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Clinical Evaluation of Right Orbital Cellulitis in An Elderly Patient

Lulu Naeluvar[1], Kantika Prinandita[2], Meriana Rasyid[1]

[1]Department of Ophthalmology, Universitas Tarumanagara, Indonesia
[2]Department of Ophthalmology, RSUD Ciawi, Indonesia

ABSTRACT

Orbital cellulitis is a severe infection of the intraorbital tissues that can threaten vision and requires prompt management. This study aims to describe the clinical characteristics, diagnosis, and management of orbital cellulitis in an elderly patient with systemic risk factors. A descriptive clinical approach was employed, collecting data through anamnesis, physical examination, and ophthalmologic assessments including visual acuity, slit-lamp examination, and fundus evaluation, as well as the patient's medical and treatment history. Data were analyzed qualitatively to illustrate the clinical manifestations, diagnosis, and therapeutic interventions. The case involved a 64-year-old male presenting with redness, swelling, pain, tearing, and difficulty opening the right eye for one week, with a history of diabetes mellitus and dental caries. Physical examination revealed palpebral edema, conjunctival and scleral hyperemia, restricted ocular motility, and decreased visual acuity in the right eye. The definitive diagnosis was orbital cellulitis in the right eye, with cataract in the left eye and diabetes mellitus as comorbidities. Management included broad-spectrum topical antibiotics and referral to both ophthalmology and internal medicine specialists for multidisciplinary care. In conclusion, early intervention and accurate clinical diagnosis are essential to prevent severe complications such as subperiosteal abscess, cavernous sinus thrombosis, or permanent vision loss.

Keywords: orbital cellulitis, elderly, diabetes mellitus, multidisciplinary management, intraorbital infection

Correspondence:
Lulu Naeluvar[1]
Tarumanegara University
Email address lulunaeluvar@yahoo.com

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INTRODUCTION

Orbital cellulitis is a serious infection involving the extraocular muscles and orbital adipose tissue within the orbit, and is sometimes referred to as postseptal cellulitis. This condition does not directly involve the globe; however, it may result in sight-threatening and potentially life-threatening complications. Although orbital cellulitis can occur at any age, it is more commonly observed in the pediatric population (Tsirouki et al., 2018).

The causative organisms of orbital cellulitis are predominantly bacterial; however, infections may also be polymicrobial, involving aerobic and anaerobic bacteria, as well as fungi or mycobacteria (Hamed-Azzam et al., 2018). The most frequently reported bacterial pathogens

include *Staphylococcus aureus* and *Streptococcus* species. Rare cases have documented non-spore-forming anaerobic bacteria such as *Aeromonas hydrophila*, *Pseudomonas aeruginosa*, and *Eikenella corrodens* (Hamed-Azzam et al., 2018). Invasive fungal infections, including mucormycosis caused by *Mucorales* and aspergillosis caused by *Aspergillus* species, may result in aggressive orbital involvement with a high mortality risk (American Academy of Ophthalmology, 2011). In immunocompromised patients, fungal infections should be strongly considered, particularly in those with diabetic ketoacidosis, renal acidosis, severe neutropenia, or HIV infection (American Academy of Ophthalmology, 2011). Mycobacterial infections, especially *Mycobacterium tuberculosis*, have also been reported as rare causes of orbital cellulitis (American Academy of Ophthalmology, 2011).

The diagnosis of orbital cellulitis is primarily clinical, based on objective findings from physical examination combined with patient-reported symptoms. Key clinical features that distinguish orbital cellulitis from preseptal cellulitis include ophthalmoplegia, pain with eye movement, and/or proptosis (Hamed-Azzam et al., 2018). Eyelid edema with or without erythema is also commonly observed; however, this finding may also be present in less severe preseptal cellulitis. Diagnostic confirmation can be supported by imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) (Hamed-Azzam et al., 2018). Given concerns regarding radiation exposure, particularly in pediatric patients, guidelines have been established to ensure appropriate imaging indications.

Management of orbital cellulitis involves broad-spectrum antibiotic therapy and supportive care. Early consultation with ophthalmology and otolaryngology specialists is essential for comprehensive evaluation and consideration of surgical intervention when indicated (Hamed-Azzam et al., 2018). Without prompt diagnosis and appropriate treatment, the infection may spread to adjacent anatomical structures, leading to serious complications such as vision loss, subperiosteal abscess, orbital abscess, and intracranial extension (Hamed-Azzam et al., 2018). Empirical antibiotic regimens should provide coverage against S. aureus (including MRSA), Streptococcus pneumoniae, other streptococcal species, and gram-negative bacilli. Anaerobic coverage is required if intracranial spread is suspected. Antifungal therapy should be initiated when fungal infection is suspected based on clinical context. Analgesics, such as NSAIDs or paracetamol, may be administered for pain control (Hamed-Azzam et al., 2018).

The orbital anatomy possesses unique structural features that facilitate the spread of infection from and to surrounding regions. The thin orbital septum acts as a barrier between the eyelid and the orbital cavity; infections anterior to the septum are classified as preseptal cellulitis, whereas infections posterior to the septum include orbital cellulitis, subperiosteal abscess, orbital abscess, and advanced complications such as cavernous sinus thrombosis (Harrington, 2016).

The lamina papyracea, a thin bony plate separating the orbit from the ethmoid sinus and maxillary sinus, frequently serves as a pathway for infection due to the presence of neurovascular defects and foramina. Infection may spread into the medial subperiosteal space, making subperiosteal abscess secondary to acute sinusitis most commonly located along the medial orbital wall. Children are at increased risk due to thinner bony walls, incomplete suture closure, and larger vascular foramina (Tsirouki et al., 2018).

The valveless orbital venous system also facilitates both anterograde and retrograde spread of infection. Venous drainage from the midface and paranasal sinuses primarily flows into the orbital veins and subsequently into the pterygoid plexus or cavernous sinus. Cavernous sinus infection may affect cranial nerves III, IV, V, and VI, the internal carotid artery, and orbital sympathetic nerves, with possible extension to the pituitary gland, meninges, and parameningeal spaces. Direct venous and lymphatic connections without valves enable retrograde thrombophlebitis and hematogenous spread from distant infectious foci (Hamed-Azzam et al., 2018).

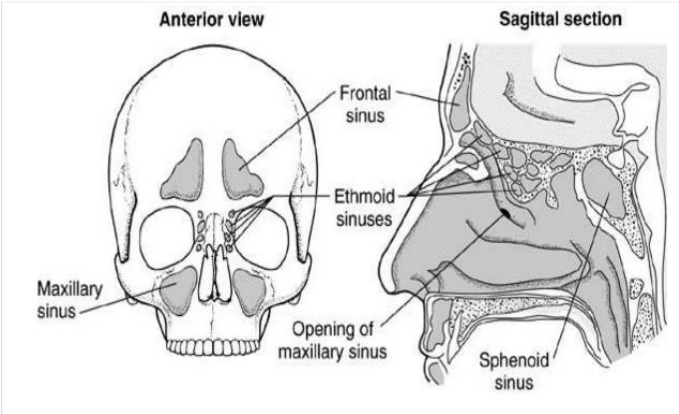

Figure 1. Paranasal sinuses

Orbital cellulitis is a suppurative inflammation of the intraorbital connective tissue posterior to the orbital septum. It is rarely a primary orbital disease and is most commonly caused by pathology of the paranasal sinuses, particularly the ethmoid sinus. Orbital cellulitis may lead to blindness; therefore, immediate treatment is required. Although it may occur at any age, it is more frequently observed in children aged 2–10 years. In pediatric patients, orbital cellulitis commonly originates from sinus infection and is frequently caused by Haemophilus influenzae. Other causative organisms include Staphylococcus aureus, Streptococcus pneumoniae, and Streptococcus pyogenes. Fungal organisms such as Mucor and Aspergillus may also cause orbital cellulitis (Tsirouki et al., 2018; Hamed-Azzam et al., 2018).

Orbital cellulitis is a suppurative inflammatory condition affecting the connective tissue surrounding the eye and is generally caused by normal skin flora, fungi, or sarcoidosis. The pathogenesis may involve several mechanisms, including infection associated with the paranasal sinuses particularly the ethmoid sinus extension of preseptal cellulitis through the orbital septum, local spread from dacryocystitis, midfacial infection, or odontogenic infection. Dental infections may lead to orbital cellulitis via maxillary sinusitis. Hematogenous spread from bacteremia, such as that associated with otitis media or pneumonia, penetrating trauma within 72 hours, and postoperative infection following retinal, globe, or lacrimal surgery have also been reported (American Academy of Ophthalmology, 2011).

The thin and porous medial orbital wall contains numerous valveless blood vessels and nerves, as well as natural defects such as Zuckerkandl dehiscences. This combination of thin bone, neurovascular foramina, and natural defects provides a direct pathway for infectious material to spread from the ethmoid air cells into the medial orbital subperiosteal space. Subperiosteal abscesses most commonly occur along the medial orbital wall. The relatively loose attachment of the periorbita to the medial wall further facilitates the lateral, superior, or inferior spread of purulent material within the subperiosteal space (American Academy of Ophthalmology, 2011).

Venous drainage from the midface, including the paranasal sinuses, occurs primarily through valveless orbital veins, allowing infection to spread both anterogradely and retrogradely. Infection may also enter the orbit directly through trauma, whether accidental or surgical, involving the skin or paranasal sinuses

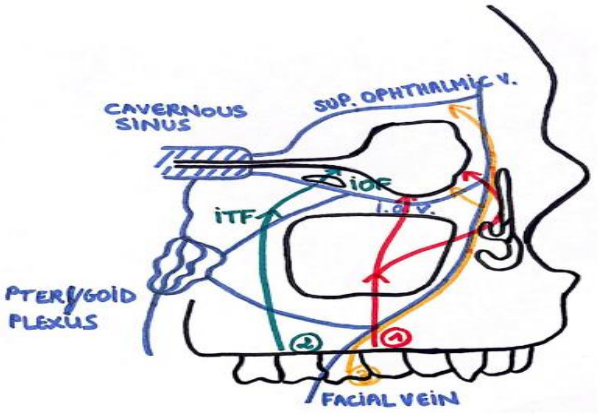

Figure 2. Distribution pathways of odontogenic orbital cellulitis

Orbital cellulitis is classified into several categories. Preseptal cellulitis is an infection anterior to the orbital septum, characterized by eyelid swelling, erythema, and pain without ophthalmoplegia, and often represents an early stage of ethmoid sinusitis. Orbital cellulitis occurs when the infection extends beyond the septum and involves the orbital soft tissues, resulting in decreased visual acuity, proptosis, chemosis, ophthalmoplegia, and diplopia. Subperiosteal abscess is characterized by pus accumulation along the lamina papyracea, displacing the globe contralaterally and causing decreased vision, proptosis, chemosis, ophthalmoplegia, and exophthalmos. Orbital abscess presents with more severe manifestations, including marked proptosis, chemosis, ophthalmoplegia, fever, pain, and significant vision loss. Progression may lead to suspected cavernous sinus thrombosis, indicated by severe proptosis, pupillary abnormalities (mydriasis or miosis), relative afferent pupillary defect (RAPD), altered consciousness, and meningeal signs (American Academy of Ophthalmology, 2011; Harrington, 2016).

Clinical manifestations of orbital cellulitis include high fever, typically exceeding 38.9°C, edema of the upper and lower eyelids accompanied by chemosis and tenderness, conjunctival hyperemia with proptosis or exophthalmos, painful and restricted ocular movements, and decreased visual acuity.

Figure 3. Clinical manifestations of orbital cellulitis

The diagnosis of orbital cellulitis is established based on findings from patient history, physical examination, and supportive investigations. Physical examination typically reveals eyelid edema and erythema, proptosis, painful ophthalmoplegia, and optic nerve dysfunction.

Supportive investigations may include complete blood count, sinus and orbital radiography, CT scan and MRI of the sinuses, orbit, and brain, orbital ultrasonography, lumbar puncture, and culture of ocular secretions, nasal discharge, and throat swabs to identify the source of infection (Sagiv et al., 2018).

Prevention of orbital cellulitis includes immunization with the Haemophilus influenzae type b (HiB) vaccine in children and early evaluation and treatment of sinus and dental infections to prevent orbital spread. Management includes antibiotic therapy such as intravenous ceftazidime 1 g every 8 hours combined with oral metronidazole 500 mg for anaerobic coverage, or intravenous vancomycin as an alternative in patients with penicillin allergy. Antibiotic therapy should be continued until the patient has been afebrile for at least four days, with optic nerve function monitored every four hours through pupillary reaction, visual acuity, color vision, and light reflex assessment. Additional investigations include leukocyte count, blood cultures, and CT imaging of the orbit, paranasal sinuses, and brain to exclude subperiosteal abscess. Lumbar puncture is indicated if meningeal or cerebral involvement is suspected. Surgical intervention is indicated in patients who fail to respond to antibiotics, have subperiosteal or intracranial abscesses, or present with atypical imaging findings requiring biopsy (Sagiv et al., 2018).

Complications of orbital cellulitis may involve ocular, orbital, and systemic systems. Ocular complications include optic nerve infarction, scleral infarction, choroidal and retinal infarction, which may result in uveitis and secondary glaucoma. Orbital complications include subperiosteal abscess and orbital abscess. Systemic complications may include parotid abscess, intracranial involvement, and septicemia, which can significantly worsen patient outcomes (James et al., 2018).

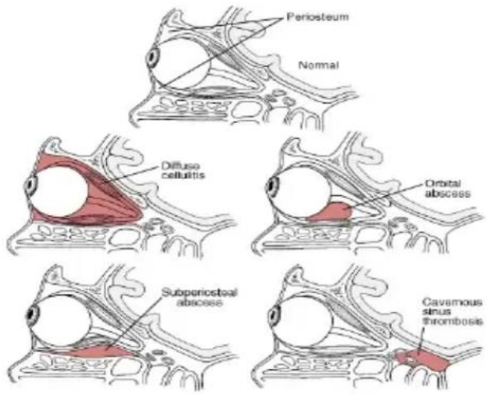

Figure 4. Complications of orbital cellulitis

Clinical diagnosis in elderly patients is also more challenging because symptoms may be atypical or less pronounced compared to younger patients. Pain, fever, and inflammatory signs may be subtle, leading to delays in presentation and initiation of treatment. This diagnostic delay significantly increases morbidity, particularly the risk of optic nerve damage and permanent visual impairment.

Given the aging population worldwide, including in developing countries, the clinical burden of orbital cellulitis in elderly patients is likely to increase. However, most existing literature and clinical guidelines are heavily based on pediatric populations, and there remains limited evidence focusing specifically on elderly patients regarding risk factors, clinical presentation, complications, and outcomes.

Therefore, this study aims to describe and analyze the clinical characteristics, predisposing factors, complications, and outcomes of orbital cellulitis in elderly patients, and to identify factors associated with severe complications and poor prognosis in this age group. By focusing on elderly

patients, this study seeks to contribute to improved early recognition, risk stratification, and management strategies tailored to this vulnerable population.

METHOD

This study employed a descriptive study design with a clinical approach to characterize cases of orbital cellulitis. The study aimed to describe clinical presentation, diagnostic processes, management strategies, and outcomes in elderly patients.

Study Site and Period

The study was conducted at the Ophthalmology and Otorhinolaryngology Departments of a tertiary referral hospital in Indonesia. Data collection was performed retrospectively and prospectively from medical records and direct clinical evaluation between January 2022 and December 2024.

Study Participants

The study population consisted of elderly patients diagnosed with orbital cellulitis. Inclusion criteria were patients aged 60 years and older with a clinical and radiological diagnosis of orbital cellulitis. Exclusion criteria included patients with preseptal cellulitis, orbital tumors, traumatic orbital infections, or incomplete medical records. A total of patients meeting the inclusion criteria were included in the study.

Data Collection and Research Flow

Data were collected through a structured clinical assessment and medical record review. The research flow consisted of the following stages:

1. Identification of eligible patients based on diagnosis and age criteria;
2. Collection of demographic data, medical history, comorbidities, and presenting symptoms;
3. Ophthalmologic examination including visual acuity testing, slit-lamp examination, pupillary reflex evaluation, color vision testing, and funduscopy;
4. Radiological evaluation using CT scan of the orbit and paranasal sinuses when indicated;
5. Documentation of management strategies including antibiotic therapy, surgical intervention, and supportive care;
6. Monitoring of clinical outcomes and complications.

Data Analysis

Data were analyzed descriptively and qualitatively. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and ranges. Clinical patterns, risk factors, management strategies, and outcomes were interpreted and compared with existing literature to identify similarities and differences.

RESULT

In this study, the examined patient was a 64-year-old male, Muslim, residing in Padurenan Village, who was evaluated on May 2, 2024, by Lulu Naeluvar. Data collection was conducted through comprehensive history taking, physical examination, and ophthalmologic investigations, including visual acuity assessment, slit-lamp examination, and fundus oculi evaluation. In addition, medical history, treatment history, risk factors, sex, and age were systematically recorded. Qualitative analysis was performed to describe the clinical characteristics,

manifestations, diagnosis, and management of orbital cellulitis, which were subsequently compared with relevant literature.

The patient presented with a chief complaint of redness and swelling of the right eye for one week, accompanied by difficulty opening the eye, pain, a burning sensation, and excessive tearing. These symptoms were preceded by fever one day prior to the onset of ocular redness. The patient also reported blurred vision in both eyes and the presence of ocular discharge. His medical history revealed type 2 diabetes mellitus under treatment and a history of dental caries. There was no history of hypertension, asthma, or similar conditions in the family. An environmental risk factor was identified, as the patient had instilled water soaked with butterfly pea flowers (*Clitoria ternatea*) into his eyes one week prior to symptom onset.

Physical examination demonstrated that the patient was in a generally stable condition with good consciousness. Vital signs showed a blood pressure of 110/90 mmHg, heart rate of 92 beats per minute, body temperature of 36.5°C, and respiratory rate of 23 breaths per minute. Other systemic examinations, including the head and neck, oral cavity, chest, cardiovascular, respiratory, and abdominal systems, were not performed. Examination of the extremities revealed no edema, capillary refill time of less than two seconds, and warm peripheral extremities.

Figure 5. Initial presentation at the ophthalmology outpatient clinic

Figure 6. Clinical improvement after one week of treatment

Figure 5 illustrates the patient's ocular condition at the initial visit to the ophthalmology clinic, while Figure 6 demonstrates clinical improvement after one week of treatment. These findings provide an initial overview of the clinical characteristics and therapeutic response in a patient with orbital cellulitis associated with diabetes mellitus and exposure of the eye to organic material.

DISCUSSION

Orbital cellulitis is a suppurative inflammation of the intraorbital connective tissue located posterior to the orbital septum (Tsirouki et al., 2018; Hamed-Azzam et al., 2018). It rarely presents as a primary orbital disease and is most commonly caused by infection of the paranasal sinuses, particularly the ethmoid sinus (Tsirouki et al., 2018; Hamed-Azzam et al., 2018). Orbital cellulitis can lead to serious complications, including blindness, and therefore requires prompt medical intervention. Predisposing factors such as diabetes mellitus (DM) increase susceptibility to ocular infections and delay the healing process (Hamed-Azzam et al., 2018). The pathogenesis of orbital

cellulitis may involve several mechanisms, including sinus-related infection, local extension from preseptal cellulitis, midfacial infection, odontogenic infection via the maxillary sinus, hematogenous spread from bacteremia, penetrating trauma, or surgical procedures involving the globe or lacrimal system (American Academy of Ophthalmology, 2011).

The reported case involved a 64-year-old male who presented with redness and swelling of the right eye accompanied by yellow purulent discharge on the eyelid for one week. The history revealed that the patient had instilled butterfly pea flower water into his eye one day before the onset of fever, which may have served as a predisposing factor for secondary infection. In addition, the presence of diabetes mellitus constituted a significant systemic risk factor, increasing vulnerability to ocular infection and delaying recovery. A positive history related to the sinonasal or dental region suggested a potential additional source of infection, such as sinusitis or odontogenic infection, which may have contributed to the development of orbital cellulitis.

Physical examination revealed limited ocular motility, palpebral edema, conjunctival and scleral hyperemia, ocular discharge, and ciliary and conjunctival injection in the right eye (OD), supporting the diagnosis of orbital cellulitis. Corneal edema and the inability to clearly identify the anterior chamber indicated severe inflammation and possible elevation of intraorbital pressure. Pupillary function remained intact with a positive light reflex, suggesting no significant optic nerve involvement at the initial assessment. The left eye (OS) demonstrated a mature senile cataract, accounting for chronic visual impairment, but showed no signs of active inflammation.

The definitive diagnoses established were orbital cellulitis of the right eye (OD), mature senile cataract of the left eye (OS), and diabetes mellitus. Differential diagnoses considered included conjunctivitis and proptosis, which are important to evaluate during the initial assessment. The diagnosis of orbital cellulitis was based on the presence of classic clinical features, including pain, palpebral edema, hyperemia, restricted ocular movements, and purulent discharge, which distinguish it from simple conjunctivitis.

Management consisted of topical broad-spectrum antibiotic therapy, including levofloxacin 0.5% administered every hour and gentamicin 0.3% administered four times daily to the right eye, aimed at controlling local bacterial infection. A multidisciplinary approach was implemented through referral to an internal medicine specialist for diabetes management, as optimal glycemic control is essential to support healing and prevent further complications. Referral to an ophthalmologist was also required for further evaluation and close monitoring of visual function.

The prognosis was described using classical Latin terminology as follows:

1. **Right eye (OD):** *ad vitam bonam* (good life prognosis), *ad functionam dubia ad bonam* (visual function possibly doubtful to good), and *ad sanationam dubia ad bonam* (healing prognosis uncertain to good, depending on therapeutic response).
2. **Left eye (OS):** *ad vitam bonam*, *ad functionam bonam*, and *ad sanationam bonam*, indicating that despite the presence of cataract, overall ocular safety and function could be preserved following further evaluation.

Orbital cellulitis in elderly patients represents a distinct clinical entity compared to cases in pediatric or younger adult populations. While orbital cellulitis is more frequently reported in children due to anatomical and immunological factors, cases in older adults are associated with different risk profiles, disease progression, and outcomes. Elderly patients are more likely to present with systemic comorbidities such as diabetes mellitus, chronic sinusitis, immunosuppression, and vascular disease, all of which increase susceptibility to infection and impair the inflammatory and healing response.

In this case, the patient's age (64 years) and the presence of diabetes mellitus played a significant role in both disease development and progression. Diabetes is known to impair

neutrophil function, reduce tissue perfusion, and delay wound healing, thereby increasing the risk of severe infection and complications such as abscess formation and optic nerve ischemia. Furthermore, age-related immune dysfunction (*immunosenescence*) may blunt early inflammatory responses, leading to delayed presentation and diagnosis in elderly patients. This may explain why the patient developed significant orbital inflammation within a relatively short period.

Unlike pediatric orbital cellulitis, which is most commonly associated with acute ethmoid sinusitis, elderly patients often have multiple potential sources of infection, including chronic rhinosinusitis, dental infections, skin breaches, or iatrogenic causes. In this case, the instillation of butterfly pea flower water into the eye may have disrupted the ocular surface barrier, facilitating bacterial invasion, while possible sinonasal or odontogenic infection could have served as an additional infectious focus.

Elderly patients are also at higher risk for severe complications, including optic nerve ischemia, intracranial extension, septicemia, and permanent visual loss. The preservation of pupillary reflexes and absence of early optic nerve involvement in this patient were favorable prognostic signs; however, close monitoring remained essential given the increased vulnerability of elderly patients to rapid deterioration.

This case highlights the importance of maintaining a high index of suspicion for orbital cellulitis in elderly patients presenting with periorbital swelling, pain, and ocular motility restriction, especially in the presence of systemic risk factors such as diabetes. Early recognition, prompt antibiotic therapy, multidisciplinary management, and strict control of underlying comorbidities are crucial to improving outcomes in this population.

CONCLUSION

Orbital cellulitis is a serious infection that requires early diagnosis and prompt treatment to prevent severe complications such as abscess formation, cavernous sinus thrombosis, and permanent visual loss. Clinical features such as edema, chemosis, proptosis, and decreased visual acuity should raise suspicion, particularly in patients with a history of sinus infection, dental infection, or immunocompromised conditions.

RECOMMENDATION

Supportive investigations such as computed tomography (CT) scans are essential to confirm the location and severity of infection. Appropriate management includes timely empirical antibiotic therapy, careful monitoring for complications, and multidisciplinary collaboration. This case highlights the importance of increasing awareness of the early signs of orbital cellulitis to ensure timely intervention, thereby minimizing morbidity and mortality.

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