgery. In conclusion, Dry Eye Disease is highly prevalent among cataract camp patients and represents an important clinical concern that should not be overlooked. Integrating Dry Eye Disease screening and management into cataract outreach programs will help improve surgical outcomes, enhance quality of care, and increase patient satisfaction. These findings highlight the importance of strengthening ocular surface evaluation as a standard component of cataract care, especially in outreach and rural eye health programs.

Limitations:

Despite providing valuable insights, this study has several limitations. First, the study was conducted at a single center, which may limit the generalization of the findings to other regions or populations. Multi-center studies involving different geographic areas would provide a more

comprehensive understanding of the prevalence of Dry Eye Disease among cataract camp patients. Second, the sample size of 170 participants was relatively small. A larger sample size would allow for better statistical power and more accurate estimation of the prevalence and severity of Dry Eye Disease.Third, the study mainly focused on clinical tests and symptom assessment, while systemic and environmental risk factors such as diabetes, medication use, screen exposure, nutritional status, and occupational exposure were not evaluated in detail. These factors may have contributed to the development or severity of Dry Eye Disease.

Implications:

The findings of this study have several important clinical and public health implications. First, the high prevalence of Dry Eye Disease among cataract camp patients highlights the need for routine ocular surface screening before cataract surgery. Incorporating simple diagnostic tools such as OSDI, TBUT, and Schirmer's test into cataract camp protocols can help identify patients at risk. Second, early detection and management of Dry Eye Disease can improve the accuracy of preoperative measurements, including keratometry and intraocular lens power calculations, thereby reducing the risk of postoperative refractive errors. Third, appropriate preoperative management of dry eye, such as lubricating eye drops, eyelid hygiene, and treatment of meibomian gland dysfunction, can enhance ocular surface health and improve surgical outcomes. Fourth, integrating Dry Eye Disease screening into cataract outreach programs can improve overall patient satisfaction and quality of vision after surgery, particularly in rural and underserved populations. Finally, this study highlights the importance of strengthening ocular surface evaluation in community eye health programs, encouraging policymakers and eye care providers to adopt comprehensive screening approaches rather than focusing solely on cataract detection.

Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this study.

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