Section: Ophthalmology

Original Research Article

CLINICAL PROFILE OF ORBITAL INFECTIONS AND FACTORS AFFECTING VISUAL OUTCOME OF ORBITAL INFECTIONS IN A TERTIARY CARE HOSPITAL

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Received *: 27/02/2025*
Received in revised form *: 01/05/2025*
Accepted *: 17/05/2025*

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DOI: 10.70034/ijmedph.2025.2.411

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (2); 2275-2280

ABSTRACT

Background: Orbital infections are serious medical conditions affecting the orbit and are categorised as pre- or post-septal (orbital) infections. Visual acuity serves as a key endpoint in assessing outcomes, with improvements commonly observed following appropriate treatment. This study aimed to investigate the clinical profile of orbital infections and the factors affecting their visual outcomes of orbital infections.

Materials and Methods: This cross-sectional study included 75 patients at Tirunelveli Medical College over 18 months, from February 2021 to August 2022. Patients were evaluated for orbital infections based on a detailed history, visual acuity, and clinical examinations, including slit-lamp, ophthalmoscopy, and imaging, for specific cases. The initial treatment involved topical and systemic antibiotics and intravenous antifungals for mucormycosis. Surgical interventions, such as incision and drainage, were performed.

Results: Most (86.7%) had normal colour vision, with 72% exhibiting visual acuity between 6/6 and 6/12. Preseptal cellulitis was the most common infection (74.7%), followed by orbital cellulitis (22.7%). Treatment primarily involved topical antibiotics and oral fluoroquinolone (62.7%). 98.7% had intact corneal sensation, in 74.7% underwent normal fundus examinations. Conjunctival congestion was observed in 16% of patients, and 10.7% had chemosis. A full range of extraocular movements was present in 77.3% of patients, with total ophthalmoplegia in 18.7%. Functional endoscopic sinus surgery was performed in 24% of patients.

Conclusion: Orbital infections were most common in children under 10 years of age, with a male preponderance and prevalence of unilateral right-eye involvement. The leading causes are lid infections and sinusitis, with risk factors such as diabetes, immunocompromised status, and fungal infections, which are associated with poorer visual outcomes.

Keywords: Orbital infections, Visual outcome, Sinusitis, Lid infections, Proptosis.

INTRODUCTION

Orbital infections are serious medical conditions affecting the orbit and are categorised as either preseptal or post-septal (orbital) infections.[1] These infections pose significant clinical challenges owing to potential complications, including vision loss, cavernous sinus thrombosis, and intracranial issues.[2] Accurate differentiation between preseptal and post-septal infections is essential for effective management, as they differ in presentation, clinical findings, and treatment strategies.[3] Orbital cellulitis, a form of post-septal infection, necessitates prompt evaluation and intervention to

avert long-term consequences.[1] Management typically involves the administration of intravenous antibiotics, with surgical intervention required in certain cases.[3] A multidisciplinary approach is crucial for achieving optimal outcomes in the treatment of these potentially life-threatening infections. The incidence of these infections varies across different populations and healthcare settings, posing a significant public health burden due to their rapid progression and potential for permanent disability.[2]

Acute invasive fungal rhinosinusitis and odontogenic sinusitis can lead to severe orbital and intracranial complications if left untreated. Common etiological agents include Staphylococcus, Streptococcus, and fungal species such as Mucor and Aspergillus.[4,5] Risk factors for complications include immunosuppression, haematologic malignancies, and diabetes.[5] Orbital complications, such as subperiosteal abscesses, are associated with higher absolute neutrophil counts and mucopurulent discharge.[6] Intracranial involvement and cranial neuropathy significantly reduce survival rates in fungal rhinosinusitis.[5] In paediatric cases, localised neurological symptoms and seizures correlate with longer hospital stays.[7] Early combined neurosurgical and endoscopic sinus interventions can shorten hospitalisation.[7] Antibiotic-resistant strains like MRSA may complicate treatment, especially in immunocompromised patients or those with a history of intravenous drug use.[4]

Orbital infections, particularly those arising from sinusitis—the most prevalent predisposing factor—can result in significant visual and systemic morbidity if not promptly and effectively managed.8 Differentiating between preseptal and post-septal infections is crucial, as the latter often presents with more severe symptoms such as ophthalmoplegia and proptosis.[3] Post-septal involvement necessitates comprehensive evaluation, with CT scans playing a pivotal role in distinguishing between cellulitis and abscess formation.[9] While intravenous antibiotics are frequently effective, surgical intervention may be required, especially in cases with large abscess volumes, which are strong indicators for surgical drainage.[3,10]

Visual acuity serves as a key endpoint in assessing outcomes, with improvements commonly observed following appropriate treatment.8 However, factors such as pre-treatment visual acuity, the presence of a relative afferent pupillary defect, and the timing of intervention significantly influence the visual prognosis.[8] Early detection of optic nerve dysfunction and prompt initiation of treatment are essential for preserving vision and preventing complications.[8] A multidisciplinary approach involving aggressive medical therapy and timely surgical management is recommended to optimize patient outcomes.[10] Despite the potential severity of orbital infections, the overall prognosis is generally favourable when intervention is swift and appropriate.[11]

Aim

This study aimed to investigate the clinical profile of orbital infections and the factors affecting their visual outcomes of orbital infections.

MATERIALS AND METHODS

This cross-sectional study included 75 patients with a diagnosis of orbital infections at the Department of Ophthalmology, Tirunelveli Medical College, for 18 months, from February 2021 to August 2022. This study was approved by the Institutional Ethics Committee prior to initiation, and informed consent was obtained from all patients.

Inclusion Criteria

Patients of all age groups and both sexes with symptoms suggestive of orbital infections, such as eyelid swelling, eyeball protrusion, pain during ocular movements, double vision, defective vision, fever, and headache, were included in this study.

Exclusion Criteria

Patients with eyelid swelling and proptosis due to causes other than orbital infections, such as malignancy, were excluded from the study.

Methods

Detailed history regarding the onset, progression, and duration of symptoms, such as swelling of the eyelids, defective vision, pain during eyeball movement, protrusion of the eyeball, restriction of eyeball movement, diplopia, fever, and headache. History of predisposing factors such as sinusitis, trauma, lid infections, insect bites, dental extraction, uncontrolled diabetes mellitus, immunosuppressive conditions, poor socioeconomic status, and mucormycosis were also recorded.

Visual acuity was assessed using a Snellen chart, colour vision using an Ishihara chart, proptosis using Luedde's exophthalmometry, and extraocular movement was evaluated. The anterior segment examination employed a slit lamp for mobile patients and a torch for bedridden patients. Fundus examination was performed using direct and indirect ophthalmoscopy. Anterior rhinoscopy and oral cavity examinations were also performed. Laboratory tests included complete blood count, blood sugar level, blood culture, and aspirate culture sensitivity, as needed. Computed tomography of the orbit and paranasal sinuses was performed in patients with orbital cellulitis and mucormycosis, while magnetic resonance imaging of the brain with arteriography and venography was performed in those with cavernous sinus thrombosis.

Patients diagnosed with preseptal cellulitis received topical antibiotics and oral fluoroquinolones. Patients with suspected orbital cellulitis were admitted and treated with intravenous and topical antibiotic therapy. Intravenous antifungal agents were administered to patients with mucormycosis, and an otolaryngologist was consulted for concurrent sinusitis. Surgical interventions included incision and drainage for lid abscesses, removal of

orbital foreign bodies, functional endoscopic sinus surgery for sinusitis, and, depending on severity, functional endoscopic sinus surgery with maxillectomy, evisceration, or exenteration for rhinocerebral mucormycosis.

RESULTS

Table 1: Demographic, clinical presentation, medical history, and laterality of orbital infections

			Number of Patients
Age group (years)		< 10	17 (22.67%)
		11-20	11 (14.67%)
		21-30	6 (8%)
		31-40	9 (12%)
		41-50	12 (16%)
		51-60	10 (13.33%)
		61-70	7 (9.33%)
		71-80	3 (4%)
Gender		Male	41 (54.67%)
		Female	34 (45.33%)
Laterality		Orbital infection (RE)	42 (56%)
		Orbital infection (LE)	31 (41.33%)
		Bilateral infection	2 (2.67%)
Symptoms		Swelling of eyelids	75 (100%)
		Hemifacial swelling	32 (42.67%)
		Mucopurulent discharge	23 (30.67%)
		Restriction of eyeball movement	17 (22.67%)
		Defective vision	13 (17.33%)
		Headache	10 (13.33%)
		Fever	9 (12%)
		Diplopia	2 (2.67%)
		Decreased sensation over the face	1 (1.33%)
History		Sinusitis	5 (6.67%)
		Insect bite	12 (16%)
		Foreign body fall	8 (10.67%)
		Dental extraction	7 (9.33%)
		Trauma	2 (2.67%)
Past medical history	Type 2 diabetes mellitus (years)	> 10	14 (18.67%)
		> 5	9 (12%)
		< 5	0
	Systemic hypertension and dyslipidaemia		1 (1.33%)
	Systemic lupus erythematosus (on steroids)		1 (1.33%)

The most affected age group was children under 10 years (17 patients). Males were more commonly affected than females, with 41 males and 34 females. Orbital infections were more prevalent in the right eye (42 patients) than in the left eye (31 patients). Bilateral infections are rare, with only two cases reported. The most common symptom among patients was eyelid swelling in 75 patients, followed by hemifacial swelling in 32. Decreased facial sensation was the least common symptom, occurring in only one patient. The most frequent history was insect bites in 12 patients. Systemic hypertension with dyslipidaemia and systemic lupus erythematosus were reported in one patient each. [Table 1]

Table 2: Clinical characteristics and ocular findings in patients with orbital infections

		Number of patients
Colour vision	Normal	65 (86.67%)
	Not recorded (due to poor vision)	10 (13.33%)
Proptosis	Mild	6 (8%)
	Moderate	2 (267%)
	Severe	0
Conjunctiva	Normal	49 (65.33%)
	Chemosis	8 (10.67%)
	Congestion	12 (16%)
	Both chemosis and congestion	6 (8%)
Cornea	Clear	73 (97.33%)
	Neurotrophic keratitis	1 (1.33%)
	Exposure keratopathy	1 (1.33%)
Corneal sensation	Intact	74 (98.67%)
	Absent	1 (1.33%)
Supra and infra-orbital sensation	Intact	64 (85.33%)
	Decreased	11 (14.67%)
Extra ocular movements	Full range	58 (77.33%)

		Total external ophthalmoplegia	14 (18.67%)
		Defective abduction	3 (4%)
		Isolated third and fourth cranial nerve palsy	0
Visual acuity		6/6-6/12	54 (72%)
		6/18-6/36	8 (10.67%)
		6/60-2/60	1 (1.33%)
		< 2/60	12 (16%)
Pupil		Normal pupillary reflex	63 (84%)
		Efferent pupillary defect	11 (14.67%)
		Afferent pupillary defect.	1 (1.33%)
Lids oedema	Mild ptosis (21)	Mechanical	21 (28%)
		Neurogenic	0
	Moderate ptosis (26)	Mechanical	22 (29.33%)
		Neurogenic	4 (5.33%)
	Severe ptosis (28)	Mechanical	17 (22.67%)
		Neurogenic	11 (14.67%)

The majority of patients (n=65) had normal colour vision, whereas colour vision was not recorded in 10 patients because of poor vision. Proptosis was mild in six patients, moderate in two, and severe in none of the patients. Among them, 49 had normal conjunctiva, 12 had congestion, 8 had chemosis, and 6 had both chemosis and congestion. Most patients (n=73) had clear corneas. Only one patient had neurotrophic keratitis and exposure keratopathy. Corneal sensation was intact in 74 patients, with only one patient showing an absent corneal sensation. Supra- and infraorbital sensations were intact in 64 patients, whereas 11 patients had decreased sensation. The full range of extraocular movements was observed in 58 patients postoperatively. Total external ophthalmoplegia was present in 14 patients, defective abduction in three patients, and no patient had isolated third or fourth cranial nerve palsy.

Most patients (n=54) had visual acuity in the range of 6/6–6/12. Eight patients had visual acuity in the range of 6/18–6/36, one patient had 6/60–2/60, and 12 patients had < 2/60. A normal pupillary reflex was observed in 63 patients. Efferent pupillary defects were present in 11 patients and afferent pupillary defects were present in one patient. Mild mechanical ptosis was observed in 21 patients. Moderate ptosis was mechanical in 22 patients and neurogenic in four. Severe ptosis was mechanical in 17 patients and neurogenic in 11 patients. [Table 2]

Table 3: Clinical features, radiological findings, and treatment approaches in orbital infections

		Number of Patients
Fundus examination	Normal	56 (74.67%)
	Central Retinal Artery Occlusion (CRAO)	1 (1.33%)
	Fundus not visible due to severe lid oedema	18 (24%)
	Patient with CRAO as a sequela to orbital cellulitis	8 (10.67%)
Nasal cavity	Mucoid discharge	14 (18.67%)
	Eschar	2 (2.67%)
Radiological imaging	No abnormality detected	4 (5.33%)
	Ethmoidal sinusitis with co-existing maxillary sinusitis	9 (12%)
	Orbital cellulitis with pansinusitis	12 (16%)
	Fungal sinusitis with orbital cellulitis	3 (4%)
Stages of orbital infections	Pre-septal cellulitis	56 (74.67%)
	Orbital cellulitis	17 (22.67%)
	Cavernous sinus thrombosis	2 (2.67%)
	Subperiosteal abscess	0
	Orbital abscess	0
Treatment regimens	Topical antibiotics and oral fluoroquinolones	47 (62.67%)
	Topical antibiotics and intravenous antibiotics (Ceftriaxone/Piperacillin Tazobactam, Metronidazole)	18 (24%)
	Topical antibiotics and intravenous amphotericin B	9 (12%)
Surgical interventions	Functional endoscopic sinus surgery (FESS)	18 (24%)
	Evisceration	1 (1.33%)
	Exenteration	1 (1.33%)
	Incision and drainage	2 (2.67%)
	FESS with maxillectomy	1 (1.33%)
Causes of orbital infections	Lid infections	15 (20%)
	Sinusitis	14 (18.67%)
	Insect bite	12 (16%)
	Mucor	11 (14.67%)
	Orbital foreign body	8 (10.67%)
	Dental extraction	7 (9.33%)
	Trauma	5 (6.67%)
	Idiopathic	2 (2.67%)
	Immunosuppression	1 (1.33%)

Most patients (n=56) underwent normal fundus examinations. The fundus was not visible in 18 patients because of severe lid oedema. Eight patients had central retinal artery occlusion (CRAO) as a sequela of orbital cellulitis, and 1 patient had CRAO. Mucoid discharge was observed in 14 patients and eschar in two patients. Orbital cellulitis with pansinusitis was observed in 12 patients. Ethmoidal sinusitis with co-existing maxillary sinusitis was found in nine patients. Preseptal cellulitis was the most common orbital infection, observed in 56 patients. Orbital cellulitis was observed in 17 patients, and cavernous sinus thrombosis was observed in two.

The most common treatment regimen was topical antibiotics and oral fluoroquinolones, administered to 47 patients. Eighteen patients received topical and intravenous antibiotics, and nine were treated with topical antibiotics and intravenous amphotericin B. Functional endoscopic sinus surgery (FESS) was performed in 18 patients. Incision and drainage were performed in two patients. Evisceration, exenteration, and FESS with maxillectomy were performed in one patient each. Lid infections were the most common cause of orbital infections, seen in 15 patients. [Table 3]

DISCUSSION

In this study of 75 patients, children under 10 years (17 patients) were the most affected, with 55% males and 45% females. All patients had eyelid swelling; 43% showed hemifacial swelling, 31% had mucopurulent discharge, 23% had restricted eyeball movement, 17% had defective vision, 13% had headache, 12% had fever, 3% had diplopia, and 1% had decreased facial sensation. The patient history included insect bites (16%), foreign bodies (11%), dental extraction (9%), sinusitis (7%), and trauma (3%).In a study by Pandian et al. involving children (75%) and adults (25%) with preseptal cellulitis, males were slightly predominant, with injury being the main predisposing factor in children, followed by insect bites and lid infections.[12] Sundar and Hegde found that orbital cellulitis commonly presented with eyelid oedema, erythema, pain, chemosis, proptosis, and limited ocular motility.[13] Aryasit et al. identified sinusitis as the primary cause of orbital cellulitis.[14]

In our study, 30% had a history of type 2 diabetes mellitus, of which 61% had a duration of > 10 years and 39% had a duration of > 5 years. Systemic hypertension with dyslipidaemia was observed in 1% of patients, 1% had a history of human immunodeficiency virus infection, and 1% had systemic lupus erythematosus. In a study by Sawant et al., orbital cellulitis was the initial presentation in a child with systemic lupus erythematosus.[15]

In our study, visual acuity was 6/6-6/12 in 72% of patients, 6/18-6/36 in 11%, 6/60-2/60 in 1%, and < 2/60 in 16%. This was similar to a study conducted by Pandian et al., where visual acuity at presentation was better than 6/18 in the adult age group.[12] A high percentage of normal pupillary reflexes (84%) and colour vision (86%) is consistent with findings in orbital cellulitis, where optic nerve involvement is relatively uncommon unless complications arise.[16]

In our study, all patients showed lid and periorbital oedema and ptosis: 28% mild mechanical, 35% moderate (85% mechanical, 15% neurogenic), and 37% severe (61% mechanical, 39% neurogenic). 11% had proptosis. Of these, 65% had normal conjunctiva, and 35% showed chemosis or congestion. 98% had clear corneas. 99% had intact corneal sensations, supporting the universal presence of lid and periorbital oedema and ptosis in most orbital infection studies as hallmark clinical signs. Corneal involvement is rare unless severe neuro-ophthalmic involvement or exposure keratopathy occurs in severe cases, particularly in intensive care unit patients or those with underlying conditions such as Grave's orbitopathy.[17,18]

In this study, 75% of the patients had a normal fundus examination, whereas 24% could not be assessed because of tense periorbital oedema. After the oedema resolved, the fundus appeared normal. Central retinal artery occlusion occurred in 1% of the patients. Garg et al. reported a case of orbital cellulitis complicated by central retinal artery occlusion, with sparing of the cilioretinal artery.[19]

In our study, anterior rhinoscopy in 33% of the patients showed mucoid discharge (56%), eschar (8%), and normal findings (36%). Leukocytosis was observed in 33% of the patients with negative cultures. CT scans in 37% of patients revealed ethmoid and maxillary sinusitis (32%), orbital cellulitis with pansinusitis (43%), fungal sinusitis (11%), and no abnormalities (14%). Patients with preseptal cellulitis (63%) received topical antibiotics and oral fluoroquinolones, those with orbital cellulitis (24%) received topical antibiotics and intravenous ceftriaxone or piperacillin, tazobactam, and metronidazole, those and with fungal infections (12%) received topical antibiotics and intravenous amphotericin B. Most patients (70%) did not require surgery; 24% underwent functional endoscopic sinus surgery, while others underwent evisceration (1%), exenteration (1%), incision and drainage (3%), or sinus surgery with maxillectomy (1%).

Our study's clinical findings align with the literature on orbital infections; leukocytosis despite negative cultures reflects an inflammatory response in orbital infections, particularly post-antibiotic.[20] CT findings show common patterns leading to orbital complications. Treatment followed guidelines: oral antibiotics for preseptal cellulitis, intravenous antibiotics for orbital cellulitis, and amphotericin B for fungal infections.[21,22] Medical management preference and selective surgical interventions in severe cases match documented strategies, supporting clinical decisions.[22]

CONCLUSION

Orbital infections are common in children under 10 years of age, with a male predominance and unilateral involvement. The most common complaints were eyelid swelling, insect bites, and sinusitis. Poor visual outcomes are associated with uncontrolled diabetes, age > 40 years, poor socioeconomic status, superadded fungal infection, and immunocompromised status. Most patients had visual acuity better than 6/12, and lid oedema was the most common clinical feature. Patients with orbital cellulitis may have efferent pupillary defects, impaired colour vision, and total ophthalmoplegia. Computed tomography (CT) was indicated only in patients with orbital cellulitis, with pansinusitis being the most common finding.

The modified Chandler staging system identified most patients with preseptal cellulitis, followed by those with orbital cellulitis and cavernous sinus thrombosis. Patients with preseptal cellulitis respond well to topical antibiotics and oral fluoroquinolones. Hospitalisation and early administration of intravenous antibiotics reduce visual morbidity and complications. Intravenous Amphotericin B was administered to all patients with fungal sinusitis. Surgical interventions included functional endoscopic sinus surgery, maxillectomy, and lid abscess removal. Common causes include lid infections, sinusitis, insect bites, mucormycosis, and trauma.

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