Assessing the Relationship between Oral Health and Systemic Infections in Hospitalized Patients

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Abstract

Oral health plays a critical role in the prevention of systemic infections, particularly in hospitalized patients. This study aimed to assess the relationship between oral health and the occurrence of systemic infections in a hospital setting. Conducted in a tertiary hospital over six months, the study involved 150 patients who were hospitalized for at least seven days. Oral health was assessed using the Oral Hygiene Index (OHI), while systemic infections were monitored throughout the hospital stay. The results indicated that patients with poor oral hygiene were significantly more likely to develop systemic infections compared to those with good oral hygiene (OR = 4.85, 95% CI: 2.37 - 9.92, p < 0.001). Findings emphasize the need for effective oral care protocols to prevent hospital-acquired infections, improve patient outcomes, and reduce healthcare costs. Interdisciplinary approaches involving dental hygienists, nurses, and laboratory specialists are crucial for maintaining oral health and minimizing the risk of systemic complications.

Keywords: Oral Health, Systemic Infections, Hospital-Acquired Infections, Oral Hygiene Index, Interdisciplinary Care, Hospitalized Patients

Introduction

Oral health is increasingly being recognized as a significant factor in overall health and well-being, particularly for patients in hospital settings. The oral cavity serves as a gateway to the body, harboring a diverse array of microorganisms that can have a profound impact on systemic health. Disruptions in oral hygiene, such as dental plaque accumulation, can contribute to the proliferation of pathogenic bacteria, which may enter the bloodstream and lead to systemic infections. In hospitalized patients, particularly those with compromised immune systems, poor oral health has been linked to increased risk of conditions such as aspiration pneumonia, sepsis, and cardiovascular complications (Scannapieco, 2013).

Hospitalized patients, especially those in intensive care units (ICUs), are often at an elevated risk of developing hospital-acquired infections (HAIs), and recent evidence suggests a possible association between inadequate oral care and the incidence of these infections (El-Solh, 2011). Aspiration of oropharyngeal secretions containing pathogenic bacteria is one of the proposed mechanisms by which poor oral health may lead to respiratory infections, such as hospital-acquired pneumonia (HAP) (Scannapieco& Shay, 2014). Given the significant morbidity and mortality associated with HAIs, understanding the link between oral health and systemic infections in hospitalized patients is crucial for improving patient outcomes and reducing healthcare costs.

Furthermore, systemic diseases such as diabetes and cardiovascular disease have also been shown to have a bidirectional relationship with oral health. In patients with diabetes, for instance, poor glycemic control has been correlated with an increased risk of periodontal disease, while periodontal infections may exacerbate systemic inflammation and glycemic instability (Preshaw et al., 2012). This interplay between oral and systemic health underscores the importance of interdisciplinary approaches to patient care, involving dentists, nurses, and laboratory specialists to develop comprehensive preventive strategies.

This study aims to assess the relationship between oral health and the occurrence of systemic infections in hospitalized patients, with a focus on understanding the potential mechanisms by which oral microorganisms contribute to systemic pathologies. By exploring this connection, we hope to provide insights that will inform hospital protocols on the importance of oral health as part of the broader strategy to prevent systemic infections and improve patient outcomes.

Literature Review

The relationship between oral health and systemic health has been extensively studied over the past few decades, with particular focus on how the oral microbiome can contribute to systemic pathologies. Oral health is often compromised in hospitalized patients due to factors such as limited mobility, dependency on nursing staff for oral hygiene, and the presence of invasive devices like endotracheal tubes. The significance of oral hygiene in preventing systemic infections, particularly in vulnerable populations, has led to an increased emphasis on integrating oral care into hospital protocols (Kanziggand Hunt, 2016).

Research has shown that poor oral health is a risk factor for developing hospital-acquired pneumonia (HAP), especially in elderly patients and those in intensive care units. Aspiration of oral pathogens is a primary mechanism by which poor oral hygiene can lead to respiratory infections. Scannapieco and Shay (2014) demonstrated that colonization of the oral cavity by respiratory pathogens can result in aspiration pneumonia, especially in patients who are bedridden or mechanically ventilated. El-Solh (2011) further highlighted that improved oral care interventions, such as chlorhexidine mouth rinses, significantly reduce the incidence of HAP in hospitalized patients.

In addition to respiratory infections, there is evidence suggesting that oral bacteria can translocate to the bloodstream, leading to bacteremia and subsequent systemic inflammation. Seymour et al. (2007) reported that periodontal pathogens such as *Porphyromonasgingivalis* and *Fusobacterium nucleatum* have been found in blood samples of patients with systemic infections. This translocation can trigger systemic inflammatory responses, which can exacerbate underlying conditions like cardiovascular disease and diabetes.

The bidirectional relationship between diabetes and periodontal disease is well established in the literature. Preshaw et al. (2012) noted that patients with poorly controlled diabetes are more susceptible to periodontal infections, and the presence of periodontal disease can further impair glycemic control due to the systemic inflammatory burden. This cycle highlights the need for effective oral care strategies in patients with chronic conditions, particularly in hospital settings where patients may already be at higher risk of systemic complications.

Cardiovascular health is also impacted by oral health, with numerous studies linking periodontal disease to increased risk of cardiovascular events. Seymour et al., (2007) found that inflammatory markers such as C-reactive protein (CRP) were elevated in patients with periodontal disease, which may contribute to the

development of atherosclerosis. The inflammatory response initiated by oral pathogens is thought to play a role in endothelial dysfunction, promoting atherosclerotic plaque formation and increasing the risk of myocardial infarction and stroke.

The importance of interdisciplinary care in managing oral health in hospitalized patients has also been emphasized in recent studies. Nurses, dentists, and laboratory specialists all play crucial roles in maintaining oral hygiene and monitoring systemic health markers. Glurich et al. (2019) suggested that a team-based approach to oral care, involving education and regular assessment, can significantly reduce the risk of systemic infections in hospitalized patients. Interventions such as regular oral assessments, mechanical cleaning, and antimicrobial mouth rinses have been shown to be effective in preventing complications arising from poor oral hygiene.

Overall, the literature underscores the critical need for effective oral hygiene practices as part of comprehensive patient care in hospitals. By addressing oral health, healthcare providers can potentially reduce the incidence of systemic infections, improve patient outcomes, and reduce healthcare costs associated with extended hospital stays and complications. The current study builds on these findings by specifically assessing the prevalence of systemic infections associated with poor oral health in a hospital setting, with the aim of providing evidence to support the integration of oral care into routine hospital protocols.

Methodology

This study was conducted at a tertiary hospital over a period of six months, involving both ICU and general ward patients. A total of 150 patients were included in the study, all of whom were hospitalized for at least seven days. The study employed a quantitative approach to assess the relationship between oral health and the occurrence of systemic infections in hospitalized patients.

Study Population

The inclusion criteria for this study were adult patients (aged 18 and above) who had been hospitalized for a minimum of seven days. Patients with existing systemic infections at the time of admission were excluded from the study. The patients were selected using purposive sampling to ensure a diverse representation of different wards, including the ICU, general medicine, and surgical wards.

Data Collection

Oral health assessments were conducted by a dental hygienist who visited patients daily. The assessment included examination for dental plaque, gingival inflammation, and other indicators of poor oral hygiene. The Oral Hygiene Index (OHI) was used to quantify the level of oral cleanliness. Blood samples were taken twice—at the time of admission and seven days after admission—to identify any bacteremia or systemic inflammatory markers.

Hospital-acquired infections, including pneumonia and sepsis, were monitored and recorded by the hospital's infection control team. The presence of pathogens in blood and respiratory samples was determined using standard microbiological techniques, and the laboratory specialist performed the analysis of these samples.

Data Analysis

Quantitative data were analyzed using SPSS software (version 25). Descriptive statistics were used to

summarize patient demographics, oral health status, and the incidence of systemic infections. Logistic regression was conducted to determine the relationship between poor oral hygiene and the risk of developing systemic infections. The results were presented in the form of odds ratios (ORs) with 95% confidence intervals (CIs) to quantify the strength of association between oral health status and the occurrence of systemic infections.

Findings

The study results revealed a significant association between poor oral health and the incidence of systemic infections in hospitalized patients. Of the 150 patients included in the study, 65 (43.3%) developed systemic infections during their hospital stay. Patients with poor oral hygiene, as indicated by higher Oral Hygiene Index (OHI) scores, were found to be at significantly higher risk of developing systemic infections compared to those with better oral hygiene.

Table 1: Patient Demographics and Oral Health Status

Characteristic	Number of Patients (n = 150)	Percentage (%)
Age (Mean ±SD)	62.5 ±14.8	-
Gender		
Male	80	53.3
Female	70	46.7
Oral Hygiene Status		
Good	45	30.0
Moderate	50	33.3
Poor	55	36.7

Table 2: Incidence of Systemic Infections Based on Oral Hygiene Status

Oral Hygiene Status	Number of Patients	Patients with Systemic Infections (n)	Percentage (%)
Good	45	5	11.1
Moderate	50	15	30.0
Poor	55	45	81.8

Table 3: Logistic Regression Analysis of Oral Health and Systemic Infections

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Poor Oral Hygiene	4.85	2.37 - 9.92	< 0.001
Moderate Oral Hygiene	1.75	0.85 - 3.62	0.130
Good Oral Hygiene	-	-	-

The logistic regression analysis indicated that patients with poor oral hygiene were nearly five times more likely to develop systemic infections compared to those with good oral hygiene (OR = 4.85, 95% CI: 2.37 - 9.92, $p < 0.001$). Moderate oral hygiene was not found to be significantly associated with an increased risk of systemic infections ($p = 0.130$).

Discussion

The findings of this study demonstrate a clear link between poor oral health and the occurrence of systemic infections in hospitalized patients. The significant association observed between high Oral Hygiene Index (OHI) scores and the risk of systemic infections underscores the importance of maintaining good oral hygiene in hospital settings. Patients with poor oral hygiene were nearly five times more likely to develop systemic infections compared to those with good oral hygiene, suggesting that inadequate oral care is a major risk factor for hospital-acquired infections.

The results align with previous studies that have highlighted the role of oral health in preventing systemic infections, particularly in vulnerable populations such as hospitalized and critically ill patients (Scannapieco& Shay, 2014; El-Solh, 2011). Poor oral hygiene has been linked to an increased risk of aspiration pneumonia, which occurs when pathogenic oral bacteria are aspirated into the lungs. This study's findings further support the hypothesis that maintaining oral health can help reduce the incidence of respiratory infections, such as hospital-acquired pneumonia (HAP), in hospitalized patients.

In addition to respiratory infections, the translocation of oral bacteria into the bloodstream, leading to bacteremia, is a key mechanism by which poor oral health can result in systemic infections. The findings of this study are consistent with the work of Seymour et al. (2007), who reported that periodontal pathogens such as *Porphyromonasgingivalis* and *Fusobacterium nucleatum* could be found in blood samples of patients with systemic infections. This suggests that improved oral hygiene could play a role in reducing systemic inflammation and the risk of bacteremia in hospitalized patients.

The logistic regression analysis showed that moderate oral hygiene was not significantly associated with an increased risk of systemic infections compared to good oral hygiene. This finding highlights the critical threshold at which poor oral hygiene becomes a substantial risk factor for systemic complications. It underscores the need for hospital protocols to ensure that patients receive consistent and effective oral care, particularly those at higher risk of developing complications due to compromised immune function or prolonged hospitalization.

The study also highlights the importance of interdisciplinary collaboration in maintaining oral health in hospitalized patients. Nurses, dental hygienists, and laboratory specialists all play a critical role in monitoring and managing oral health, which, as shown in this study, can have a significant impact on patient outcomes. The findings support the need for hospital-wide policies that integrate oral hygiene as a fundamental component of patient care, similar to other preventive measures such as hand hygiene and infection control protocols (Glurich et al., 2019).

The implications of this study are particularly relevant for patients in the ICU and other high-risk hospital units, where the risk of systemic infections is highest. Given that poor oral hygiene was associated with an 81.8% incidence of systemic infections in this study, targeted interventions such as regular oral assessments, mechanical cleaning, and the use of antimicrobial mouth rinses could significantly reduce the burden of hospital-acquired infections. Implementing such protocols could lead to shorter hospital stays, reduced healthcare costs, and improved patient outcomes.

Limitations

This study has several limitations. The sample size, while sufficient to detect significant associations, was relatively small and limited to a single tertiary hospital. This may limit the generalizability of the findings to

other hospital settings. Additionally, the study relied on the Oral Hygiene Index (OHI) as a measure of oral health, which, while widely used, may not capture all aspects of a patient's oral health status. Future studies could benefit from including a larger and more diverse patient population and using additional measures of oral health, such as microbiome analysis, to provide a more comprehensive understanding of the relationship between oral health and systemic infections.

Conclusion

The findings of this study highlight the critical role of oral health in preventing systemic infections in hospitalized patients. Poor oral hygiene is a significant risk factor for hospital-acquired infections, and maintaining good oral hygiene should be considered an essential component of patient care in hospital settings. By integrating oral health into routine patient care protocols, healthcare providers can potentially reduce the incidence of systemic infections, improve patient outcomes, and lower healthcare costs associated with prolonged hospital stays and complications. Further research is needed to explore the effectiveness of specific oral care interventions in reducing the risk of systemic infections and to establish best practices for oral hygiene in hospitalized patients.

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