DOI: 10.7860/JCDR/2026/88916.24338

Original Article

Psychiatry/Mental Health Section

Dry Eye Disease in Psychiatric Disorders: A Cross-sectional Study on Prevalence and its Impact on Sleep Quality and Quality of Life

POOJA GOVIND[1], VIGNESHVAR CHANDRASEKARAN[2], SIVAPRAKASH BALASUNDARAM[3], AVUDAIAPPAN SANKARAN[4], AR RAJALAKSHMI[5], SUKANTO SARKAR[6], KIRTI NATH JHA[7]

ABSTRACT

Introduction: A bidirectional relationship exists between Dry Eye Disease (DED) and mental health. Approximately, 23% of patients with mild DED have psychiatric co-morbidities, with higher risks in moderate and severe cases. DED also impacts sleep patterns and productivity, affecting Quality of Life (QoL).

Aim: To estimate the prevalence of DED among patients with mental disorders and its impact on sleep quality and QoL.

Materials and Methods: The present cross-sectional study was conducted at the Department of Psychiatry and the Department of Ophthalmology in a tertiary care centre, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry, India from February 2021 to February 2022, involved four groups namely Group A1 {Patients with mental disorders and DED from Psychiatry Outpatient Department (OPD)} (n=61), Group A2 (DED patients with Mental disorders from ophthalmology OPD) (n=68), Group B (Patients with Mental disorders alone) (n=44) and Group C (patients with DED alone) (n=48). Assessments included the Clinical Global Impression Severity scale (CGI-S), Sleep Condition Index (SCI), QoL Enjoyment and Satisfaction Questionnaire-Short Form (Q-LES-Q-SF), and clinical ocular tests like Tear Film Break-up Time (TBUT) and Schirmer's test. Independent t-test was used to compare continuous variables with normal distribution whereas Mann-Whitney U test was used to compare continuous variables with non-normal distribution. Chi-square test was used to compare categorical variables. Spearman correlation was carried out to assess correlation between variables and predictive analysis was carried out using multiple logistic regression.

Results: The prevalence of DED among patients with psychiatric disorder was found to be 58.09%. Participants with comorbid psychiatric and DED (A1) had significantly lower QoL (Q-LES-Q-SF) and poorer sleep (SCI) compared to those with only psychiatric disorders (B), with most reporting poor or fair QoL ($p<0.001$). Though participants in A2 had more instances of eye disorders in family ($p=0.002$) compared to DED only participants (C), the TBUT and Schirmer's test severity did not vary significantly between any of the groups.

Conclusion: DED is increasingly prevalent among patients with severe mental disorders, significantly affecting sleep quality and QoL. A multidisciplinary management approach involving timely screening and referral by ophthalmologists and psychiatrists could improve outcomes.

Keywords: Co-morbidity, Mental disorders, Sleep patterns

INTRODUCTION

Mental disorders are the leading cause of disability, where individuals with mental disorders spend around one year out of six years with disability [1]. Disease burden for mental illness globally accounts for 32.4% of Years Lived with Disability (YLDs) and 13% of Disability-Adjusted Life-Years (DALYs) [2]. DED is a frequently encountered ocular morbidity and a growing public health problem [3]. The prevalence of DED varies from 7% to 54% across countries [4]. Indian studies are limited, and record a prevalence varying between 29.3% to 32% and further reported that DED is more common among elderly population and women [5-7].

Studies suggest that eye disorders with chronic pain or discomfort, such as dry eye are frequently associated with mental disorders [8,9]. In a systematic review evaluating depression and anxiety among patients with DED, it was observed that depression and anxiety were present in 39% and 40% of the participants [10]. An increase in the prevalence of DED, especially asymptomatic DED, has been found in patients with schizophrenia [11].

The literature has posited many an explanation for the association between DED and mental disorders, such as the effect of subjective symptoms of dry eye being affected not only by changes in the tear film and ocular surface but also by psychological factors such as anxiety, depression, Post-Traumatic Stress Disorder (PTSD) and the use of psychotropic medications [12-14]. Some studies quote that the presence of chronic stress may lead to dry sensation or irritation of the ocular surface [3,15]. Among patients with schizophrenia, the inflammatory cytokines in the tears were significantly increased compared to controls, and the levels of which correlate with the clinical parameters of DED such as increased dryness of ocular surface [11].

An Indian study on patients with Alcohol Use Disorder (AUD) revealed that AUD was increasingly associated with DED among younger men [16]. A family history of DED was found to be a risk factor for DED among patients with a mental disorder [17]. Presence of depression, PTSD, the use of psychiatric medications imparted a two-fold risk of developing DED [14].

QoL and visual functions are one of the important outcomes in the evaluation of therapeutic decisions as well as in the assessment of the economic and public health impact of any ocular condition [18]. The presence of both dry eye and psychiatric symptoms can have an additive effect leading to poorer QoL among such individuals [19].

Sleep disturbances are extremely common among individuals with mental disorders and sleep problems such as insomnia, nightmares or impaired sleep quality can lead to a negative impact on mental health and functioning [20]. Eye pain due to DED can cause sleep

disturbances frequently leading to sleep disorders [21]. Managing both the mental disorder and dry eye would result in better sleep quality as suggested by a study reporting that stress, depression, and sleep disorders are risk factors for DED [22].

The relationship between DED and mental disorders is complex, possibly bi-directional as per existing literature. However, the scientific literature is limited in the Indian context, especially in southern part of India. Hence, the current study was undertaken to evaluate the relationship between DED and mental disorders which will provide valuable region-specific insights into how co-existing DED and mental disorders adversely impact clinical outcomes, QoL, and sleep quality, ultimately informing better patient care for those suffering from both conditions.

MATERIALS AND METHODS

The present cross-sectional study was conducted at the Department of Psychiatry and the Department of Ophthalmology in a tertiary care centre Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry, India, from February 2021 to February 2022. The study was approved by the Institutional Ethics committee (MGMCRI/Res/01/2020/70/IHEC/296).

Inclusion criteria: Patients of all gender including both new and review cases, age 18 years and above, attending psychiatry OPD on a specified day of the week diagnosed with mental disorder by a consultant psychiatrist were included in the study. Further, Patients of all gender including both new and review cases, age 18 years and above, attending Ophthalmology OPD were also included.

Exclusion criteria: Those patients who are unable to give consent for the study, who are not able to comprehend and respond to questions asked and those patients with agitated behaviour; who are uncooperative for the ophthalmological tests and detailed psychiatric evaluation were excluded from the study. Further, patients with major neurocognitive disorder and intellectual disability were also excluded. Those ophthalmological patients with contact lens use, history of Lasik surgery and those on long-term topical eye drops, antiglaucoma medication for more than six months, on treatment for allergy, and those with recent eye surgery were excluded from the study.

Sample size calculation: the required sample size was calculated using the formula:

For Psychiatry population [23]:

1. Alpha (a): 0.05
2. Estimated proportion (p): 0.0484
3. Estimation error (d): 0.05

Minimum sample size needed: 71

For Ophthalmology population [9]:

1. Alpha (a): 0.05
2. Estimated proportion (p): 0.23
3. Estimation error (d): 0.08

Minimum sample size needed: 107

Considering an attrition rate of 10%. Total minimum sample size needed is 195. Since the study was time bound, all the eligible participants during the study period were included.

Study Procedure

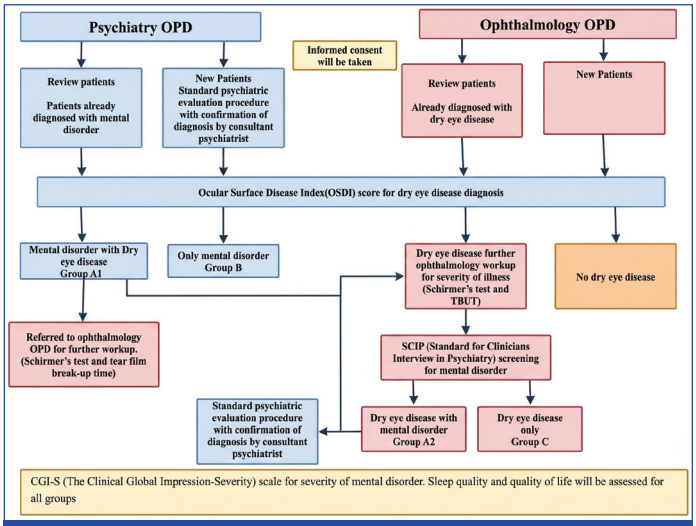
The study comprised of four groups namely:

- Group A1 (Patients with mental disorders and DED from Psychiatry OPD);
- Group A2 (DED patients with Mental disorders from ophthalmology OPD);
- Group B (Patients with Mental disorders alone);
- Group C (patients with DED alone).

Subjects were screened for eligibility to participate, based on the inclusion and exclusion criteria and recruited after informed consent was obtained from the patients/legally accepted representative. In psychiatry OPD, the patients were recruited after standard psychiatric evaluation with confirmation of diagnosis by a consultant psychiatrist. The patients were assessed using Ocular Surface Disease Index (OSDI) for the diagnosis of DED. Among patients with psychiatric disorders, those who meet the criteria for DED were categorized as Group A1 (Patients with mental disorders and DED from Psychiatry OPD) and patients who don't have DED were categorized as Group B (Patients with Mental disorders alone). Group A1 patients were subjected to Schirmer's test and Tear film break up time for assessment of DED severity.

In Ophthalmology OPD, the patients were administered OSDI for the diagnosis of DED. Patients diagnosed with DED were evaluated with Schirmer's test and tear film break up time for severity of DED. Following which, screening for mental disorders was carried out using the Standard for Clinicians Interview in Psychiatry (SCIP). The patients who screened positive for mental disorders were referred for standard psychiatric evaluation procedure with confirmation of diagnosis by consultant psychiatrist and be categorised into Group A2 (DED patients with Mental disorders from ophthalmology OPD). The patients who don't have mental disorder during screening were categorized as Group C (Patients with DED alone).

The Clinical Global Impression-Severity (CGI-S) for severity of mental disorders was administered in group A1, A2, and B i.e., those groups with mental disorders. Sleep quality was assessed using SCI and QoL with QoL Enjoyment and Satisfaction questionnaire in all the four groups [Table/Fig 1].



[Table/Fig-1]: Diagrammatic representation of the methodology.

Study Tools

The Standard For Clinicians' Interview in Psychiatry screening [24]: The Standard For Clinicians' Interview in Psychiatry is a method of assessment of psychopathology administered by psychiatrist or clinician who has knowledge about mental health and the diagnostic criteria for mental disorder. It provides diagnosis according to Diagnostic and Statistical Manual of Mental Disorders (DSM) and International Classification of Diseases (ICD) criteria. The dimensional score is provided for the following types of psychopathology anxiety post-traumatic, stress, obsession and compulsion, depression, mania, suicidal behavior, self-injurious behavior delusion, hallucinations, agitation, disorganised behaviour, negative symptoms catatonia, alcohol addiction, drug addiction, attention and hyperactivity. It has 29 screening questionnaires, 26 items have a binary item (present or absent) and rest three have higher number of possible responses.

Ocular Surface Disease Index (OSDI) [25,26]: OSDI is a frequently used survey instrument for the assessment of ocular surface disease

severity. It is a 12-item scale for the assessment of symptoms related to dry eye disease. Four points were given for each question and the severity of DED was considered as follows:

- Scores 0-12 - Normal;
- Scores 13-22 - Mild;
- Scores 23-32 - Moderate;
- Severe 33-100 - Severe.

For the purpose of diagnosing DED for inclusion, a cut-off of 24 was considered in the present study.

Tear-film Break-Up Time Test (TBUT) [27]: A Fluorescein strip was used to stain the eye. The patient was asked to blink three or four times to distribute the dye in conjunctival sac and was then asked to look straight ahead and not to blink. The eye was scanned using slit lamp under cobalt blue light; the first area of tear film rupture, manifested by the appearance of a black island within the green film of fluorescein, was noted. Generally, >10 seconds is considered to be normal, 5 to 10 seconds marginal, and <5 seconds is considered low. A short tear break-up time is a sign of a poor tear film and the longer it takes the more stable the tear film.

Schirmer's test [28]: A specialised Schirmer's strip was prepared from Whatman™ filter paper (GE Healthcare Life Science, Chicago, IL, US) measuring 40×5 mm, graded 0-35 mm. A 5 mm strip was folded and placed in the lower fornix at the junction of medial 2/3 and lateral 1/3, and time noted. Extent of wetting of the strip was noted after five minutes. Wetting of less than 15 mm was regarded as ineffective tear production. Grading of tear production was as follows: normal>15 mm, mild=11-15 mm, moderate=6-10 mm, severe ≤5 mm.

Clinical Global Impression-Severity (CGI-S) [29]: CGI-S is a 7-point scale that healthcare professionals or researchers use to rate the patient's severity of illness at the time of assessment, relative to the clinician's past experience with patients who have the same diagnosis. Scores vary from 1=normal, not at all ill; 2=borderline mentally ill; 3=mildly ill; 4=moderately ill; 5=markedly ill; 6=severely ill; 7=among the most extremely ill patients. The scores reflect the average severity levels in the past seven days at the time of assessment.

Quality of Life Enjoyment and Satisfaction Questionnaire-Short Form (Q-LES-Q-SF) [30]: A 16-item questionnaire which is a self-report measure designed to enable investigators to easily obtain sensitive measures of the degree of enjoyment and satisfaction experienced by subjects in various areas of daily functioning. it is based on a Likert scale the response from very poor to very good. Higher the score better is the QoL. There is no cut off range which classifies the score into poor, average and good.

Sleep Condition Indicator (SCI) [31]: The SCI is valid, reliable and sensitive to change in insomnia severity. The eight-item SCI (concerns about getting to sleep, remaining asleep, sleep quality, daytime personal functioning, daytime performance, duration of sleep problem, nights per week having a sleep problem and extent troubled by poor sleep). Each item was scored on a 5-point scale (0-4) with the possible total score ranges from 0 to 32, with higher values indicative of better sleep.

STATISTICAL ANALYSIS

Data were collected using a semi-structured data collection sheet and the above tools were translated in the local language for administration to the patients. Data were analysed with categorical variables presented as numbers and percentages, and continuous variables with normal distribution presented as mean±SD; normality was assessed using the Kolmogorov-Smirnov test. Group Comparisons were performed using independent t-test, Mann-Whitney U, ANOVA, Kruskal-Wallis, or Chi-square tests as appropriate, correlations were assessed using Pearson or Spearman tests, and multivariate logistic regression was used to identify predictors. Data were entered in Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) version 16.0 (IBM, Chicago, USA).

RESULTS

The study included 221 participants, with ages ranging from 18 to 63 years (mean±SD: 39.03±11.17). The majority were female 119 (53.8%) and 119 were unmarried (53.8%). Majority had completed secondary education 92 (41.6%) however nearly 57(25.8%) were unemployed. The sample population belonged to rural areas 210 (95%) and belonged to Class III 78 (35.3%) of socioeconomic status.

Among 105 patients screened in the psychiatry OPD, 61 subjects had DED, yielding a prevalence of 58.09%. The participants were distributed across four study groups: A1 (Psychiatry OPD patients with associated DED) comprised of 61 (27.6%), A2 (ophthalmology OPD patients with associated mental disorder) 68 (30.8%), B (only psychiatric illness) 44 (19.9%), and C (only DED) 48 (21.7%). Q-LES-Q-SF scores ranged from 25 to 45, with a mean of 35.11±5.03, while SCI scores ranged from 5 to 26, with a mean of 16.30±5.11 [Table/Fig-2].

Variables	Group A1 (n=61)	Group A2 (n=68)	Group B (n=44)	Group C (n=48)
Age (Mean±SD)	35.97±11.252	43.93±9.435	32.91±9.170	44.19±10.524
Gender				
Male	23 (37.7%)	28 (41.2%)	19 (43.2%)	21 (43.8%)
Female	30 (49.2%)	40 (58.8%)	22 (50%)	27 (56.3%)
Transgender	8 (13.1%)	-	3 (6.8%)	-
Marital status				
Married	36 (59%)	22 (32.4%)	27 (61.4%)	16 (33.3%)
Unmarried	24 (39.3%)	46 (67.6%)	17 (38.6%)	32 (66.7%)
Separated	1 (1.6%)	-	-	-
Education status				
Primary school	8 (13.1%)	4 (5.9%)	1 (2.3%)	1 (2.1%)
Middle school	4 (6.6%)	17 (25.0%)	8 (18.2%)	18 (37.5%)
Secondary school	29 (47.5%)	28 (41.2%)	20 (45.5%)	15 (31.3%)
Intermediate/diploma	14 (23.0%)	14 (20.6%)	3 (6.8%)	11 (22.9%)
Graduate	3 (4.9%)	5 (7.4%)	6 (13.6%)	3 (6.3%)
Professional	3 (4.9%)	-	6 (13.6%)	-
Occupation				
Unemployed	24 (39.3%)	7 (10.3%)	21 (47.7%)	5 (10.4%)
Unskilled worker	16 (26.2%)	18 (26.5%)	7 (15.9%)	12 (25.0%)
Semiskilled worker	8 (13.1%)	15 (22.1%)	5 (11.4%)	12 (25.0%)
Skilled worker	8 (13.1%)	14 (20.6%)	8 (18.2%)	3 (6.3%)
Clerical/shop/farm	1 (1.6%)	3 (4.4%)	1 (2.3%)	3 (6.3%)
Semi professional	2 (3.3%)	-	-	-
Professional	1 (1.6%)	-	1 (2.3%)	-
Homemaker	1 (1.6%)	11 (16.1%)	1 (2.3%)	13 (27.1%)
Area of Domicile				
Rural	57 (93.4%)	65 (95.6%)	41 (93.2%)	47 (97.9%)
Urban	4 (6.6%)	3 (4.4%)	3 (6.8%)	1 (2.1%)
Socioeconomic status				
Class I	7 (11.5%)	15 (22.1%)	7 (15.9%)	9 (18.8%)
Class II	9 (14.8%)	17 (25.0%)	15 (34.1%)	8 (16.7%)
Class III	29 (47.5%)	18 (26.5%)	13 (29.5%)	18 (37.5%)
Class IV	15 (24.6%)	18 (26.5%)	8 (18.2%)	13 (27.1%)
Class V	1 (1.6%)	-	1 (2.3%)	-
CGI severity score				
Normal, not at all ill	1 (1.6%)	-	-	-

Borderline mentally ill	15 (24.6%)	-	6 (13.6%)	-
Mildly ill	31 (50.8%)	-	30 (68.2%)	-
Moderately ill	6 (9.8%)	-	7 (15.9%)	-
Markedly ill	8 (13.1%)	-	1 (2.3%)	-
Q-LES-Q-SF-total score	31.74	38.85	35.76	35.28
SCI-total score (mean±SD)	13.41±3.725	14.69±3.275	21.57±3.494	17.42±6.021
TBUT severity				
Normal	5 (8.2%)	-	42 (95.45%)	-
Marginal	29 (47.5%)	47 (69.1%)	2 (4.55%)	35 (72.9%)
Low	27 (44.2%)	21 (30.9%)	-	13 (27.1%)
Schirmer's test				
Mild	38 (62.3%)	13 (19.1%)	1 (2.3%)	13 (27.1%)
Moderate	16 (26.3%)	53 (77.7%)	1 (2.3%)	33 (68.8%)
Severe	2 (3.3%)	2 (2.9%)	-	2 (4.2%)
Normal	5 (8.2%)	-	42 (95.5%)	-

[Table/Fig-2]: Sociodemographic characteristics across groups (N=221). The values are presented as n (%)

Among participants in Group A1 (Psychiatry OPD patients with associated DED), schizophrenia was the most common psychiatric diagnosis with 13 (21.3%), followed by bipolar disorder with 9 (14.8%) and depression with 9 (14.8%). Whereas in Group A2 (Ophthalmology OPD patients with mental disorder), depression predominated with 18 (26.5%), with one of bipolar disorder 1 (1.5%).

Antipsychotic use was noted in 13 (21.3%) of A1 participants, while antidepressants were used by 20 (32.8%); usage in A2 was lower. Family history of psychiatric illness was reported in 25 (41%) of A1 and 25 (36.7%) of A2. Regarding ophthalmological conditions, cataract was common in A2, 32 (47.1%) and C, 22 (45.8%), and family history of ophthalmological disease was significantly higher in A2, 32 (47.1%) compared to C, 9 (18.8%, p=0.002) [Table/Fig-3].

Characteristics	n (%)
Primary psychiatric diagnosis- Group A1	
Schizophrenia	13 (21.3%)
Bipolar	9 (14.8%)
Depression	9 (14.8%)
Substance-related and addictive disorders	4 (6.6%)
Anxiety and other stress related disorder	26 (42.6%)
Primary psychiatric diagnosis-Group A2	
Schizophrenia	0 (0%)
Bipolar	1 (1.5%)
Depression	18 (26.5%)
Substance-related and addictive disorders	16 (23.5%)
Anxiety and other stress related disorder	33 (48.35%)
Primary psychiatric diagnosis-Group B	
Schizophrenia	17 (38.6%)
Bipolar	7 (15.9%)
Depression	3 (6.8%)
Substance-related and addictive disorders	5 (11.4%)
Anxiety and other stress related disorder	12 (27.3%)
Antipsychotic use	
Group A1	13 (21.3%)
Group A2	0 (0%)
Group B	21 (47.7%)
Antidepressant use	
Group A1	20 (32.8%)
Group A2	8 (11.7%)
Group B	8 (18.2%)
Family history of psychiatric diagnosis	
Group A1	25 (41.0%)
Group A2	25 (36.7%)
Group B	11 (25.0%)
Ophthalmological diagnosis	
Group A2 Cataract	32 (47.1%)
Group C Cataract	22 (45.8%)
Family history ophthalmology	
Group A2	32 (47.1%)
Group C	9 (18.8%)

[Table/Fig-3]: Psychiatric and ophthalmological characteristics of the sample.

Comparison Analysis between the Groups

On comparison, there was no significant difference with respect to sociodemographic variables, however antipsychotic use was higher in Group B, 21 (47.7%) vs 13 (21.3%) (p=0.004) compared to A1. Further, Group A1 had lower Q-LES-Q-SF rank sums (31.74 vs 82.48, p<0.001) and lower SCI scores (13.41±3.73 vs 21.57±3.49, p<0.001) compared to Group B. The prevalence of Diabetes was higher in Group B, 5 (11.4%) vs 3 (4.9%) (p=0.025) [Table/Fig-4].

The sociodemographic variables were comparable between the groups. Family history of ophthalmologic disease was higher 32 (47.1%) vs 9 (18.8%) (p=0.002), however DED duration did not differ significantly between the groups (p=0.150) in Group A2 compared to Group C. The Q-LES-Q-SF and SCI scores were significantly lower in Group A2 (38.85 vs 86.34, p<0.001; 14.69±3.28 vs 17.42±6.02, p=0.003). TBUT scores and Schirmer's severity were similar between groups [Table/Fig-4].

The participants in A2 were older (43.93 vs 35.97 years, p=0.0001) with fewer married individuals, 22 (32.4%) vs 36 (59%) (p=0.019) and lower unemployment, 7 (10.3%) vs 24 (39.3%) (p=0.006). TBUT and Schirmer's tests indicated milder DED in A2 compared to A1 (TBUT mild: 69.1% vs 47.5%, p=0.004; Schirmer's mild: 19.1% vs 62.3%, p<0.001) [Table/Fig-4].

Quality of Life (QoL) and Sleep Quality-Comparison Analysis

Group A1 (Mental disorder+DED) had a significantly lower Q-LES-Q-SF mean rank (31.74) compared to Group B (only mental disorder) (82.48) (Z=-8.444, p<0.001), indicating poorer QoL. Item-wise analysis (item16) showed that most Group A1 participants rated their QoL as poor or fair, whereas Group B participants mostly reported good or very good (χ^2=89.617, p<0.001). Similarly, SCI total scores indicated poorer sleep in Group A1 (13.41±3.73) versus Group B (21.57±3.49; t=-11.362, p<0.001).

Group A2 (DED + Mental disorder) also had lower Q-LES-Q-SF mean rank (38.85) compared to Group C (only DED) (86.34) (Z=-7.541, p<0.001), though item 16 category differences were not statistically significant. SCI scores were lower in Group A2 (14.69±3.28) than Group C (17.42±6.02; t=-3.141, p=0.003).

Comparing groups A1 and A2, the Q-LES-Q-SF mean rank was found to be significantly lower in Group A1 (53.82) compared to Group A2 (75.03) (Z=-3.230; p<0.001). Further, SCI total scores were also found to be significantly lower in Group A1 (13.41±3.725) compared to Group A2 (14.69±3.275) (t=-2.079; p=0.040) [Table/Fig-4].

Association and Correlation Analysis

The severity of DED was associated with educational status (χ^2=27.482; p=0.0225), psychotropic use (χ^2=30.802; p=0.000) and family history of psychiatric illness (χ^2=8.791; p=0.032). Age showed a significant negative correlation with SCI (r=-0.288, p=0.043), indicating poorer sleep with increasing age, while its

Comparison		A1 (n=61)	B (n=44)	Test (statistic)	p-value
Age (Mean±SD)		35.97±11.252	32.91±9.170	t=1.418 (df=103)	0.141
Gender-Male		23 (37.7%)	19 (43.2%)	χ^2=1.163	0.559
Marital-Married		36 (59%)	27 (61.4%)	χ^2=0.748	0.688
Education-distribution (selected)		Secondary 29 (47.5%)	Secondary 20 (45.5%)	χ^2=15.251	0.180
Antipsychotic use		13 (21.3%)	21 (47.7%)	χ^2=8.146	0.004
Family history psychiatric-Yes		25 (41.0%)	11 (25.0%)	χ^2=2.898	0.089
Q-LES-Q-SF total (mean rank)		31.74	82.48	Z=-8.444	<0.001
Q-LES-Q-SF item16	Very poor	5 (8.2%)	0 (0%)	χ^2=89.617	<0.001
	Poor	30 (49.2%)	0 (0%)		
	Fair	24 (39.3%)	2 (4.5%)		
	Good	1 (1.6%)	14 (31.8%)		
	Very good	1 (1.6%)	28 (63.6%)		
SCI total (Mean±SD)		13.41±3.725	21.57±3.494	t=-11.362	<0.001
Diabetes mellitus (GMD1)		3 (4.9%)	5 (11.4%)	χ^2=14.496	0.025
Comparison		**A2 (n=68)**	**C (n=48)**	**Test (statistic)**	**p-value**
Age (Mean±SD)		43.93±9.435	44.19±10.524	t=(not specified)	0.462
Gender-Male		28 (41.2%)	21 (43.8%)	χ^2=0.076	0.782
Family history ophthalmologic-Yes		32 (47.1%)	9 (18.8%)	χ^2=9.867	0.002
DED duration (months) (Mean±SD)		33.13±31.34	23.67±19.48	U=1377.0	0.150
TBUT severity-Mild		47 (69.1%)	35 (72.9%)	χ^2=0.817	0.665
Schirmer's severity-Moderate		53 (77.7%)	33 (68.8%)	χ^2=1.240	0.538
Q-LES-Q-SF total (mean rank)		38.85	86.34	Z=-7.541	<0.001
Q-LES-Q-SF item16	Very poor	3 (4.4%)	2 (4.2%)	χ^2=8.179	0.085
	Poor	30 (44.1%)	16 (33.3%)		
	Fair	34 (50.0%)	23 (47.9%)		
	Good	0 (0%)	3 (6.3%)		
	Very good	1 (1.5%)	4 (8.3%)		
SCI total (Mean±SD)		14.69±3.275	17.42±6.021	t=-3.141	0.003
Comparison		**A1 (n=61)**	**A2 (n=68)**	**Test (statistic)**	**p-value**
Age (Mean±SD)		35.97±11.252	43.93±9.435	t= 4.3682	0.0001
Marital-married		36 (59%)	22 (32.4%)	χ^2=9.8449	0.019
Occupation-unemployed		24 (39.3%)	7 (10.3%)	χ^2=14.380	0.006
TBUT severity-mild		29 (47.5%)	47 (69.1%)	χ^2=13.286	0.004
Schirmer's severity-mild		38 (62.3%)	13 (19.1%)	χ^2=36.824	<0.001
Q-LES-Q-SF total (mean rank)		53.82	75.03	Z=-3.230	<0.001
Q-LES-Q-SF item16	Very poor	5 (8.2%)	3 (4.4%)	χ^2=2.853	0.583
	Poor	30 (49.2%)	30 (44.1%)		
	Fair	24 (39.3%)	34 (50.0%)		
	Good	1 (1.6%)	0		
	Very good	1 (1.6%)	1 (1.5%)		
SCI total (Mean±SD)		13.41±3.725	14.69±3.275	t=-2.079	0.040

[Table/Fig-4]: Comparison analysis between groups (A1 vs B; A2 vs C; A1 vs A2).
t-independent t-test was used to compare continuous variables with normal distribution; U-Mann Whitney U test was used to compare continuous variables with non-normal distribution; χ^2-Chi-square test was used to compare categorical variables; p-value <0.05 was considered significant; The values are presented in n (%)

correlation with Q-LES-Q-SF was not statistically significant (r=-0.246, p=0.085) [Table/Fig-5].

Variables	Test statistic	p-value
Educational status and Severity of DED (Schirmer's test)	χ^2=27.482	0.0225
Psychotropic use and Severity of DED (Schirmer's test)	χ^2=30.802	0.000
Psychotropic use and Severity of DED (TBUT test)	χ^2=12.976	0.043
Family history of psychiatric illness and Severity of DED (Schirmer's test)	χ^2=8.791	0.032
Age and SCI correlation	r=-0.288	0.043
Age and Q-LES-Q-SF	r=-0.246	0.085

[Table/Fig-5]: Correlation analysis in Group A1 (Patients with mental disorders and DED from Psychiatry OPD).
*χ^2-Chi-square test; r-spearman correlation; p<0.05 was considered significant

Predictive Analysis using Regression

A significant association with the severity of DED (Schirmer's test) with educational status and family history of psychiatric illness and psychotropic use was noted. A negative correlation was observed between age and sleep quality score. However, on performing multiple logistic regression, none of the variables was found to be independent risk factors for each other.

DISCUSSION

The cross-sectional study was conducted to estimate the prevalence of DED among patients with mental disorders and examined its association with sociodemographic variables, clinical factors such as psychiatric diagnosis, severity of the illness and medication use along with assessing the QoL and sleep quality. A total of 221

patients were recruited from the psychiatry and ophthalmology out patient departments at tertiary care hospital in southern India.

Prevalence of DED in Mental Disorder Patients

Among 105 patients screened in the psychiatry OPD, 61 subjects had DED, yielding a prevalence of 58.09%. This is higher than the reported range of 21-52% in existing literature [10-12]. The elevated prevalence in the current study can be attributed to the inclusion of participants with all mental disorder categories, unlike previous studies that predominantly focused on depression and anxiety [12-14]. General population studies report DED prevalence ranging from 5% to 34% with substantial inter-study variations [5,32,33].

Among the 61 participants from psychiatry OPD, 21.3% had schizophrenia, 29.6% had mood disorders, 42.6% had anxiety disorders, and 6.6% had substance use disorders. The DED prevalence among patients with AUDs and schizophrenia was lower than existing literature, which reported rates of 44.2% and 97.5%, respectively [11]. This discrepancy may be explained by inclusion of various psychiatric diagnoses within a limited sample population.

Age and Demographic Factors

The mean age of patients with mental disorders having comorbid DED was 35.97±11.252 years, considerably lower than previous literature reporting 62.2±14.9 years [23]. Similarly, DED patients with mental disorders had a mean age of 43.93±9.435 years, contrasting with previous findings of 63.7±8.6 years [34]. This lower age range of the study sample could explain the absence of association between increasing age and prevalence of DED noted in existing literature [32]. No significant differences were found in socio-demographic factors (age, gender, domicile, socio-economic status, occupational status) when comparing patients with comorbid mental disorders and DED versus those with mental disorders alone. This aligns with existing literature showing that age and gender do not significantly affect DED prevalence in patients with depression, anxiety, or schizophrenia [11].

Research in DED report that severity of DED increased with increased antidepressant use, which has been reiterated in the current study [32,35,36]. Literature supports that depressive disorders are most commonly present among DED patients, and depression treatment may influence DED management approaches [8]. Studies demonstrate positive associations between dry eye symptoms and antidepressant use, particularly Selective Serotonin Reuptake Inhibitor (SSRIs), which affect ocular surface and tear film stability [26]. However, no significant difference in psychiatric illness duration was found between groups A1 and B, contrasting with existing literature [32]. This may be attributed to the participants having relatively shorter illness duration.

Research indicates that single-nucleotide polymorphisms in genes encoding brain-derived neurotrophic factor and vitamin D receptors may be related to DED, with depression status potentially influencing these associations [36,37]. Both psychiatric illnesses and DED have proposed genetic underpinnings, possibly explaining the increased occurrence of psychiatric illness in families of subjects with both conditions. Family history of ophthalmological conditions was more common among DED patients with comorbid mental disorders, supporting literature suggesting that family history of DED can precipitate the condition in subsequent generations [38].

The severity of DED has been associated with reduced QoL and patient related outcomes among patients with DED [39]. Most of the DED assessment questionnaires are limited in assessing patient related outcomes and QoL hence utilisation of a specific tool such as Q-LES-Q-SF was warranted [40]. Q-LES-Q-SF revealed significantly lower total scores among patients with both mental disorders and DED compared to those with mental disorders alone which is understandable due to the synergistic role of mental disorders and DED. These findings have been reiterated in the scientific literature evaluating QOL in individuals with DED and comorbid mental disorders [41,42].

The individuals with DED have been found to have poorer subjective sleep quality, longer sleep latency, and higher risk of insufficient sleep or excessive sleepiness [43]. Further, poor sleep quality, depression and stress are considered risk factors for DED, thus indicating a bidirectional association [44]. In the current study, SCI showed poorer sleep quality in patients with both DED and Mental disorders compared to those with either DED or Mental disorders. This reiterates contemporary research findings of common sleep disorders in patients with both DED and mental disorders [21].

Positive associations were found between DED severity (Schirmer's test) and education level, with most mild and moderate DED subjects educated up to secondary school. Among Group A1 (Mental disorders+DED), positive associations existed between DED severity and depressive disorders, antidepressant use, and family history of psychiatric illness. The findings are in line with existing literature mentioning association between DED and depressive symptoms and antidepressant use [32,36]. TBUT-based severity showed positive association with psychotropic medication use, with nearly 60% of moderate DED patients on psychotropic medications [36]. Subjective dry eye symptom severity is largely influenced by psychological factors coupled with ocular surface and tear film anomalies [45].

A negative correlation was observed between age and sleep quality, with poorer sleep quality associated with increasing age. The decline in sleep quality with increasing age could indicate a longer duration of psychiatric illness and DED leading to alterations in sleep cycle and due to psychotropic use [13].

Limitation(s)

The study participants included were less than the calculated sample size. Further, the sample size was relatively smaller and hence the findings could not be generalised to the population. The study was cross-sectional in nature, and hence is methodologically limited in assessing the course of DED and psychiatric illness and their inter-relationship longitudinally.

CONCLUSION(S)

The prevalence of DED among individuals with mental disorders was 58.09%. DED among patients with mental disorder was associated with educational status, use of psychotropic medications and a family history of psychiatric illness. For optimal management, DED treatment should be combined with treatment of underlying mental disorder. The study findings require replication in larger samples to establish more definitive conclusions about the bidirectional relationship between mental disorders and DED.

REFERENCES

[1] WHO highlights urgent need to transform mental health and mental health care [WHO] [Internet]. 2022 [cited 2022 Sep 4]. Available from: https://www.who.int/news/item/17-06-2022-who-highlights-urgent-need-to-transform-mental-health-and-mental-health-care.
[2] Vigo D, Thornicroft G, Atun R. Estimating the true global burden of mental illness. Lancet Psychiatry. 2016;3(2):171-78. Doi: 10.1016/S2215-0366(15)00505-2.
[3] Uchino M, Schaumberg DA. Dry eye disease: Impact on quality of life and vision. Curr Ophthalmol Rep. 2013;1(2):51-57. Doi: 10.1007/s40135-013-0009-1.
[4] Shah S, Jani H. Prevalence and associated factors of dry eye: Our experience in patients above 40 years of age at a Tertiary Care Center. Oman J Ophthalmol. 2015;8(3):151-56. Doi: 10.4103/0974-620X.169910.
[5] Gupta N, Prasad I, Jain R, D'Souza P. Estimating the prevalence of dry eye among Indian patients attending a tertiary ophthalmology clinic. Int J Med Sci. 2010;104(3):247-55. Doi: 10.1179/136485910X12647085215859.
[6] Chatterjee S, Agrawal D, Sharma A. Dry eye disease in India. Indian J Ophthalmol. 2020;68(7):1499-500. Doi: 10.4103/ijo.IJO_2299_19.
[7] Donthineni PR, Kammari P, Shanbhag SS, Singh V, Das AV, Basu S. Incidence, demographics, types and risk factors of dry eye disease in India: Electronic medical records driven big data analytics report I. Ocul Surf. 2019;17(2):250-56. Doi: 10.1016/j.jtos.2019.02.007.
[8] Ayaki M, Kawashima M, Negishi K, Tsubota K. High prevalence of sleep and mood disorders in dry eye patients: Survey of 1,000 eye clinic visitors. Neuropsychiatr Dis Treat. 2015;11:889-94. Doi: 10.2147/NDT.S81515.

[9] Singh L, Singh VP, Yadav S, Garg P. Mental health status in dry eye disease – a case control study. Eur Ophthalmic Rev. 2018;12(1):56-59.
[10] Basilious A, Xu CY, Malvankar-Mehta MS. Dry eye disease and psychiatric disorders: A systematic review and meta-analysis. Eur J Ophthalmol. 2022;32(4):1872-89. Doi: 10.1177/11206721211060963.
[11] Chen Q, Wei Z, Wang L, Xu X, Wei Z, Zheng P, et al. Dry eye disease in patients with schizophrenia: A case-control study. Front Med (Lausanne). 2022;9:831-37. Doi: 10.3389/fmed.2022.831337.
[12] Kitazawa M, Sakamoto C, Yoshimura M, Kawashima M, Inoue S, Mimura M, et al. The relationship of dry eye disease with depression and anxiety: A naturalistic observational study. Trans Vis Sci Tech. 2018;7(6):35. Doi: 10.1167/tvst.7.6.35.
[13] Han SB, Yang HK, Hyon JY, Wee WR. Association of dry eye disease with psychiatric or neurological disorders in elderly patients. Clin Interv Aging. 2017;12:785-92. Doi: 10.2147/CIA.S137580.
[14] Galor A, Feuer W, Lee DJ, Florez H, Faler AL, Zann KL, et al. Depression, post-traumatic stress disorder, and dry eye syndrome: A study utilizing the national United States Veterans Affairs administrative database. Am J Ophthalmol. 2012;154(2):340-346.e2. Doi: 10.1016/j.ajo.2012.02.009.
[15] Wen W, Wu Y, Chen Y, Gong L, Li M, Chen X, et al. Dry eye disease in patients with depressive and anxiety disorders in shanghai. Cornea. 2012;31(6):686-92.
[16] Daniel L, Taj M. Dry eye disease in patients with alcohol use disorder. TNOA J Ophthalmic Sci Res. 2022;60(2):166-70. Doi: 10.4103/tjosr.tjosr_157_21.
[17] Kaštelan S, Bakija I, Bogadi M, Orešković I, Kasun B, Gotovac M, et al. Psychiatric disorders and dry eye disease - A transdisciplinary approach. Psychiatr Danub. 2021;33(Suppl 4):580-87.
[18] Miljanović B, Dana R, Sullivan DA, Schaumberg DA. Impact of dry eye syndrome on vision-related quality of life. Am J Ophthalmol. 2007;143(3):409-15. Doi: 10.1016/j.ajo.2006.11.060.
[19] Asiedu K, Dzasimatu SK, Kyei S. Impact of dry eye on psychosomatic symptoms and quality of life in a healthy youthful clinical sample. Eye Contact Lens. 2018;44 Suppl 2:S404-S409.
[20] Riemann D. Sleep hygiene, insomnia and mental health. J Sleep Res. 2018;27(1):03-03. Doi: 10.1111/jsr.12661.
[21] An Y, Kim H. Sleep disorders, mental health, and dry eye disease in South Korea. Sci Rep. 2022;12(1):11046. Doi: 10.1038/s41598-022-14167-0.
[22] He Q, Chen Z, Xie C, Liu L, Wei R. The association between dry eye disease with depression, anxiety and sleep disturbance during covid-19. Front Psychiatry. 2022;12:802302. Doi: 10.3389/fpsyt.2021.802302.
[23] Liang CY, Cheang WM, Wang CY, Lin KH, Wei LC, Chen YY, et al. The association of dry eye syndrome and psychiatric disorders: A nationwide population-based cohort study. BMC Ophthalmol. 2020;20(1):123. Doi: 10.1186/s12886-020-01395-z.
[24] Aboraya A, Nasrallah H, Muvvala S, El-Missiry A, Mansour H, Hill C, et al. The Standard for Clinicians' Interview in Psychiatry (SCIP): A clinician-administered tool with categorical, dimensional, and numeric output—conceptual development, design, and description of the SCIP. Innov Clin Neurosci. 2016;13(5-6):31-77.
[25] Schiffman RM, Christianson MD, Jacobsen G, Hirsch JD, Reis BL. Reliability and validity of the Ocular Surface Disease Index. Arch Ophthalmol. 2000;118(5):615-21. Doi: 10.1001/archopht.118.5.615.
[26] Hashmani N, Mustafa FG, Tariq MA, Ali SF, Bukhari F, Memon AS, et al. Distribution and correlation of ocular surface disease index scores in a non-clinical population: The Karachi Ocular Surface Disease Study. Cureus. 2020;12(7):e9193.
[27] Dibajnia P, Mohammadinia M, Moghadasin M, Amiri MA. Tear film break-up time in bipolar disorder. Iran J Psychiatry. 2012;7(4):191-93.
[28] Brott NR, Zeppieri M, Ronquillo Y. Schirmer Test. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 [cited 2026 May 1]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK559159/.
[29] Busner J, Targum SD. The clinical global impressions scale: Applying a research tool in clinical practice. Psychiatry (Edgmont). 2007;4(7):28-37.
[30] Endicott J, Nee J, Harrison W, Blumenthal R. Quality of life enjoyment and satisfaction questionnaire: A new measure. Psychopharmacol Bull. 1993;29(2):321-26.
[31] Espie CA, Kyle SD, Hames P, Gardani M, Fleming L, Cape J. The sleep condition indicator: A clinical screening tool to evaluate insomnia disorder. BMJ Open. 2014;4(3):e004183. Doi: 10.1136/bmjopen-2013-004183.
[32] Britten-Jones AC, Wang MTM, Samuels I, Jennings C, Stapleton F, Craig JP. Epidemiology and risk factors of dry eye disease: Considerations for clinical management. Medicina (Kaunas). 2024;60(9):1458. Doi: 10.3390/medicina60091458.
[33] Gayton J. Etiology, prevalence, and treatment of dry eye disease. OPTH. 2009;3:405-12. Doi: 10.2147/OPTH.S5555
[34] Gonzales JA, Chou A, Rose-Nussbaumer JR, Bunya VY, Criswell LA, Shiboski CH, et al. How are ocular signs and symptoms of dry eye associated with depression in women with and without sjögren syndrome? Am J Ophthalmol. 2018;191:42-48. Doi: 10.1016/j.ajo.2018.04.004.
[35] Kaštelan S, Bakija I, Bogadi M, Orešković I, Kasun B, Gotovac M, et al. Psychiatric Disorders and Dry Eye Disease - A Transdisciplinary Approach. Psychiatr Danub. 2021;33(Suppl 4):580-87.
[36] Kaštelan S, Kozina L, Tomić Z, Bakija I, Matejić T, Vidović D. Dry eye disease and psychiatric disorders: Neuroimmune mechanisms and therapeutic perspectives. Int J Mol Sci. 2025;26(21):10699. Doi: 10.3390/ijms262110699.
[37] Weatherby TJM, Raman VRV, Agius M. Depression and dry eye disease: A need for an interdisciplinary approach? Psychiatr Danub. 2019;31(Suppl 3):619-21.
[38] Tiskaoglu NS, Yazıcı A, Karlıdere T, Sari E, Oguz EY, Musaoglu M, et al. Dry eye disease in patients with newly diagnosed depressive disorder. Curr Eye Res. 2017;42(5):672-76. Doi: 10.1080/02713683.2016.1236966.
[39] Kai JY, Wu YB, Shi B, Li DL, Dong XX, Wang P, et al. Dry eye symptoms and health-related quality of life among Chinese individuals: A national-based study. Br J Ophthalmol. 2024;108(11):1500-07. Doi: 10.1136/bjo-2023-324677.
[40] Grubbs JR, Tolleson-Rinehart S, Huynh K, Davis RM. A review of quality of life measures in dry eye questionnaires. Cornea. 2014;33(2):215-18. Doi: 10.1097/ICO.0000000000000038.
[41] Morthen MK, Magno MS, Utheim TP, Snieder H, Hammond CJ, Vehof J. The physical and mental burden of dry eye disease: A large population-based study investigating the relationship with health-related quality of life and its determinants. Ocul Surf. 2021;21:107-17. Doi: 10.1016/j.jtos.2021.05.006.
[42] Na KS, Han K, Park YG, Na C, Joo CK. Depression, stress, quality of life, and dry eye disease in Korean women: A population-based study. Cornea. 2015;34(7):733-38. Doi: 10.1097/ICO.0000000000000464.
[43] Gu Y, Cao K, Li A, Wang J, Guo Y, Hao Y, et al. Association between sleep quality and dry eye disease: A literature review and meta-analysis. BMC Ophthalmol. 2024;24(1):152. Doi: 10.1186/s12886-024-03416-7.
[44] Jongkhajornpong P, Lekhanont K, Anothaisintawee T, Rattanasiri S, McKay G, Attia J, et al. Prevalence of dry eye disease and its association with sleep quality and depression: A hospital-based survey in Thai population. BMJ Open. 2025 Jun 18;15(6):e094046. Doi: 10.1136/bmjopen-2024-094046. PMID: 40533215; PMCID: PMC12182010.
[45] Ashena Z, Dashputra R, Nanavaty MA. Autoimmune dry eye without significant ocular surface co-morbidities and mental health. Vision (Basel). 2020;4(4):43. Doi: 10.3390/vision4040043.

PARTICULARS OF CONTRIBUTORS:

1. Senior Resident, Department of Psychiatry, Andaman and Nicobar Islands Institute of Medical Sciences, Port Blair, Andaman and Nicobar Islands, India.
2. Associate Professor, Department of Psychiatry, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry, India.
3. Professor, Department of Psychiatry, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry, India.
4. Professor, Department of Psychiatry, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry, India.
5. Professor, Department of Ophthalmology, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry, India.
6. Additional Professor, Department of Psychiatry, All India Institute of Medical Sciences Kalyani, Nadia, West Bengal, India.
7. Visiting Consultant, Department of Ophthalmology, Sri Satya Sai Insitute of Higher Medical Sciences, Bengaluru, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Vigneshvar Chandrasekaran,
Associate Professor, Department of Psychiatry, Mahatma Gandhi Medical College and Research Institute, Sri Balaji Vidyapeeth, Puducherry-607403, India.
E-mail: vigneshvarchandrasekaran@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Mar 22, 2026
- Manual Googling: Jul 18, 2026
- iThenticate Software: Jul 20, 2026 (9%)

ETYMOLOGY: Author Origin

EMENDATIONS: 8

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Mar 13, 2026**
Date of Peer Review: **Apr 03, 2026**
Date of Acceptance: **Jul 22, 2026**
Date of Publishing: **Sep 01, 2026**