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Isolation and Identification of Pathogens Associated in Orbital Cellulitis

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Abstract

Orbital cellulitis is inflammation of eye tissues behind the orbital septum. It is most commonly caused by an acute spread of infection into the eye socket from either the adjacent sinuses or through the blood. It may also occur after trauma. When it affects the rear of the eye, it is known as retro-orbital cellulitis. The study was carried out to determine the pathogens associated with orbital cellulitis among patients attending the clinic in Our Lady of Lourdes Hospital Complex, Ihiala. The samples were inoculate and cultured on CLED, chocolate and SDA media, after which they are tested further using the gram staining tech, coagulase and catalase test methods to identify the pathogens. The results show that out of the 150 participants examined, 8 (5%) tested positive for orbital cellulitis, while 142 (95%) tested negative by incubation. The findings of this study suggest that orbital cellulitis is a relatively rare condition among patients attending the clinic in Our Lady of Lourdes Hospital Complex, Ihiala. Organisms isolated includes; *Staphylococcus aureus*, *Streptococci spp*, *Pseudomonas aeruginosa*, *Candida albicans*. However, the fact that 8% of the participants tested positive for orbital cellulitis highlights the need for healthcare providers to be aware of the condition and to take prompt action to diagnose and treat it. The results of this study have implications for public health policy and practice, particularly in terms of preventing and managing orbital cellulitis. Healthcare providers should be aware of the risk factors for orbital cellulitis, such as trauma to the face or sinusitis, and should take prompt action to diagnose and treat the condition.

Keywords: Orbital Cellulitis, Bacterial Pathogens, Staphylococcus Aureus, Pseudomonas Aeruginosa, Microbiological Diagnosis

1. Introduction

Orbital cellulitis is inflammation of eye tissues behind the orbital septum. It is most commonly caused by an acute spread of infection into the eye socket from either the adjacent sinuses or through the blood. It may also occur after trauma. When it affects the rear of the eye, it is known as retro-orbital cellulitis [1].

Orbital cellulitis is defined as a serious infection that involves the muscle and fat located within the orbit. It is also sometimes referred to as postseptal cellulitis. Orbital cellulitis does not involve the globe itself. Although orbital cellulitis can occur at any age, it is more common in the pediatric population [2].

The causative organisms of orbital cellulitis are commonly bacterial but can also be polymicrobial, often including aerobic and anaerobic bacteria and even fungal or mycobacteria. The most common bacterial organisms causing orbital cellulitis are Staphylococcus aureus and Streptococci species. Rare cases of orbital cellulitis caused by non-spore-forming anaerobes Aeromonas hydrophila, Pseudomonas aeruginosa, and Eikenella corrodens have also been reported. Fungal pathogens causing invasive orbital cellulitis include Mucorales which causes mucormycosis and Aspergillus which can cause life-threatening invasive orbital infections. In immunocompromised patients with orbital cellulitis, mucormycosis and invasive aspergillosis should be considered as the cause of orbital cellulitis. Mucormycosis affects patients with diabetic ketoacidosis as well as the patients with renal acidosis. Aspergillus infection of the orbit occurs in patients with severe neutropenia or other immune deficiencies, such as HIV infection. Other rare reported cause of orbital cellulitis is mycobacteria, especially *Mycobacterium tuberculosis* [3].

Orbital cellulitis is primarily diagnosed clinically by objective findings on physical examination combined with presenting signs and symptoms. The most important distinguishing feature of orbital cellulitis is the presence of ophthalmoplegia, the presence of pain with eye movement, and/or proptosis. Orbital cellulitis also typically cause eyelid swelling with or without erythema; however, these findings are also seen in another less serious condition called preseptal cellulitis. The diagnosis of orbital cellulitis can be confirmed by imaging modalities such as Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). Due to the controversy surrounding imaging use and the risks of radiation exposure to the pediatric population, there are guidelines and recommendation in place that highlight the indications and aid in the proper use of imaging for diagnosis of orbital cellulitis [4].

The best indicators of orbital cellulitis is a pain with eye movements, proptosis, and ophthalmoplegia with diplopia. Chemosis (conjunctival swelling) is more commonly present in orbital cellulitis; however, it may also be seen occasionally in severe cases of preseptal cellulitis. Fever and peripheral leukocytosis with a predominance of neutrophils are also seen in orbital cellulitis. Eyelid erythema may or may not be present [5].

Treatment of orbital cellulitis includes antibiotics and other supportive therapies. An ophthalmologist and otolaryngologist should also be consulted for proper examination and because, in some cases, surgery may be required. Without prompt diagnosis and proper treatment, the infection of the orbit can progress and extend to the adjacent anatomical locations and result in serious complications. Those complications include loss of vision, subperiosteal abscess, orbital abscess, and intracranial extension of the infection. The choice of antibiotics is broad spectrum regimens aimed at covering for organisms such as *Staphylococus aureus* (including methicillin-resistant *Staphylococus aureus* [MRSA]), Streptococcus pneumoniae, other Streptococci, as well as gram-negative bacilli. The antibiotic regimen should also include coverage for anaerobes when an intracranial extension is suspected. Antifungals are indicated only when a fungal infection is suspected in the appropriate clinical setting. Further details on specific antibiotics will be explained in the diagnosis section. Analgesics such as NSAIDs and acetaminophen can be used alone or in combination to achieve effective pain control in patients with orbital cellulitis [6]. The Aim of study is to Isolate and Identify the pathogens (bacteria and fungi) associated with orbital cellulitis among patients attending eye clinic in Our Lady of Lourdes Hospital Complex, Ihiala.

Orbital cellulitis is defined as a serious infection that involves the muscle and fat located within the orbit. It is also sometimes referred to as postseptal cellulitis. Orbital cellulitis does not involve the globe itself. Although, orbital cellulitis can occur at any age, it is more common in the pediatric population [2].

The causative organisms of orbital cellulitis are commonly bacterial but can also be polymicrobial, often including aerobic and anaerobic bacteria and even fungal or mycobacteria. Orbital cellulitis is primarily diagnosed clinically by objective findings on physical examination combined with presenting signs and symptoms.

2. Materials and Methods

2.1 Materials

- Record book/biro
- Media(Chocolate agar, Cystine-lactose-electrolyte deficient agar, sabraoud dextrose agar)
- incubator
- petridish
- Wireloop
- Bunsen burner
- Sterile swab stick.

2.2 Study area and population

A cross-sectional study was carried out among 150 patients attending eye clinic in Our Lady of Lourdes Hospital Complex,Ihiala Anambra State between June and November, 2024.

2.3 Sample Collection

The verbal consent of the patients were sorted out. They were advised and informed on the sample techniques. A sterile swab stick was used to collect the sample by swapping on the surface of the orbit and then sent to the laboratory for microbiological examination.

2.4 Sample Analysis

The eye swab was inoculated into the CLED, Chocolate and SDA media respectively and they were incubated at 37c for 24hours.

2.5 Identification of Isolates

Gram staining technique

- A smear was fixed in the glass slide by passing it twice on the busen flame.
- VIt was stained with crystal violet for 2 minutes.
- It was washed with water.
- It was stained with a mordant using Lugol's iodine for 2 minutes.
- It was washed with water.
- It was decolourise with acetone for 2 seconds.
- It was washed with water.

- It was counterstained with 0.5% aqueous solution of neutral red.
- It was washed with water, blot dry and examined with oil immersion.

Catalase test
- The colony was emulsified in distilled water on a clean slide placed in a petri dish.
- Two drops of H2O was added and the dish was covered.
- The Gas bubbles indicates a positive reaction.

Coagulase test
- Two drops of saline was place on separate slides.
- The colony was emulsified in each of the drops.
- Undiluted plasma was mixed with one of the drops.
- It was observed for immediate clumping.

3. Results
A total of hundred and fifty(150) participants attending eye clinic in Our Lady of Lourdes Hospital Complex Ihiala were examined for orbital cellulitis during the period of study.
Out of150 samples, 8(5%) yielded growth. The culture on CLED, chocolate and SDA yielded growth of bacterial and fungal species, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Streptococcus spp* and *Candida albicans.*

Table 1: Shows the bacteria and fungal isolates

Sample	No of sample examined	Bacteria	Fungi
Eye swab	150	Staphylococcus aureus	Candida albican
		Pseudomonas aeruginosa	
		Streptococcus spp	

Table 2: Shows the percentage prevalence of pathogens isolated from the studied population

Sample	No of sample examined	No of positive sample	No of negative sample
Eye swab	150	8(5%)	142(95%)

4. Discussion
The results of this study on the prevalence of orbital cellulitis among patients attending the clinic in Our Lady of Lourdes Hospital Complex, Ihiala, show that out of the 150 participants examined, 8 (5%) tested positive for orbital cellulitis, while 142 (95%) tested negative. The overall prevalence of 5% is relatively low compared to other studies on orbital cellulitis. This could be attributed to the fact that the study was conducted in a hospital setting, where patients may have had access to prompt medical attention, thereby reducing the risk of developing orbital cellulitis. The bacterial and fungal species isolated from the positive cultures include Staphylococcus aureus, Pseudomonas aeruginosa, Streptococcus spp, and Candida albicans. These pathogens are commonly associated with orbital cellulitis. Staphylococcus aureus, a Gram-positive bacterium, is a common cause of orbital cellulitis, particularly in children and young adults. Its presence in this study may be attributed to its ability to colonize the nasal passages and skin, making it a frequent cause of infections. Pseudomonas aeruginosa, a Gram-negative bacterium, is an opportunistic pathogen that can cause severe infections, including orbital cellulitis. Its isolation in this study may be due to its ability to thrive in moist environments, such as the eye. Streptococcus spp, a group of Gram-positive bacteria, are also common causes of orbital cellulitis. Their presence in this study may be attributed to their ability to colonize the respiratory tract and skin. Candida albicans, a fungus, is a common commensal organism that can cause opportunistic infections, including orbital cellulitis. Its isolation in this study may be due to its ability to colonize the skin and mucous membranes. The low prevalence of orbital cellulitis in this study may be due to various factors, including the effective use of antibiotics, improved hygiene practices, and the relatively low incidence of trauma or surgery in this population.
However, the presence of these pathogens highlights the importance of proper diagnosis, treatment, and prevention strategies to reduce the risk of orbital cellulitis. Healthcare professionals should be aware of the potential causes of orbital cellulitis and take appropriate measures to prevent and manage the infection.

5. Conclusion
In conclusion, the results of this study show that there is pathogens associated with patience attending eye clinic in Our Lady of Lourdes Hospital Complex, Ihiala, Anambra State Nigeria.is low. The organisms isolated includes; *Streptococcus spp*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*.

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