ODONTOGENIC FASCIAL SPACE INFECTION IN DIABETIC AND NON-DIABETIC PATIENTS: A CLINICAL COMPARATIVE STUDY

Deepak Yadav,[1] Ravish Mishra,[1] Laxmi Kandel,[1] Shahid Ali[1]

ABSTRACT

INTRODUCTION

Maxillofascial space infections are commonly encountered conditions and its prevalence is more in South Asia compared to other regions due to lack of awareness in seeking dental treatment. Carious teeth, contiguous non-vital teeth, postoperative infections, periodontal disease and pericoronal infections are major sources of odontogenic infections. These infections can easily spreads into facial spaces which may lead into life threatening conditions. Facial space infections with comorbid conditions of patients always increases extent of severity. Among the various systemic comorbidities, diabetes is commonly associated with space infections, which determines over all prognosis and treatment. The present study aims to find out the prevalence of diabetes, demographic value, the odontogenic spaces involved, educational value in relation, and the influence of systemic comorbidity over the treatment.

MATERIAL AND METHODS

This observational cross-sectional study was conducted at the Department of Oral and Maxillofacial Surgery at Universal College of Medical Sciences (UCMS), Bhairahawa from November 2023 to October 2024. All the patients were enrolled in this study after proper counselling and informed written consent. Diabetic and non-diabetic patients were considered as group A and group B respectively. Demographic data and prevalence of maxillofascial infection, role of education, facial spaces involved were the variables of this study.

RESULTS

The total number of cases during the study period were 3441. Out of which 56 were diagnosed with maxillofacial space infections and only 40 met the inclusion criteria of the study. The prevalence during this period was (16.27 per thousand). The study comprised 40 patients with maxillofascial space infections, divided into two groups based on their medical history and lab investigations. Out of which, 25 patients were diabetic (Group A) and 15 were non-diabetic (Group B).

CONCLUSION

This study found a higher prevalence of maxillofascial space infections in diabetic patients, with female predilection. The mean age group affected was 49.88 years and submandibular space infections was the most common among all.

KEYWORDS

Diabetes, Maxillofascial space infections, Odontogenic infections, Submandibular space infection

1. Department of Oral and Maxillofacial Surgery, Universal College of Medical Sciences, Bhairahawa, Nepal

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For Correspondence
Dr. Deepak Yadav
Department of Oral and Maxillofacial Surgery
Universal College of Medical Sciences,
Bhairahawa, Nepal
Email: drdeepakyadav12@gmail.com

INTRODUCTION

Orofascial space infections are common presentations in both OPD (Out Door Patient) basis and emergency conditions as well. Maxillofascial spaces have been defined and described by Urns in 1811 as potential spaces between the layers of fascia. These spaces constitute loose connective tissues and various vital structures like veins, arteries, nerves and anatomical structures like glands and lymph nodes.[1-2] Among the various space infections, spreading odontogenic infections are the most serious infections that ranges from periapical abscess to superficial and deep neck abscess. In reports from different parts of world, odontogenic infections contribute around 50-89 % cases among various infections.[3] According to Haung et al. among 185 cases of deep neck infection, 50% of cases were odontogenic infection and he also concluded that diabetes mellitus (DM) had increased this range to 88.9%.[4]

Odontogenic infections are typically polymicrobial in nature which may be due to the fact that the oral cavity contains a complex population of microorganisms. The major causative factors include severely carious teeth, contiguous non-vital teeth, postoperative infections, periodontal disease and pericoronal infections. If disseminated, they generally spread into facial spaces which may lead to life threatening consequences.[5]

Most of the maxillofascial space infections are challenging problem to the clinicians because of the complex fascial anatomy and serious medical complications that can occur even though skillful management. Airway obstruction, septicemia, cavernous sinus thrombosis, necrotizing fasciitis and mediastinitis, which can develop subsequent to maxillofascial space infection, are potentially fatal.[3]

For proper diagnosis, it requires complete history taking, close clinical examinations and certain investigations like complete blood investigations, OPG (Orthopantamogram), USG, CT scan and MRI. Complete blood count and CRP (C-reactive Protein) supports to confirm severity of the infection. CT scan is an appropriate imaging tool used for both diagnosis of head and neck space infection and also to show extent of disease. However, MRI is superior for anatomic discrimination, lesion conspicuity, extension, and to identify the number of anatomic spaces involved.[6]

Most of the time, maxillofascial infections seem to be associated with co-morbid conditions like diabetes mellitus, cardiovascular and renal diseases. Among the various morbidities, diabetes mellitus is considered as the common associated systemic condition in maxillofascial region. While comparing between diabetic and non-diabetic patient; the severity of infection, extent of infection, systemic complications, total hospital stay, mortality of patients are always more significant with diabetic patients. An association between diabetes and the occurrence of severe head and neck infections such as necrotizing fasciitis has been shown in clinical studies. Higher infection rate has been recorded in diabetes compared to non- diabetes.[7]

Space infection with diabetes mellitus has got poor prognosis in compared to non-diabetes due to multiple space involvement, abnormal hematological findings and more complications.[8]

Along with impaired host defense mechanism, several factors may also increase the risk of diabetic patients to infection. Microangiopathy impairs leukocyte migration by thickening the capillary basement membrane and macroangiopathy favors acral skin and soft tissue infection.[9]

Streptococcus as well as *Klebsiella pneumoniae* are the predominate causative organism. Literature revealed in odontogenic infections the organisms that affect diabetic individuals might be different from those in individuals who are not diabetic.[9]

Most of the time, patients come with self-used different types of higher level of antibiotics without prescription by experts. In such conditions it is always challenging for the clinicians to handle the case. Multiple resistant antibiotics in diabetic patient is one of the reason for causality related to maxillofascial surgery. So, the present study aims to compare the prevalence and outcome of maxillofascial odontogenic space infection between diabetic and non-diabetic patients.

MATERIAL AND METHODS

An observational cross-sectional study was conducted from November 2023 to October 2024 at the Department of Oral and Maxillofacial Surgery, Universal College of Medical Sciences- College of Dental Surgery (UCMS-CODS), Bhairahawa, focused on patients who were reported with maxillofacial space infections. Approval was obtained from Institutional Review Committee (UCMS/IRC/103/23). The present study included both diabetic and non-diabetic space infection patients who provided informed written consent, regardless of age or gender. Exclusion criteria were patients with other pathological findings in the maxillofascial region, non-odontogenic head and neck space infections, prior antibiotic use, immunocompromised conditions (other than diabetes mellitus), or those refusing consent. Utilizing convenience (consecutive/enumerative) sampling, the study leveraged the tertiary care center's capacity to draw samples from diverse districts in western Nepal. During study period, total 59 patients with maxillofacial space infections visited the department, on both emergency and OPD basis. Out of which, 40 patients were eligible for the study and divided into two groups. Among them, 25 were diabetic and 15 were non-diabetic. Diabetic patients are the patient who had a fasting blood glucose level more than 130 mg/dL (7.2 mmol/L) or had a known history of diabetes but with controlled sugar levels. Patients who had normal blood glucose levels at the time of reporting, no history of diabetes, and their sugar levels always remained within normal limits without hypoglycemic agents during hospital stay were kept in non-diabetic patients group.

Group A: Maxillofascial space infection patients who are diabetic.
Group B: Maxillofascial space infection patients who are non-diabetic.

The study considered demographic variables: age, gender and educational status. Outcome variables included the prevalence of infections and the specific spaces involved. After taking written informed consent, a detailed history was taken and relevant data were entered in proforma. Routine clinical and radiographic examination was done. Patients

were sorted out into diabetic and non-diabetic group based on medical history and laboratory investigation. Diagnosis of the involved fascial space was done by four different oral and maxillofacial surgeons in the department based on clinical and radiological features.

Data collection and analysis: The study collected data using MS Excel Sheet 2013 and analyzed using SPSS 25.0.

RESULTS

The total number of cases presented to the Department of OMFS during the study period were 3441. Out of which 56 were diagnosed with maxillofacial space infections and only 40 met the inclusion criteria of the study. The prevalence during this period was (16.27 per thousand).

The study comprised 40 patients with maxillofascial space infections, divided into two groups based on their medical history and lab investigations. Out of which, 25 patients were diabetic (Group A) and 15 were non-diabetic (Group B). The mean age was 49.88 years with standard deviation of 14.278. Most patients were female (62.5%) (Figure 1).

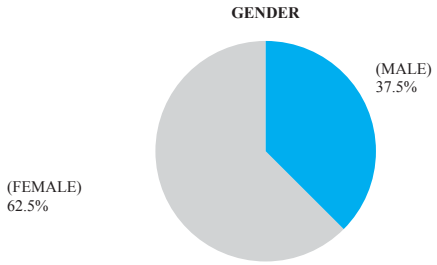

Figure 1. Gender-wise distribution of study group

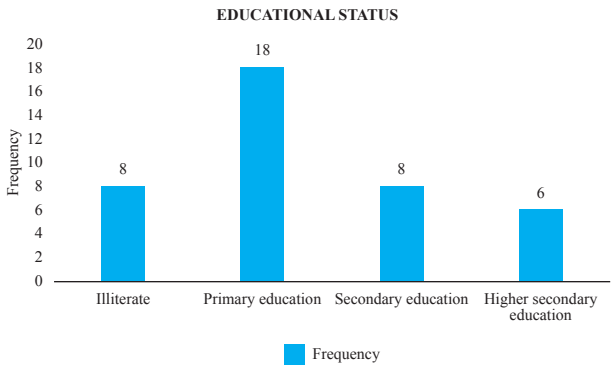

Figure 2. Distribution of samples based on educational status

Figure 2 shows that majority of the patients attended school up to primary education (n=18) while minimum patients had higher secondary level education (n=6) in the study population.

Table 1 shows the distribution of samples according to spaces involved. Submandibular space infection showed the maximum incidence among both groups across the study period (Group A, n=11 and Group B, n=6), followed by submental space infection (Group A, n=4 and Group B, n=3). There was no incidence of Ludwig's Angina in non-diabetic group (n=0) compared to diabetic group (n=2). Sublingual space infection showed equal incidence in both groups (n=2) during the study period.

Table 1. Spaces involved among study groups

Spaces involved	Groups	
	A, Diabetic (n=25)	B, Non-diabetic (n=15)
Buccal	3	1
Ludwig's Angina	2	0
Sublingual	2	2
Submental	4	3
Submasseteric	2	1
Submandibular	11	6
Multiple	1	2

DISCUSSION

Maxillofascial space infection is one of the common condition in day to day practice. Maxillofascial region is anatomically complicated with different potential spaces. Once the odontogenic infection develops, it travels easily in the least resistant area. The spread of an infection depends on the balance between the patient condition and microbial factors. The virulence of microorganisms along with the local and systemic conditions of the patient, determine host resistance.[10] Whenever the patients presented with comorbidity, the challenges become multiplies. The clinical course of space infection comorbid with DM is more severe having a poorer prognosis and increase tendency toward deep neck infection in compared with non-DM subject.[11] The diabetic host is believed to have an increased susceptibility to infections due to disturbances in the immune system including neutrophil bactericidal function, cellular immunity and complement activation. The vascular effects of diabetes involve the cardiovascular, cerebrovascular and peripheral vessels.[12] Deficient immune system along with the vascular abnormalities present in diabetic patients provoke them for a variety of invasive infections such as pyogenic bacterial infections, necrotizing infections, and fungal infections.[9] A longer duration of diabetes, presence of diabetes-specific complications and older age are the risk factors for development of infections.[12] As the age progresses the chances of infection increases. At the 4th decade of life the chances of head and neck infection is high.[7,13] The mean age in this study was 49.88 years which is in accordance with the study done by Rao et al (2010), where mean age group was 49.97 years for diabetic group and 43.70 years for non-diabetic group.[9]

There was female predilection for maxillofascial space infections in our study (F:M = 1.67:1) which might be due to certain conditions like chronic systemic diseases or hormonal changes during pregnancy in female. Contrary to this, Kamat RD et al (2015) found male preponderance.[10] In the study population, the majority of patients (n = 18) had schooling up to primary education, while the lowest number of patients (n = 6) had completed higher secondary education. The reason for this may be due to lack of awareness in oral hygiene in primary education group.

The most frequently involved space in our study was submandibular space in both groups (n= 11 in group A and n=6 in group B). Mathew GC et al. (2012) conducted a 5 year retrospective study on odontogenic maxillofascial space infection at a tertiary care centre in North India and found that most commonly involved space was

submandibular space which is in accordance of our study.[3] Similarly, Qian Y et al performed a comprehensive retrospective review of medical records of 222 maxillofascial space infections patients admitted in Center of Stomatology during 1993-2019 and found submandibular space to be the most involved space.[14]

The prevalence of odontogenic maxillofascial space infection in the present study is 16.27 per thousand.

In our part of the world, most of the patients are presented to clinicians with undiagnosed diabetes though prevalence of diabetes is high. Patients use to take antibiotics because of its easy availability without any prescription and investigations may lead to drug resistance and presented with more severe complication to clinicians. The severity of infection, long hospital stay with intensive care, and complications associated with the infection are considered to be greater in diabetic individuals and treatment of such patient with low socioeconomic status is more challenging. Educational status and affordability of patient determines the misuse of antibiotics and quality of treatment.

CONCLUSION

This study found a higher prevalence of maxillofascial space infections in diabetic patients, with female predilection. The mean age group affected was 49.88 years and submandibular space infections was the most common among all. Awareness and early intervention are crucial in managing these infections, particularly in diabetic populations. Patients socioeconomic condition, time of presence, complication before appearing the hospital, attitude of patient and patient attendant all factors are finally determine outcome of treatment. As early intervention in space infection with comorbidity is advisable.

CONFLICT OF INTEREST

None

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