ORIGINAL RESEARCH

The Impact of Ocular Microbial Infections on Psychiatric Symptoms in Patients with Chronic Eye Diseases

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ABSTRACT

Aim: This study aimed to investigate the impact of ocular microbial infections on psychiatric symptoms in patients with chronic eye diseases, including glaucoma, diabetic retinopathy, and age-related macular degeneration. **Materials and Methods:** A total of 80 patients with chronic eye diseases and a history of ocular microbial infections were enrolled. The study was conducted in an outpatient ophthalmology clinic, and psychiatric symptoms were assessed using the Hamilton Depression Rating Scale (HDRS) and the Positive and Negative Syndrome Scale (PANSS). Ocular infections were diagnosed based on clinical signs and microbiological cultures. Statistical analysis was performed using SPSS software to explore correlations between infection severity and psychiatric symptoms. **Results:** The study revealed that 62.5% of patients experienced depressive symptoms, with nearly 40% having moderate to severe depression. A significant correlation was found between the severity of ocular infections and the worsening of depressive and negative psychiatric symptoms. Fungal and mixed infections were associated with the highest HDRS scores, indicating more severe depression. Additionally, patients with more severe ocular infections exhibited higher scores for both positive and negative psychiatric symptoms on the PANSS. **Conclusion:** This study demonstrates a significant association between ocular microbial infections and the exacerbation of psychiatric symptoms in patients with chronic eye diseases. The severity of ocular infections was linked to increased levels of depression and negative symptoms, particularly in cases of fungal and mixed infections. These findings highlight the importance of integrated care that addresses both ocular and psychiatric health.

Keywords: Ocular microbial infections, psychiatric symptoms, chronic eye diseases, depression, PANSS

INTRODUCTION

Ocular microbial infections, including bacterial, viral, fungal, and parasitic infections, are a significant health concern worldwide. The eye is a delicate and complex organ, and any infection can lead to a range of symptoms, some of which may not only affect the vision but also impact the overall well-being of patients. Chronic eye diseases, such as dry eye syndrome, diabetic retinopathy, glaucoma, and age-related macular degeneration, often necessitate long-term management and, in some cases, surgical interventions. These conditions create an environment that may make patients more susceptible to ocular infections, which can, in turn, exacerbate the clinical course of their eye diseases.[1]

However, the consequences of ocular microbial infections extend beyond the physical effects on the eye. Emerging evidence suggests that these infections can significantly influence psychiatric symptoms in individuals suffering from chronic eye diseases. The psychological and emotional burden of dealing with persistent or recurrent eye infections is profound, as the ability to see plays a crucial role in one's overall quality of life. For individuals with pre-existing chronic eye conditions, the development of microbial infections can introduce a range of psychiatric symptoms, including anxiety, depression, and in more severe cases, psychosis.[2]

This intricate relationship between ocular infections and psychiatric health is often underexplored in clinical practice, yet it carries important implications

for patient care. The psychological strain imposed by chronic visual impairment, coupled with the discomfort and potential vision loss caused by ocular infections, can create a vicious cycle that hampers the patient's overall health and recovery. Furthermore, patients who experience repeated infections may become increasingly anxious or depressed due to the unpredictability of their condition, fear of permanent vision loss, or the necessity of continuous medical treatments and surgeries. This emotional distress can hinder their ability to effectively manage their chronic eye diseases, leading to poorer health outcomes.[3]

The pathophysiology underlying the connection between ocular infections and psychiatric symptoms is complex. Chronic ocular conditions can lead to alterations in the immune system, with inflammation and immune dysregulation potentially playing a role in both the ocular and psychiatric manifestations of disease. For example, prolonged inflammation in the eye can lead to increased levels of pro-inflammatory cytokines, which not only damage ocular tissues but may also affect brain function, thereby contributing to the development of mood disorders such as depression and anxiety. Additionally, the direct impact of visual impairment on daily life and the ability to engage in social and occupational activities can contribute to feelings of isolation, frustration, and helplessness.[4]

One of the critical elements in understanding the psychiatric effects of ocular infections is the role of pain and discomfort. Ocular infections often present with symptoms such as eye redness, irritation, discharge, and pain, which can be severe and chronic. For many patients, these symptoms can become overwhelming, leading to heightened stress and frustration. The physical discomfort caused by ocular infections can significantly impair daily functioning, contributing to emotional instability. Patients with chronic eye diseases may also experience feelings of helplessness, as their ability to perform basic tasks such as reading, driving, or even recognizing faces becomes compromised. This gradual loss of independence can exacerbate feelings of depression and anxiety.[5]

Moreover, the fear of vision loss and the uncertainty of the future trajectory of chronic eye diseases can lead to anticipatory anxiety, which may manifest as panic attacks or chronic worry. These mental health challenges can be further compounded by the medical treatments required to manage both the ocular infection and the underlying chronic eye disease. Topical and systemic antibiotics, antifungals, and antivirals, as well as other treatments like corticosteroids, can have their own side effects, including mood swings, irritability, and sleep disturbances, which further contribute to psychiatric symptoms.[6]

In some cases, psychiatric symptoms can directly affect the patient's ability to adhere to treatment regimens, which in turn, worsens the ocular infection and the chronic eye condition. This cyclical relationship creates a barrier to recovery, as untreated infections and poorly managed chronic conditions can lead to more severe psychiatric outcomes. For instance, individuals who experience persistent pain or visual impairment may avoid necessary follow-up appointments or fail to take prescribed medications due to feelings of hopelessness or lack of motivation. As a result, they may enter into a downward spiral of worsening physical and mental health.[7,8]

The relationship between ocular infections and psychiatric symptoms also underscores the importance of an interdisciplinary approach to patient care. Mental health professionals, such as psychologists or psychiatrists, should be integrated into the care teams of individuals with chronic eye diseases, especially those who are at risk for developing infections. Similarly, ophthalmologists and other specialists managing chronic eye conditions should remain attuned to the potential psychological impact of ocular infections and should take steps to screen for and address psychiatric symptoms in their patients. By recognizing and treating both the physical and mental health aspects of care, healthcare providers can improve the overall well-being of individuals suffering from chronic eye diseases.

MATERIALS AND METHODS

This study aimed to investigate the impact of ocular microbial infections on psychiatric symptoms in patients with chronic eye diseases. A total of 80 patients with chronic eye conditions, including glaucoma, diabetic retinopathy, and age-related macular degeneration, were enrolled in this study. Participants were selected from an outpatient ophthalmology clinic, and all patients had a history of ocular microbial infections, either current or prior. Inclusion criteria included patients aged 18 years and older, diagnosed with one or more chronic eye diseases, and having experienced at least one episode of ocular microbial infection in the last six months. Exclusion criteria involved patients with systemic psychiatric disorders, recent ocular surgery, or active ocular diseases unrelated to microbial infections.

The study employed a cross-sectional design, and data were collected through patient interviews, clinical examinations, and laboratory tests. Psychiatric symptoms were assessed using standardized diagnostic tools, including the Hamilton Depression Rating Scale (HDRS) and the Positive and Negative Syndrome Scale (PANSS), which were administered by trained psychiatrists. Ocular microbial infections were diagnosed based on clinical signs such as conjunctival redness, discharge, and corneal lesions, in conjunction with microbiological culture results obtained from ocular swabs. The patients' ophthalmological history, treatment regimens, and frequency of ocular infections were documented.

Statistical analysis was performed using SPSS software (version 25.0), where descriptive statistics were used to summarize demographic and clinical

characteristics. Correlations between the severity of ocular infections and psychiatric symptoms were analyzed using Pearson's correlation coefficient. A significance level of $p < 0.05$ was considered statistically significant. The study was approved by the institutional review board, and informed consent was obtained from all participants prior to their inclusion.

RESULTS

Table 1: Demographic Characteristics of Study Participants

The demographic data of the 80 study participants revealed that the mean age was 57.2 ± 12.4 years, indicating a middle-aged to older population. The gender distribution showed that 45 participants (56.3%) were male, and 35 participants (43.7%) were female, with a slightly higher proportion of males. The participants were diagnosed with three main chronic ocular conditions: 37.5% had glaucoma (30 participants), 31.3% had diabetic retinopathy (25 participants), and the remaining 31.3% had age-related macular degeneration (25 participants). All participants (100%) had a history of ocular microbial infections, which highlights the study's focus on patients with chronic eye diseases and past infections. The mean duration of chronic eye disease was 6.4 ± 3.2 years, indicating that most participants had been living with their conditions for several years, making them more likely to experience recurrent infections.

Table 2: Frequency and Types of Ocular Microbial Infections

Table 2 outlines the types of ocular microbial infections observed among the participants. Bacterial conjunctivitis was the most common infection, affecting 22 patients (27.5%). This was followed by viral conjunctivitis, which affected 18 participants (22.5%). Fungal keratitis was observed in 15 participants (18.8%), while mixed infections (both bacterial and viral) were found in 12 participants (15.0%). Acanthamoeba keratitis, a rare but serious infection, was present in 7 participants (8.8%), and fungal endophthalmitis, another severe infection, affected 6 participants (7.5%).

Table 3: Psychiatric Symptoms in Study Participants (Hamilton Depression Rating Scale - HDRS)

Table 3 presents the severity of depressive symptoms as assessed by the Hamilton Depression Rating Scale (HDRS). Of the 80 participants, 37.5% (30 participants) had no depression (HDRS score 0-7), while 25% (20 participants) showed mild depression (HDRS score 8-13). Moderate depression (score 14-18) was observed in 18.8% (15 participants), and severe depression (score ≥ 19) was found in another 18.8% (15 participants). These results suggest that a significant proportion of patients (62.5%) experienced some degree of depressive symptoms, with nearly 40% of participants presenting with moderate to severe depression.

Table 4: Psychiatric Symptoms Based on Positive and Negative Syndrome Scale (PANSS)

Table 4 provides details on psychiatric symptoms categorized by the Positive and Negative Syndrome Scale (PANSS). The positive symptoms include delusions, hallucinations, and disorganized speech. Delusions were found in 15% (12 participants), hallucinations in 17.5% (14 participants), and disorganized speech in 12.5% (10 participants). For negative symptoms, affective flattening (reduced emotional expression) was observed in 25% (20 participants), blunted affect (reduced emotional responsiveness) in 27.5% (22 participants), and poor rapport (difficulty in establishing social connections) in 22.5% (18 participants). These results suggest that a notable proportion of patients exhibited both positive and negative psychiatric symptoms, with negative symptoms such as blunted affect and poor rapport being more prevalent.

Table 5: Correlation Between Severity of Ocular Infections and Psychiatric Symptoms

Table 5 demonstrates the relationship between the severity of ocular infections and psychiatric symptoms, as measured by the HDRS and PANSS scales. The results show that as the severity of ocular infections increased, so did the severity of depressive symptoms (HDRS score). For patients with mild ocular infections (severity 0-3), the mean HDRS score was 8.1 ± 3.2, indicating mild depression. For moderate infections (severity 4-6), the mean HDRS score increased to 12.6 ± 5.1, indicating moderate depression. Severe ocular infections (severity ≥7) were associated with a higher mean HDRS score of 18.3 ± 6.7, indicating severe depression. This trend was statistically significant ($p < 0.01$). In terms of PANSS, positive symptoms (such as delusions and hallucinations) and negative symptoms (such as blunted affect) also worsened with increasing severity of ocular infections, with p-values of 0.05 for positive symptoms and 0.03 for negative symptoms, showing a significant association between infection severity and psychiatric symptom exacerbation.

Table 6: Association Between Type of Ocular Microbial Infection and Psychiatric Symptoms

Table 6 shows the psychiatric symptoms associated with different types of ocular microbial infections. Patients with bacterial conjunctivitis had a mean HDRS score of 10.3 ± 4.5, with moderate levels of depression. Similarly, viral conjunctivitis and mixed infections had mean HDRS scores of 12.0 ± 4.8 and 15.2 ± 5.9, respectively, indicating higher levels of depressive symptoms compared to bacterial conjunctivitis. Fungal infections, such as fungal keratitis, Acanthamoeba keratitis, and fungal endophthalmitis, were associated with the highest

HDRS scores (ranging from 14.5 ± 5.2 to 18.5 ± 7.2), suggesting more severe depression in these patients. Statistically significant differences were observed across infection types for both HDRS and PANSS scores ($p < 0.05$), particularly for fungal and mixed infections, indicating that these types of infections have a stronger association with worse psychiatric symptoms. Patients with Acanthamoeba keratitis and fungal endophthalmitis, in particular, had the most severe psychiatric symptoms, with both positive and negative PANSS scores also significantly elevated (p-values ranging from 0.02 to 0.05).

Table 1: Demographic Characteristics of Study Participants

Characteristic	Number (n)	Percentage (%)
Mean Age (years)	-	57.2 ± 12.4
Gender Distribution		
- Male	45	56.3
- Female	35	43.7
Ocular Disease Type		
- Glaucoma	30	37.5
- Diabetic Retinopathy	25	31.3
- Age-related Macular Degeneration	25	31.3
History of Ocular Infections	80	100
Duration of Chronic Eye Disease (years)	-	6.4 ± 3.2

Table 2: Frequency and Types of Ocular Microbial Infections

Infection Type	Number (n)	Percentage (%)
Bacterial Conjunctivitis	22	27.5
Fungal Keratitis	15	18.8
Viral Conjunctivitis	18	22.5
Mixed Infections (Bacterial + Viral)	12	15.0
Acanthamoeba Keratitis	7	8.8
Fungal Endophthalmitis	6	7.5

Table 3: Psychiatric Symptoms in Study Participants (Hamilton Depression Rating Scale - HDRS)

Symptom Severity	Number (n)	Percentage (%)
No Depression (Score 0-7)	30	37.5
Mild Depression (Score 8-13)	20	25.0
Moderate Depression (Score 14-18)	15	18.8
Severe Depression (Score ≥ 19)	15	18.8

Table 4: Psychiatric Symptoms Based on Positive and Negative Syndrome Scale (PANSS)

Symptom Category	Number (n)	Percentage (%)
Positive Symptoms		
- Delusions	12	15.0
- Hallucinations	14	17.5
- Disorganized Speech	10	12.5
Negative Symptoms		
- Affective Flattening	20	25.0
- Blunted Affect	22	27.5
- Poor Rapport	18	22.5

Table 5: Correlation Between Severity of Ocular Infections and Psychiatric Symptoms

Ocular Infection Severity	HDRS Score (Depression)	PANSS Positive Symptoms	PANSS Negative Symptoms	p-value (HDRS)	p-value (PANSS Positive)	p-value (PANSS Negative)
Mild (0-3)	8.1 ± 3.2	3.2 ± 1.5	4.1 ± 2.1	$p < 0.01$	$p = 0.05$	$p = 0.03$
Moderate (4-6)	12.6 ± 5.1	4.5 ± 2.3	5.0 ± 2.3			
Severe (≥7)	18.3 ± 6.7	6.4 ± 3.0	6.5 ± 3.2			

Table 6: Association Between Type of Ocular Microbial Infection and Psychiatric Symptoms

Infection Type	HDRS Score (Depression)	PANSS Positive Symptoms	PANSS Negative Symptoms	p-value (HDRS)	p-value (PANSS Positive)	p-value (PANSS Negative)
Bacterial Conjunctivitis	10.3 ± 4.5	4.2 ± 2.0	4.7 ± 2.1	-	-	-
Fungal Keratitis	14.5 ± 5.2	5.0 ± 2.6	5.3 ± 2.4	p = 0.02	p = 0.05	p = 0.04
Viral Conjunctivitis	12.0 ± 4.8	4.6 ± 2.4	5.0 ± 2.5	p = 0.03	p = 0.04	p = 0.05
Mixed Infections (Bacterial + Viral)	15.2 ± 5.9	5.3 ± 2.9	5.6 ± 3.1	p = 0.01	p = 0.03	p = 0.03
Acanthamoeba Keratitis	16.0 ± 6.0	6.0 ± 3.1	6.2 ± 3.4	p = 0.03	p = 0.02	p = 0.02
Fungal Endophthalmitis	18.5 ± 7.2	6.7 ± 3.5	6.9 ± 3.7	p = 0.01	p = 0.03	p = 0.02

DISCUSSION

The present study explores the relationship between ocular microbial infections and psychiatric symptoms in patients with chronic eye diseases, providing insight into how ocular health can influence mental well-being. A total of 80 patients were examined, with a mean age of 57.2 years, and a majority of participants were male (56.3%). Most participants were diagnosed with glaucoma (37.5%), diabetic retinopathy (31.3%), and age-related macular degeneration (31.3%). All participants (100%) had a history of ocular microbial infections, and the mean duration of chronic eye disease was 6.4 ± 3.2 years, suggesting that most patients had been living with their conditions for several years, making them more likely to experience recurrent infections.

These findings are consistent with those of **Dong et al. (2021)**, who observed that patients with long-standing ocular diseases are more likely to experience microbial infections due to compromised immunity and chronic inflammation. The 100% history of ocular infections in our study participants supports this notion, as these chronic eye diseases predispose individuals to recurrent infections.[9]

The severity of depressive symptoms in our study participants was assessed using the Hamilton Depression Rating Scale (HDRS). The results indicated that 62.5% of participants experienced some degree of depression, with 37.5% (30 participants) exhibiting no depression, 25% (20 participants) showing mild depression, 18.8% (15 participants) displaying moderate depression, and 18.8% (15 participants) presenting with severe depression. This high prevalence of depressive symptoms is concerning, as nearly 40% of the participants were severely affected by depression. These findings align with **Müller and Schwarz (2021)**, who emphasized the strong link between chronic diseases, including eye conditions, and the mental health burden these diseases impose. Chronic ocular diseases and recurrent microbial infections, such as those found in our study, can increase susceptibility to depression due to prolonged physical discomfort and visual impairment.[10]

In our study, the severity of psychiatric symptoms also correlated with the severity of ocular infections, as shown in Table 5. For patients with mild ocular infections (severity 0-3), the mean HDRS score was 8.1 ± 3.2, indicating mild depression. Moderate ocular infections (severity 4-6) were associated with a higher HDRS score of 12.6 ± 5.1, and severe ocular infections (severity ≥7) led to even higher HDRS scores of 18.3 ± 6.7, indicating severe depression. This trend was statistically significant ($p < 0.01$), supporting the idea that more severe ocular infections are linked to worse psychiatric symptoms. This finding is consistent with **Zhao et al. (2020)**, who reported that intraocular inflammation could contribute to systemic inflammation and worsening psychiatric symptoms, including depression.[11]

In terms of the types of ocular microbial infections, bacterial conjunctivitis was the most common infection, observed in 22 patients (27.5%), followed by viral conjunctivitis in 18 participants (22.5%), and fungal keratitis in 15 participants (18.8%). Mixed infections (both bacterial and viral) were found in 12 participants (15.0%), while Acanthamoeba keratitis and fungal endophthalmitis affected 7 (8.8%) and 6 (7.5%) participants, respectively. The association between the type of ocular infection and psychiatric symptoms was further explored in Table 6. Fungal and mixed infections were associated with the most severe depressive symptoms. For example, fungal keratitis had a mean HDRS score of 14.5 ± 5.2, Acanthamoeba keratitis had a score of 16.0 ± 6.0, and fungal endophthalmitis had the highest score of 18.5 ± 7.2. Statistically significant differences were observed across infection types ($p < 0.05$), particularly for fungal and mixed infections, indicating that these infections have a stronger association with worse psychiatric symptoms. This result is supported by **Siddiqui et al. (2021)**, who highlighted that patients with fungal infections often experience more severe psychiatric symptoms due to the chronicity and severity of the infection.[12]

Our findings are also consistent with the research by **Gao et al. (2018)**, who observed that severe ocular infections such as fungal keratitis are associated with

higher levels of depression and anxiety due to prolonged pain and the risk of permanent visual impairment. This is also reflected in the data from Table 5, where the severity of ocular infections directly correlated with worsening psychiatric symptoms. The more severe the infection, the higher the depression scores, with significant increases in both HDRS and PANSS scores (positive and negative symptoms) as the infection severity worsened.[13]

In addition to depression, negative psychiatric symptoms such as affective flattening (25%), blunted affect (27.5%), and poor rapport (22.5%) were also common in our study participants. These findings align with **Müller and Schwarz (2021)**, who suggested that systemic inflammation, which can be triggered by chronic ocular infections, may lead to disturbances in emotional regulation, contributing to these negative symptoms.[10]**Zhao et al. (2020)** also discussed how ocular inflammation, particularly in severe infections, can potentially impact the central nervous system, leading to both mood disturbances and negative psychiatric symptoms.[11]

Our study also showed that mixed infections (both bacterial and viral) were linked to more severe psychiatric symptoms, with a mean HDRS score of 15.2 ± 5.9, which was significantly higher than that for bacterial conjunctivitis (10.3 ± 4.5). This supports the findings of **Errera (2021)**, who discussed the role of viral ocular infections in increasing the psychiatric burden on affected individuals. Viral ocular infections, especially those that are chronic or recurrent, can result in prolonged inflammation and stress, leading to more severe psychiatric symptoms.[14]

CONCLUSION

In conclusion, this study highlights a significant association between ocular microbial infections and the severity of psychiatric symptoms in patients with chronic eye diseases. As the severity of ocular infections increased, so did the severity of depressive and negative psychiatric symptoms. Fungal and mixed ocular infections, in particular, were linked to the most severe psychiatric symptoms, emphasizing the need for comprehensive management of both ocular and psychological health in these patients.

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