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DRY EYE PREVALENCE AND RISK FACTORS: AN OSDI-BASED HOSPITAL STUDY IN SOUTH 24 PARGANAS

Ophthalomology

Manisha Saha Assistant Professor, Department of Allied Health Science, Optometry Program, Brainware University

Anumoy Bisoi Bachelor of Optometry, Department of Allied Health Science, Optometry Program, Brainware University

Chiranjib Majumder* Assistant Professor, Department of Allied Health Science, Optometry Program, Brainware University*Corresponding Author

ABSTRACT

Purpose: A study of dry eye prevalence and risk factors in South 24 Parganas using OSDI questionnaires. **Material and Methods:** During April–May 2024, 181 participants from South 24 Parganas were enrolled in a cross-sectional study at a tertiary eye care center. After providing informed consent, subjects underwent a full clinical workup and completed the OSDI questionnaire to assess dry eye severity. While the questionnaire was provided in English, verbal translations were offered to overcome language barriers. Rigorous exclusion criteria were applied to omit participants with recent ocular infections or abnormalities. Statistical analysis was performed using Microsoft Excel, utilizing percentages to categorize the distribution of symptoms across the study population. **Results:** Among the 181 participants who completed the study, dry eye symptom severity was categorized according to the criteria in Table 1. Only 1.2% of the cohort reported normal or absent symptoms, while 7% and 14.8% presented with mild and moderate symptoms, respectively. Notably, a significant majority 77% of participants exhibited severe dry eye symptoms. **Conclusion:** In this cohort of 181 participants, OSDI scoring revealed a striking disease distribution: 1.2% asymptomatic, 7% mild, 14.8% moderate, and a predominant 77% with severe dry eye symptoms. These results highlight a substantial clinical burden, confirming that dry eye significantly impacts patient quality of life in this region. The high prevalence of severe cases necessitates a shift toward early diagnostic screening and targeted management. Furthermore, these findings underscore the urgency for robust public health strategies and further research into the localized risk factors and pathophysiology driving such high severity.

KEYWORDS

Dry Eye, DEWS II, symptoms of dry eye, OSDI, risk factors for dry eye, prevalence of dry eye

INTRODUCTION:

Globally, Dry Eye Disease (DED) is recognized as a prevalent ocular condition affecting all age groups [1]. Its increasing incidence is attributed to a combination of geographical and climatic variations [2-4], alongside the predominant use of visual display units and electronic devices within increasingly stressful environments [5-8]. Clinically, DED is characterized by ocular surface damage and symptoms such as burning, epiphora (tearing), and grittiness. These manifestations often lead to visual impairment, significantly reducing both health-related quality of life and workplace productivity [9-15].

The definition of Dry Eye Disease (DED) has evolved significantly over the last three decades. Originally defined by the National Eye Institute in 1995, DED is currently recognized by the International Dry Eye Workshop (DEWS II, 2017) as a multifactorial ocular surface disease characterized by a loss of tear film homeostasis [16]. Diagnosis typically integrates subjective patient data, such as the Ocular Surface Disease Index (OSDI) score, with objective clinical metrics including Schirmer's test, Tear Break-up Time (TBUT), and Non-Invasive Tear Break-up Time (NIBUT) [17]. However, a significant clinical and pathological challenge remainsand frequent discrepancies are observed between subjective symptomatic reports (including Health-Related Quality of Life impact) and objective clinical findings [17].

Epidemiological data from West Bengal indicate a high prevalence of Dry Eye Disease (DED), with approximately 73% of menacross both urban and rural demographicsexhibiting a higher susceptibility compared to women. In rural cohorts, this elevated risk among men is primarily attributed to occupational factors, specifically prolonged ultraviolet (UV) exposure during farming. Conversely, in urban areas, the increased incidence is linked to environmental stressors, including global warming and elevated nitrogen dioxide levels from air pollution. Interestingly, the risk profile for women differs by environment; while urban women are affected by atmospheric pollutants, approximately 86% of rural women are at risk due to postmenopausal physiological changes. This is further aggravated by limited awareness and the underutilization of hormone replacement therapy (HRT) [18].

Further investigation within West Bengal has identified specific risk cohorts, notably postmenopausal women over the age of 50. In this demographic, the presence of Meibomian Gland Dysfunction (MGD) and the chronic administration of anxiolytic or antidepressant medications are significant predictors of DED symptoms [19]. Beyond individual health profiles, the study highlights a distinct geographic disparity in prevalence, with higher incidence rates concentrated in the Gangetic and Eastern regions of West Bengal, likely driven by regional environmental stressors [19].

The global prevalence of DED is estimated between 10.8% and 57.1% [20], representing a major burden on patient well-being and a critical variable in postoperative success for refractive, cataract, and corneal procedures. Despite the availability of numerous diagnostic tests, the evaluation of DED remains challenging due to low reproducibility and high inter-observer discordance [21–23]. Notably, these objective markers frequently fail to align with subjective symptomatic experiences, complicating the definitive assessment of disease severity and its impact on quality of life.

Extensive research identifies various exogenous stressors, including tobacco smoke, atmospheric pollutants, and exposure to extreme wind, solar radiation, and high ambient temperatures, as significant contributors to ocular surface irritation. These factors are closely associated with tear film instability, a primary etiological component of Dry Eye Disease (DED) [24–29]. Furthermore, the disruption of any individual tear film constituent can precipitate overall instability, a process that may be further exacerbated in patients with a history of systemic pharmacological interventions [24–29].

Refractive errors have been identified as potential risk factors for Dry Eye Disease (DED) in several studies, primarily due to an increased frequency of mechanical ocular irritation through eye rubbing. This behavior, regardless of the introduction of infectious pathogens, can consider perspiration, sebum, and exogenous particulate matter within the conjunctival sac, thereby predisposing the tear film to instability [24]. Furthermore, the type of refractive error appears to influence prevalence; Sahai et al. [30] reported a higher incidence of DED among hypermetropes (22.9%) compared to myopes (16.8%), while emmetropes exhibited the lowest prevalence at 14%.

The primary objective of this study is to evaluate the prevalence of Dry Eye Disease (DED) and identify its associated risk factors among the population of South 24 Parganas. Utilizing the Ocular Surface Disease Index (OSDI) questionnaire, we aim to characterize the epidemiological profile of DED in this specific geographic region.

Materials and Methodologies:

Participants:

A cross-sectional study was conducted between April and May 2024 at a tertiary eye care center serving four villages in the South 24 Parganas district of West Bengal. The sample size was determined using the Krejcie and Morgan formula, resulting in the recruitment of 181 participants. Following a comprehensive ophthalmic examination, all subjectsregardless of symptomatic statuscompleted the Ocular Surface Disease Index (OSDI) questionnaire (Allergan India®, Bengaluru, India). To ensure data integrity, the examiner provided standardized verbal translations in the participants' native language for those with English linguistic barriers. Exclusion criteria included a history of uveitis, blepharitis, conjunctivitis, or any eyelid and ocular surface abnormalities diagnosed within the preceding three months. The study adhered to ethical guidelines, and informed written consent was obtained from all participants prior to clinical evaluation.

Clinical Workup:

Each participant underwent a standardized ophthalmic evaluation, which included a detailed medical history, slit-lamp biomicroscopy, and both objective and subjective refraction. Fundus examination (dilated or undilated) was performed as clinically indicated. Following the clinical assessment, the 12-item Ocular Surface Disease Index (OSDI) questionnaireoriginally developed by the Outcomes Research Group [31]was administered. The OSDI serves as a validated tool to quantify DED severity across three distinct subscales: (1) Ocular symptoms, including photophobia, foreign body sensation, and blurred vision; (2) Vision-related functional limitations, such as difficulties during reading, driving, or digital screen use; and (3) Environmental triggers, encompassing exposure to wind, low humidity, and air-conditioned environments [31].

Each of the twelve OSDI items was evaluated using a 5-point Likert-type scale, where scores were assigned as follows: 0 (never), 1 (occasionally), 2 (half of the time), 3 (most of the time), and 4 (constantly). The aggregate OSDI score was calculated using the standardized formula:

$$OSDI = \frac{(\text{sum of scores for all questions answered}) \times 100}{(\text{total number of questions answered}) \times 4}$$

[32]. This method yields a total score ranging from 0 to 100, with higher values indicating a positive correlation with increased disease severity and functional impairment. Based on the calculated scores, the severity of DED symptoms was categorized into four distinct clinical cohorts: normal (0–12), mild (13–22), moderate (23–32), and severe (33–100) [33–35].

Statistical Analysis:

Data were tabulated using Microsoft Excel (Microsoft Corp., Redmond, WA, USA) and subjected to descriptive statistical analysis. Categorical variables, specifically the distribution of symptom severity among the study cohort, were expressed as frequencies and percentages to provide a comprehensive summary of the participant data.

RESULT:

Population and Percentage of Dry eye prevalence:

A total of 181 participants, comprising both male and female subjects, were enrolled in the study. Based on the OSDI severity classification (Figure 1), 1.2% of the cohort was categorized as normal (asymptomatic), while 7% presented with mild symptoms. Moderate and severe DED symptoms were reported by 14.8% and 77% of the participants, respectively.

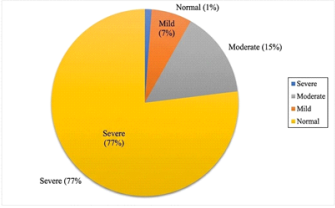

Figure1.Distribution of OSDI Severity in the Study Population .This pie chart illustraes the symptomatic profile of the study population (N=330) based on the Ocular Surface Disease Index(OSDI) scores. Participants were stratified into four distinct severity cohorts:severe (n=254,77%), moderate (n=49, 15%),mild (n=23, 7%), and normal (n=4,1%).The data demonstrate a high prevalence of advanced symptomatic burden (moderate and severe cohorts)within the critically studied demographic.(OSDI,Ocular Surface Disease Index; N, total population size; n,cohort size; p-value<0.05).

DISCUSSION:

Dry Eye Disease (DED) remains one of the most prevalent yet frequently misdiagnosed ocular conditions, affecting millions globally through either aqueous deficiency or evaporative tear film instability. Based on existing literature, DED progression can be categorized into three distinct pathological stages [36]. The primary stage is characterized by subjective symptomatic distress in the absence of observable clinical signs. The secondary stage encompasses these initial symptoms alongside mucus discharge, nasal and temporal bulbar conjunctival hyperemia, and reversible corneal involvement, such as superficial punctate erosions. The tertiary stage involves chronic manifestations, including persistent corneal ulceration and opacification, which may lead to irreversible visual impairment [36]. Consistent with previous epidemiological findings, our study demonstrates that DED prevalence, as measured by OSDI scores, is significantly higher in the geriatric population compared to younger cohorts.

Extant literature indicates that the prevalence of Dry Eye Disease (DED) varies widely, ranging from 10.8% to 57.1% [37]. DED risk factors and the subsequent development of chronic ocular symptoms significantly compromise clinical outcomes in corneal, cataract, and refractive surgeries, ultimately diminishing patient-reported quality of life. While DED severity is traditionally assessed through a battery of objective and subjective diagnostic modalities, these tests often exhibit limited repeatability, substantial inter-observer variability, and a poor correlation with symptomatic experiences [38–40]. In accordance with the Food and Drug Administration (FDA) and Patient-Reported Outcomes (PRO) criteria, standardized questionnaires have emerged as essential evaluative tools. Specifically, the Ocular Surface Disease Index (OSDI) and the Impact of Dry Eye on Everyday Life (IDEEL) questionnaires have been validated for quantifying the functional and psychosocial impacts of the disease [41–45].

In this study, the Ocular Surface Disease Index (OSDI) questionnaire was utilized as the primary screening instrument for Dry Eye Disease (DED). The OSDI is an optimal tool for clinical applications within outpatient departments due to its high degree of feasibility, brevity in administration, and ease of patient comprehension. Furthermore, as a non-invasive and economically viable diagnostic modality, it facilitates efficient patient assessment without incurring additional clinical costs [41,45].

Our study cohort comprised 458 participants (330 males and 128 females) within a broad age range of 15 to 75 years. The analysis reveals a significant prevalence of Dry Eye Disease (DED) across the entire age spectrum; notably, the condition was common not only among younger demographics but also remained highly prevalent within the geriatric population.

This study identifies Dry Eye Disease (DED) as a prevalent ocular condition affecting patients across the entire age spectrum. However, the associated risk factors appear to be demographic-specific, involving a complex interplay of geographic location, climatic variations, and environmental pollutants. Furthermore, systemic pharmacological interventions, occupational lifestyles, and hormonal fluctuations contribute to the multifactorial etiology of the disorder. Clinically, only a negligible fraction of the study population (1.2%) was classified as asymptomatic. In contrast, 7% presented with mild symptoms and 14.8% with moderate symptoms, while a significant majority (77%) were categorized as suffering from severe DED.

Comprehensive clinical evaluation of the study cohort indicates that in younger demographics, both corrected and uncorrected refractive errors are primary drivers of Dry Eye Disease (DED). These refractive anomalies, often coupled with accommodative dysfunction, precipitate significant ocular discomfort, characterized by persistent asthenopia and periorbital pain. Post-pandemic clinical investigations have identified a robust correlation between the escalation of dry eye symptoms and the prolonged use of Video Display Terminals (VDTs), alongside increased sedentary indoor behaviors and psychological stress. Beyond these lifestyle factors, Dry Eye Disease (DED) is frequently associated with specific congenital and systemic etiologies. These include Riley-Day Syndrome and ectodermal dysplasia, as well as iatrogenic factors such as pseudophakia. Furthermore, underlying

endocrine dysregulation and systemic inflammatory disorders remain significant contributors to the multifactorial pathogenesis of the condition. Consistent with existing literature, our findings confirm a high prevalence of Dry Eye Disease (DED) within the geriatric population. Specifically, females over the age of 50 exhibit a higher susceptibility to the condition. This clinical observation is largely attributed to the postmenopausal decline in estrogen levels, which precipitates a reduction in the aqueous component of the tear film, thereby predisposing this demographic to aqueous-deficient DED.

Our findings indicate that geriatric males in both rural and urban settings are highly susceptible to Dry Eye Disease (DED). This vulnerability is primarily attributed to chronic exposure to exogenous stressors, including tobacco smoke, atmospheric pollutants, and adverse climatic factors such as high ambient temperatures, solar radiation, and wind. Additionally, long-term pharmacological interventions in this age group may further exacerbate tear film instability [46]. By employing the OSDI as a standardized symptomatic assessment tool, this study underscores the significantly higher prevalence of DED among older adults compared to younger cohorts. However, it is important to note a limitation in our data: the relatively small sample size of younger participants may restrict the generalise ability and validation of our findings within that specific demographic.

CONCLUSION:

The data derived from this study highlight a significant symptomatic burden within the target population of South 24 Parganas. Notably, a vast majority of the cohort (77%) was categorized as having severe Dry Eye Disease (DED) according to OSDI criteria, while only a marginal fraction (1.2%) was found to be asymptomatic. This skewed distribution suggests that by the time residents of this region seek or undergo ophthalmic evaluation, the disease has often progressed to an advanced stage. The intermediate prevalence of mild (7%) and moderate (14.8%) symptoms further indicates a high threshold for symptom reporting or a lack of early-stage diagnostic awareness in the community.

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