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Multidisciplinary Management of Odontogenic Infections: Integrating Dental Intervention, Antimicrobial Therapy, and Nursing Care-An Updated Review.

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Abstract

Background: Odontogenic infections (OIs) are common bacterial conditions originating from dental structures and may progress to involve facial and cervical fascial spaces. Their clinical severity and outcomes are influenced by socioeconomic circumstances, systemic comorbidities, lifestyle factors, and the anatomical extent of infection. Severe cases may require surgical intervention, hospitalization, and multidisciplinary management.

Aim: To examine the clinical characteristics, risk factors, diagnostic findings, treatment approaches, and outcomes of patients with OIs, with particular emphasis on factors associated with disease severity and prolonged hospitalization.

Methods: This review discusses the epidemiological and clinical characteristics of OIs, including socioeconomic determinants, educational attainment, harmful lifestyle habits, systemic comorbidities, clinical manifestations, and fascial space involvement. It also addresses diagnostic investigations, source control, pharmacological treatment, imaging indications, and factors influencing hospitalization.

Results: OIs demonstrated considerable variation in clinical presentation and severity. Lower socioeconomic status, limited educational attainment, harmful lifestyle habits, and greater systemic comorbidity were associated with prolonged hospitalization. Patients with higher Charlson Comorbidity Index scores experienced longer hospital stays. Mandibular posterior teeth were frequently identified as infection sources, while high-risk fascial space involvement was associated with more complicated clinical courses and greater utilization of computed tomography. Extraction and drainage represented common treatment approaches, supported by analgesics, anti-inflammatory agents, and antibiotics when indicated. Clinical examination and timely source control remained central to effective management.

Conclusion: OIs require comprehensive assessment because their progression depends on interacting social, systemic, anatomical, and clinical factors. Early recognition, appropriate imaging, effective source control, and individualized treatment strategies are essential for improving outcomes and reducing hospitalization.

Keywords: Odontogenic infections; dental abscess; fascial spaces; socioeconomic factors; comorbidities; antimicrobial therapy; surgical drainage; hospitalization.

Introduction

Odontogenic infections (OIs) are bacterial infections that originate from dental tissues or their supporting structures, including the periodontal tissues, alveolar bone, mandible, maxilla, and adjacent anatomical spaces.[1] They represent a common clinical problem in dentistry and oral and maxillofacial surgery. Most cases develop as a consequence of dental caries, pulpal necrosis, periodontal disease, periapical pathology, or complications associated with dental procedures. Although many infections remain localized and respond to appropriate dental treatment, others progress into the surrounding facial and cervical tissues, producing conditions that require surgical intervention and hospital-based care. OIs therefore represent an important clinical concern because their severity ranges from localized dental abscesses to life-threatening deep neck infections and systemic sepsis.[2,3] The development of OIs is closely

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associated with the microbial environment of the oral cavity. The oral microbiota contains a diverse population of microorganisms that normally coexist within the oral ecosystem. Disruption of local tissue integrity, particularly through dental caries, periodontal destruction, trauma, or pulpal exposure, allows microorganisms to invade deeper tissues. These infections are generally polymicrobial and involve combinations of aerobic, facultative anaerobic, and obligate anaerobic bacteria. The composition of the microbial population may change as the infection progresses from an initially localized dental process to involvement of deeper tissues. Reduced oxygen tension within infected and necrotic tissues favors the growth of anaerobic organisms, contributing to the complexity of established abscesses. The resulting inflammatory response produces tissue edema, pain, increased local temperature, erythema, and accumulation of purulent material.

The clinical presentation of OIs depends on the anatomical origin, extent of tissue involvement, virulence of the causative microorganisms, and immune response of the affected individual. Early infections commonly present with localized dental pain, tenderness, gingival swelling, and sensitivity during mastication. As infection progresses, patients may develop facial swelling, erythema, fever, lymphadenopathy, and restricted mouth opening. More extensive infections may involve the masticator, submandibular, sublingual, buccal, canine, parapharyngeal, or retropharyngeal spaces. Clinical manifestations associated with advanced disease include trismus, dysphagia, odynophagia, dysphonia, dyspnea, and elevation of the floor of the mouth.[1] These findings are particularly important because they may indicate extension into anatomical spaces that threaten the airway. In severe cases, infection may spread through fascial planes, producing extensive cervical inflammation, mediastinal involvement, septic complications, and hemodynamic instability. Consequently, early recognition and appropriate management are essential to prevent disease progression and reduce mortality. Several patient-related and socioeconomic factors contribute to the development and progression of OIs. Inadequate oral hygiene, untreated dental caries, limited access to dental services, low socioeconomic status, and insufficient preventive dental care increase the likelihood of developing dental infections. Dietary habits, particularly frequent consumption of fermentable carbohydrates, also contribute to dental caries and subsequent pulpal infection. Socioeconomic disadvantage may further delay diagnosis because patients may seek professional care only after pain becomes severe or facial swelling develops. Previous research has identified associations between oral health outcomes and socioeconomic indicators, including income, education, and broader measures of human development.[4] Other factors that may increase the risk of severe infection include diabetes mellitus, immunosuppression, malnutrition, advanced age, and underlying systemic disease. These conditions can impair host defense mechanisms, alter inflammatory responses, and complicate recovery. However, severe OIs may also occur in otherwise healthy individuals, emphasizing the importance of clinical assessment rather than relying exclusively on recognized risk factors.

The diagnosis of OIs requires integration of medical and dental history, clinical examination, laboratory investigations when indicated, and appropriate imaging. Historically, diagnosis relied primarily on physical examination, conventional radiography, and surgical exploration. These approaches remain relevant for identifying dental sources and evaluating localized infections. However, the increasing availability of advanced imaging has improved the assessment of infections involving complex facial and cervical anatomical spaces. Computed tomography (CT), particularly contrast-enhanced CT (CECT), is widely used when deep space infection, extensive inflammation, or abscess formation is suspected. It provides information about the anatomical extent of infection, the presence of fluid collections, surrounding tissue involvement, and potential complications. Nevertheless, routine CT examination in every patient with an odontogenic infection remains controversial because imaging should be guided by clinical findings and its expected influence on management.[5–8] Certain clinical findings indicate the need for advanced imaging and urgent specialist assessment. These include mouth opening below 35 mm, dysarthria, periorbital swelling, inability to palpate the mandibular border, dysphagia, odynophagia, dyspnea, elevation of the floor of the mouth, cervical swelling, and oropharyngeal edema.[8] Such manifestations may suggest involvement of deep anatomical spaces or impending airway compromise. Clinical examination should therefore evaluate the location and extent of swelling, mouth opening, swallowing ability, speech, respiratory function, and the condition of the oral cavity. Laboratory investigations, including complete blood count and inflammatory markers, may support the assessment of systemic inflammation. Blood cultures may be appropriate in patients with suspected bacteremia or sepsis, while microbiological examination of drained material may help guide antimicrobial therapy in selected severe or complicated infections.

Other imaging modalities, including magnetic resonance imaging (MRI) and ultrasonography, may provide additional diagnostic information. MRI offers detailed soft tissue characterization and can help distinguish inflammatory changes from other pathological

processes. It is also less affected by some metallic artifacts than CT, which may be relevant in patients with dental restorations.[6,9] However, MRI generally requires longer acquisition times, greater financial resources, and patient cooperation. These limitations may restrict its use in emergency settings. Ultrasonography offers a noninvasive method for evaluating superficial facial and cervical collections. It can help distinguish cellulitis from localized abscesses and may support the assessment of treatment response following drainage.[6,10] Its limitations include operator dependence, restricted visualization of deeper anatomical structures, and variable availability of trained personnel. Therefore, the choice of imaging modality should reflect the clinical presentation, suspected anatomical involvement, patient stability, and available resources. An important aspect of OI management is determining whether the patient requires outpatient treatment or hospital admission. Localized dentoalveolar abscesses in otherwise healthy patients may often be managed in dental clinics through appropriate source control and follow-up. Outpatient treatment is particularly suitable when the infection remains confined to a limited anatomical area, the patient can maintain oral intake, and there are no signs of systemic involvement or airway compromise.[11] In contrast, infections involving deep fascial spaces, significant facial or cervical swelling, dehydration, severe trismus, dysphagia, odynophagia, or systemic toxicity require more intensive assessment. Hospitalization should also be considered in patients with important comorbidities, immunosuppression, rapidly progressing infection, or inadequate response to initial treatment. Patients with suspected airway compromise require urgent multidisciplinary management involving oral and maxillofacial surgeons, anesthesiologists, emergency physicians, and other relevant specialists.

The fundamental principle of OI treatment is early elimination of the source of infection. Antibiotics alone are insufficient when an infected tooth, necrotic pulp, or established abscess remains untreated. Source control may involve tooth extraction, endodontic treatment, incision and drainage, or a combination of these procedures, depending on the clinical condition and the possibility of preserving the affected tooth.[3,6] Drainage reduces the accumulation of purulent material, decreases tissue pressure, and facilitates the resolution of infection. Delayed intervention may permit further spread through adjacent fascial spaces and increase the risk of systemic complications. Antibiotic therapy serves as an adjunct when there is spreading infection, systemic involvement, deep space disease, or relevant patient-related risk factors. Selection should consider the likely microbial spectrum, disease severity, allergy history, local resistance patterns, and individual patient characteristics. Antimicrobial stewardship is also important to reduce unnecessary antibiotic exposure and limit the development of bacterial resistance. The management of OIs requires coordinated contributions from dentists, pharmacists, and nursing professionals. Dentists and oral and maxillofacial surgeons identify the source of infection, assess anatomical involvement, and perform definitive dental or surgical treatment. Pharmacists contribute to antimicrobial selection, dose optimization, evaluation of drug interactions, assessment of allergies, and monitoring of adverse effects. Nursing professionals support early recognition of deterioration, assessment of pain and vital signs, administration of prescribed medications, monitoring of hydration and nutritional status, and postoperative care. In hospitalized patients, nursing assessment of respiratory function, swallowing, consciousness, and changes in facial or cervical swelling is particularly important. Patient education also contributes to prevention by emphasizing oral hygiene, regular dental examinations, timely treatment of dental caries, and adherence to prescribed therapy.

Despite advances in diagnostic imaging, surgical techniques, and antimicrobial treatment, OIs remain associated with considerable clinical variability. Outcomes depend on early diagnosis, anatomical extent, microbial characteristics, patient comorbidities, and the timing of definitive source control. Severe infections may require repeated surgical procedures, intensive care admission, and prolonged hospitalization. Therefore, an effective approach must integrate prevention, accurate clinical assessment, appropriate imaging, timely surgical intervention, rational antimicrobial therapy, and coordinated postoperative care. Examining these factors provides a basis for improving clinical decision-making and strengthening collaboration among dental, pharmacy, and nursing professionals in the management of odontogenic infections.



Figure-1: Overview of Odontogenic Infections.

Risk Factors

The clinical progression and outcomes of odontogenic infections are influenced by socioeconomic conditions, educational background, lifestyle behaviors, and pre-existing medical conditions. Socioeconomic status may affect access to dental services, oral hygiene practices, early diagnosis, and timely treatment. In the reviewed study, socioeconomic characteristics were estimated using patients' residential ZIP codes and corresponding demographic information. The average monthly family income was US$708, according to data obtained from the Brazilian Institute of Geography and Statistics (IBGE). Among the study population, 401 patients (69.98%) lived in areas with income levels above this average, whereas 172 patients (30.02%) were associated with lower income levels. A clear relationship was observed between income and hospitalization duration. Patients from higher-income areas had a mean hospital stay of 1.88 days, compared with 3.81 days among those from lower-income areas. Lower income was significantly associated with an increased risk of a more complicated clinical course ($p = 0.003$, RR = 1.66). It was also associated with greater requirements for surgical exploration and treatment, as well as higher prevalence of smoking and alcohol consumption. Educational attainment represented another socioeconomic factor associated with disease severity. Although the overall literacy level in the study population was relatively high, patients from areas with lower educational indicators experienced different clinical outcomes. The mean hospitalization period was 2.0 days among patients with lower educational attainment, compared with 3.0 days among those with higher educational indicators. Prolonged hospitalization occurred in 51% of patients in the less educated group, compared with 21.8% in the more educated group. This association was statistically significant ($p = 0.036$, RR = 1.92), suggesting that limited education may contribute to delayed healthcare utilization and more advanced infection at presentation. Lower educational attainment was also associated with deeper fascial space involvement, increased need for invasive treatment, and higher prevalence of smoking and alcohol consumption [6-11].

The Human Development Index (HDI) provides an additional measure of socioeconomic conditions by incorporating indicators related to education, income, and life expectancy. The national Brazilian HDI was 0.754, whereas the study population had a mean value of 0.788. Approximately 82.89% of patients belonged to areas with an HDI above the national average. Patients from higher-HDI areas had a mean hospital stay of 1.92 days, and 20.84% experienced prolonged hospitalization. In comparison, patients from lower-HDI areas had a mean stay of 3.38 days, with prolonged hospitalization affecting 36.73%. The difference was statistically significant ($p = 0.04$, RR = 1.76). Lower HDI was also associated with more aggressive treatment requirements and greater exposure to smoking and alcohol consumption. Lifestyle-related risk factors further contributed to adverse clinical outcomes. Alcohol consumption was the most frequently reported harmful behavior, affecting 23.90% of patients, followed by smoking at 20.76% and illicit drug use at 7.67%. Thirty-nine patients (6.80%) reported simultaneous use of alcohol, tobacco, and illicit drugs, while 15.70% reported combined alcohol consumption and smoking. Each evaluated addictive behavior was significantly associated with prolonged hospitalization. These findings suggest that substance use may contribute to poorer outcomes through its effects on general health, immune function, treatment adherence, and healthcare-seeking behavior. Pre-existing systemic conditions were evaluated using the Charlson Comorbidity Index (CCI), which estimates the burden of comorbid diseases and their potential influence on clinical outcomes. Most patients (70.85%) had a CCI score below one point, indicating a relatively low comorbidity burden. Moderate systemic comorbidity was identified in 23.38%, while 5.77% had more substantial health conditions with scores of four points or higher. The most frequently documented comorbidities included vascular disease (17.21%), controlled diabetes mellitus (10.69%), and mild liver disease (7.06%). A CCI score of four or higher was significantly associated with prolonged hospitalization ($p = 0.003$, RR = 2.64). These patients experienced an average hospitalization period approximately 260% longer than those with a CCI score of zero. Collectively, these findings demonstrate that socioeconomic disadvantage, limited education, harmful lifestyle behaviors, and systemic comorbidities are important factors associated with the severity and treatment outcomes of odontogenic infections [1-11].

Signs and Symptoms

The clinical assessment of odontogenic infections is essential for identifying the primary source, determining the extent of tissue involvement, and selecting an appropriate treatment strategy. Accurate recognition of presenting signs and symptoms allows clinicians to distinguish localized dental infections from conditions involving deeper facial and cervical anatomical spaces. In the reviewed study, clinical manifestations were documented in all patient records. The most frequently recorded finding was localized swelling, reported in 94.24% of patients. Tenderness on palpation was observed in 84.99%, while toothache occurred in 72.25%. Restricted mouth opening was also common, affecting 43.97% of the study population. These findings reflect the inflammatory response associated with infection, including tissue edema, accumulation of inflammatory exudate, and irritation of adjacent

structures. In contrast, sensory disturbances were uncommon at initial assessment (0.34%). Tachycardia and tachypnea were documented in 0.69% and 5.06% of patients, respectively. Although these systemic manifestations were less frequent, their presence may indicate more extensive infection or physiological stress and should be considered during clinical evaluation. Identification of the causative dental source is a central component of diagnosis and treatment. In 95.4% of the reviewed medical records, the suspected origin of infection was established during the initial consultation. The mandibular right first molar was the most frequently implicated tooth, accounting for 15.70% of cases. The mandibular right second molar followed at 11.16%, while the mandibular right third molar represented 8.9%. The predominance of mandibular molars may be related to their susceptibility to dental caries, pulpal infection, and subsequent spread into adjacent anatomical spaces. Establishing the responsible tooth is important because definitive treatment requires elimination of the primary source through extraction or appropriate endodontic intervention [6-11].

The anatomical distribution of infection provides additional information about clinical severity. The most frequently affected spaces included the buccal space (56.51%), the combined buccal/palatal region (54.30%), and the submandibular space (44.10%). Involvement of these spaces may produce facial swelling, tenderness, restricted jaw movement, and difficulty with oral functions. Submandibular involvement requires particular attention because infection may extend into neighboring sublingual and deeper cervical spaces, potentially compromising the airway. According to the anatomical risk classification described by Miloro et al. (2007), patients were categorized according to involvement of low-, moderate-, high-, or extreme-risk spaces. Most patients had moderate-risk infections (68.76%), followed by low-risk involvement (20.94%), high-risk disease (10.12%), and extreme-risk involvement (0.17%). The anatomical classification was associated with hospitalization duration. The reported proportion of prolonged hospitalization in the low-risk group was 2.5%, with a statistically significant association ($p = 0.03$). Among patients with high-risk space involvement, 70.68% experienced hospitalization exceeding twice the average duration ($p = 0.024$). These findings demonstrate the importance of anatomical assessment in predicting disease progression and healthcare requirements. Clinical evaluation should therefore include the location of swelling, mouth opening, swallowing ability, respiratory status, and examination of the floor of the mouth and cervical tissues. Early recognition of high-risk anatomical involvement supports timely referral, imaging, surgical intervention, and airway assessment [10][11].

Treatment and Outcome

The management of odontogenic infections depends on the severity of clinical manifestations, the anatomical spaces involved, the patient's general health, and the presence of systemic complications. In the reviewed population, most patients presented with mild-to-moderate disease, which influenced the selection of treatment and the need for hospitalization. All patients included in the study demonstrated complete clinical improvement following treatment and subsequent follow-up. This outcome emphasizes the importance of identifying the source of infection and providing appropriate local and pharmacological management. The most frequently selected treatment involved tooth extraction combined with surgical drainage, accounting for 30.63% of cases. Drainage followed by referral for endodontic treatment was used in 23.89%, while drainage with subsequent referral for extraction represented 19.9%. These approaches reflect the central role of source control in managing odontogenic infections. Extraction removes the infected tooth when preservation is not feasible, whereas endodontic treatment may be appropriate when the affected tooth can be retained. Incision and drainage facilitate the removal of purulent material, reduce tissue pressure, and support resolution of the inflammatory process. The choice between these interventions depends on the condition of the tooth, the extent of infection, and the patient's clinical status. Laboratory investigations were performed in selected patients, particularly those requiring hospitalization and surgical intervention. Hematological and inflammatory findings provided additional information about the systemic response to infection. Hypochromia was reported in 74.04% of patients, while leukocytosis occurred in 41.34%. Elevated C-reactive protein levels were particularly frequent, affecting 92.86% of those assessed. These abnormalities may support the identification of systemic inflammation and help evaluate disease severity. However, inflammatory markers should be interpreted alongside clinical findings because they do not independently establish the presence of sepsis. No laboratory findings in the study population confirmed a diagnosis of sepsis [1-7].

Imaging requirements differed according to the anatomical risk classification. Patients with low-risk infections generally did not require additional imaging during the initial assessment when the clinical diagnosis was sufficiently clear or previous imaging was available. In contrast, computed tomography was used more frequently in patients with high-risk anatomical involvement. The association between CT utilization and involvement of high-risk spaces was statistically significant ($p = 0.039$). Patients with high-risk space involvement were 7.06 times more likely to receive a CT examination than those with infections limited to low-risk spaces. This finding supports the selective

use of advanced imaging when clinical examination suggests deep anatomical extension or possible complications. Most patients were managed without hospital admission. Outpatient care accounted for 75.39% of the study population, with patients receiving treatment and close clinical follow-up. Hospitalization was therefore reserved for patients requiring closer observation, surgical management, or treatment of more extensive disease. Pharmacological treatment was prescribed to approximately 89% of patients. The most common regimen combined analgesics and nonsteroidal anti-inflammatory drugs (NSAIDs) with penicillin antibiotics, accounting for 86.02% of prescriptions. Analgesics and NSAIDs combined with cephalosporins were used in 7.08%, while clindamycin-based regimens represented 3.74%. Combinations involving more than one antibiotic were less frequent. Analgesics, NSAIDs, penicillins, and clindamycin were prescribed together in 1.96% of cases, whereas the combination of analgesics, NSAIDs, penicillins, and cephalosporins accounted for 1.2%. These findings demonstrate the predominance of penicillin-based treatment in the study population. Nevertheless, antibiotic selection should consider infection severity, suspected microorganisms, allergy history, and local antimicrobial resistance patterns. Antibiotics should complement rather than replace definitive dental treatment and drainage when indicated [7][8][9].

Penicillin allergy was also evaluated because it may influence antimicrobial selection. Among patients receiving medication for odontogenic infections between 2002 and 2022, 96.27% had no documented allergy to penicillin derivatives, while 3.73% reported a history of allergy or adverse reactions. No significant relationship was identified between reported penicillin allergy and prolonged hospitalization. These findings suggest that allergy history did not independently influence the duration of admission in this population. However, accurate documentation remains necessary to prevent adverse drug reactions and support appropriate antibiotic prescribing. Overall, the findings indicate that most odontogenic infections can be managed successfully through timely source control, appropriate drainage, analgesia, and selective antimicrobial therapy. Treatment decisions should be individualized according to anatomical involvement and systemic condition. Coordination among dentists, pharmacists, and nursing professionals supports medication safety, postoperative monitoring, early recognition of complications, and continuity of care [11].

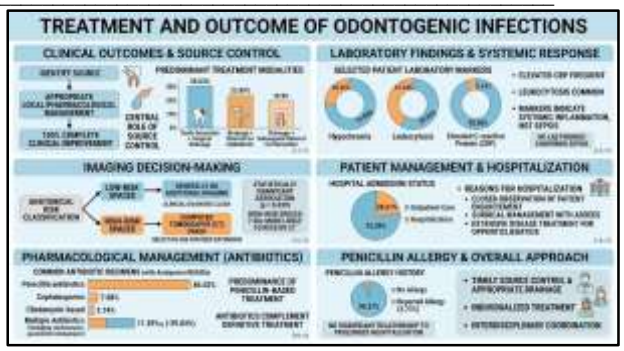


Figure-2: Treatment and outcomes of odontogenic infections.

Discussion

Odontogenic infections (OIs) present with diverse clinical manifestations and varying degrees of severity, ranging from localized dental inflammation to infections involving deep fascial spaces and requiring hospital admission [3]. Dental caries and advanced periodontal disease remain major causes of these infections and constitute important public health challenges. Their consequences extend beyond individual patients, affecting families, healthcare systems, and communities. The economic burden is substantial. Public expenditure on oral healthcare and preventive programs has exceeded US$200 million in some settings [13], while the reported average daily cost of hospitalization for severe OIs has reached US$81,053.35 [14]. These figures highlight the importance of prevention, early diagnosis, and timely treatment. Socioeconomic circumstances play an important role in oral health outcomes. Previous studies have identified a higher prevalence of dental caries and other oral diseases among disadvantaged populations [15–17]. Limited income and educational opportunities may restrict access to dental services and preventive information. They may also influence dietary habits, oral hygiene practices, and healthcare-seeking behavior. Consistent with these observations, the present study identified associations between unfavorable socioeconomic indicators, poorer oral health conditions, and more complicated OI outcomes. Patients with lower educational attainment experienced a greater likelihood of prolonged hospitalization, with a relative risk of 1.92 compared with more educated patients. This finding suggests that health literacy may influence the recognition of oral disease, preventive behavior, and the timing of clinical intervention.

Systemic health also contributed to the clinical course of OIs. The Charlson Comorbidity Index (CCI) provides a validated method for evaluating the burden of comorbid conditions and estimating their potential influence on clinical outcomes [12]. Previous investigations have applied this index to patients with odontogenic infections to assess disease severity and prognosis [7,8]. In the present study, vascular diseases were the most frequently identified comorbidities, followed by

controlled diabetes mellitus and mild liver disease. Most patients had no substantial comorbidity, while smaller proportions presented moderate or severe systemic conditions. This distribution was comparable to findings reported in previous studies [7,8]. Hospitalization duration increased with the severity of underlying comorbidities. Patients with CCI scores above four had a mean hospital stay of 4.72 days, representing a 264% increase compared with patients without recorded systemic disease. Similar relationships between comorbidity burden and unfavorable outcomes have been reported elsewhere [3,18,19]. Impaired systemic health may compromise immune function and reduce the capacity to control bacterial infection. Nevertheless, the retrospective nature of these findings does not establish a direct causal relationship. They support the importance of considering the patient's overall medical condition when evaluating OI severity and planning treatment. Lifestyle-related factors also showed associations with hospitalization outcomes. Alcohol consumption, smoking, and illicit drug use frequently coexist with socioeconomic disadvantage and may contribute to behaviors that compromise general and oral health [20,21]. In this study, alcohol consumption and smoking were the most frequently reported harmful habits, and both were associated with longer hospitalization. Their combined presence was associated with a 19% increase in mean hospital stay. Although illicit drug use affected a smaller proportion of patients (7.67%), it was also associated with unfavorable outcomes. The combination of all three substances was associated with an 84% increase in hospitalization duration compared with the sample average. These findings indicate that lifestyle assessment should form part of the clinical evaluation of patients with OIs.

Clinical examination remains central to identifying disease severity and recognizing signs of potentially dangerous progression. Important warning features include restricted mouth opening of 35 mm or less, voice changes, periorbital edema, inability to palpate the inferior mandibular border, dysphagia, odynophagia, dyspnea, elevation of the floor of the mouth, and cervical or oropharyngeal swelling [7,8]. In the present study, swelling, tenderness, toothache, and restricted mouth opening were the most frequently documented manifestations. Although swelling and pain are common features of localized infection, restricted mouth opening may indicate deeper anatomical involvement and requires careful assessment. Identification of the causative tooth is equally important because it determines the appropriate method of infection source control [6]. The present findings showed that mandibular molars, particularly those on the right side, were frequently implicated. Lower posterior teeth may facilitate the spread of infection into clinically important fascial spaces because of their anatomical relationships with the surrounding tissues [22]. Consequently, infections originating from mandibular molars and premolars may require longer hospitalization than those arising from upper posterior teeth. These observations emphasize the importance of detailed dental examination and accurate identification of the infection source. Fascial space involvement provides another important indicator of OI severity. Anatomical classifications of head and neck spaces have been used for decades to estimate the potential consequences of infection spread [22]. Although antibiotics have reduced the frequency of advanced infections, severe disease can still develop, particularly among immunocompromised patients [23]. In the present study, moderate-risk spaces represented the largest category, whereas high-risk involvement occurred in approximately 10% of patients. Low-risk infections were associated with shorter hospital stays, while high-risk involvement corresponded to substantially longer hospitalization. This relationship supports the use of anatomical classification in clinical assessment and treatment planning.

Source control remains the foundation of effective OI management. Depending on the clinical presentation, treatment may involve extraction of the causative tooth or endodontic therapy, accompanied by incision and drainage when indicated [6]. The most frequently performed procedures in this study were extraction with drainage (30.63%) and drainage followed by referral for endodontic treatment (23.89%). Non-operative management may be appropriate in selected patients with stable general health, limited anatomical involvement, and no warning signs. Its observed prevalence in this study was 16.59%, with a significant association with less severe fascial space involvement ($p = 0.019$). These findings support individualized treatment decisions based on clinical severity rather than a uniform management approach. Laboratory investigations provide additional information for diagnosis and monitoring. Hypochromia, leukocytosis, and elevated C-reactive protein were among the most frequently observed abnormalities in the present sample. These findings are consistent with previous reports describing inflammatory and hematological changes in patients with severe odontogenic infections [3,24]. However, laboratory parameters should not be interpreted independently. A single abnormal result cannot adequately represent the complexity of an infection involving multiple anatomical, immunological, and systemic factors [25]. Clinical findings and the patient's overall condition should therefore guide interpretation. Imaging also contributes to the assessment of suspected deep-space involvement. Computed tomography should be considered when clinical findings suggest extensive infection, particularly in patients with systemic toxicity, immunocompromising conditions, or signs of airway and deep neck involvement [7]. The association observed in this study between high-risk

fascial spaces and CT utilization supports the selective use of advanced imaging. This approach may reduce unnecessary radiation exposure and healthcare expenditure while preserving timely diagnosis in patients with potentially serious disease.

Pharmacological management generally combines analgesics, anti-inflammatory agents, and antibiotics when clinically indicated. Amoxicillin with clavulanic acid is commonly recommended for empirical treatment, while clindamycin has historically been used as an alternative in patients reporting penicillin allergy [26,27]. Antibiotic selection should account for infection severity, allergy history, local resistance patterns, and antimicrobial stewardship principles. Nonsteroidal anti-inflammatory drugs are frequently prescribed to control pain and inflammation. Corticosteroids have also been investigated as adjunctive treatment for reducing edema and improving patient comfort, although their use requires appropriate clinical judgment [6,28]. In the present study, analgesics, NSAIDs, and penicillin-class antibiotics represented the most frequently prescribed combination. Reported penicillin allergy was relatively uncommon (3.73%), and no significant association with hospitalization duration was identified. This finding does not exclude the need for careful allergy assessment before prescribing. Overall, the findings demonstrate that OIs are multifactorial conditions influenced by socioeconomic circumstances, educational attainment, harmful lifestyle habits, systemic comorbidities, causative teeth, anatomical spread, and clinical manifestations. Their management requires accurate assessment, timely source control, appropriate antimicrobial therapy, and recognition of patients at risk of complications. The retrospective design represents an important limitation because incomplete documentation and reporting bias may have influenced the recorded variables. The findings may also have limited generalizability beyond the population studied. Further prospective investigations are needed to validate these associations and assess standardized diagnostic and therapeutic protocols. Such approaches may improve clinical outcomes, reduce unnecessary investigations and hospitalization, and support more efficient use of healthcare resources.

Conclusion:

Odontogenic infections represent multifactorial conditions influenced by socioeconomic status, educational attainment, lifestyle habits, systemic comorbidities, and anatomical patterns of infection spread. Lower educational and socioeconomic indicators, harmful substance use, and increased comorbidity burden were associated with prolonged hospitalization and more complicated clinical outcomes. Mandibular posterior teeth and involvement of high-risk fascial spaces require particular attention because of their potential for extensive infection. Effective management depends on early clinical recognition, appropriate diagnostic investigations, and timely elimination of the infection source through extraction, endodontic treatment, or surgical drainage. Antibiotics and anti-inflammatory medications serve as important adjuncts when clinically indicated. An integrated approach involving dental professionals, physicians, pharmacists, and nursing staff can support treatment safety and continuity of care. Further prospective studies are needed to validate these associations and establish standardized protocols that improve patient outcomes while reducing unnecessary hospitalization and healthcare expenditure.

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