

# Management of fascial space infections in a Nigerian teaching hospital: A 4-year review

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## ABSTRACT

**Background:** Fascial space infections of the head and neck region, usually odontogenic in origin, are routinely treated as an out-patient procedure. Untreated or rapidly spreading odontogenic infections can be potentially life threatening. The present study is a review of patients with orofacial infections who required emergent incision and drainage in the maxillofacial unit of our institution. The need for early presentation is highlighted. **Materials and Methods:** This is a retrospective study of patients with orofacial space infections between January 2007 and December 2010. Patients' case files were retrieved and demographic as well as clinical characteristics were obtained and analyzed. A *P* value of <0.05 was considered significant. **Results:** A total of 53 patients with fascial space infection were seen over the period of study. Of the 41 patients reviewed, males accounted for 26 (63.4%) and females 15 (36.6%). Their ages ranged from 4 months to 80 years (mean 32.8±18.3 years). There was no statistical difference between the mean age of male and female patients ( $t=-962$ ,  $P=0.342$ ). Submandibular space was the most frequently involved single space and accounted for 43.9% of the cases. This was followed by multiple space involvement (Ludwig angina) which accounted for 36.6%. Buccal space and submasseteric space infection represented 7.3% each. Sources of infections were of odontogenic origin in 92.7% of cases and were unknown in the remaining 7.3%. The outcome was satisfactory with complete resolution in 48.8% of cases. Resolution with some morbidities in the form of persistent limitation of mouth opening, orocutaneous fistula, and necrotising fasciitis were seen in an almost equal proportion of 46.3% of cases. The outcome was observed to be significantly associated with the presence of underlying systemic conditions ( $\chi^2=21.66$ ;  $r=0.73$ ;  $P=0.0001$ ), time of presentation ( $\chi^2=12.28$ ;  $r=0.55$ ;  $P=0.002$ ), and age ( $\chi^2=54.48$ ;  $r=0.69$ ;  $P=0.0001$ ). **Conclusion:** Fascial space infections of the head and neck region, though potentially life threatening, can be prevented by regular dental visits. Early recognition and treatment of established cases are necessary to prevent considerable morbidity and mortality, especially in older patients with an underlying systemic condition.

**Key words:** Fascial space, infections, Nigeria

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## INTRODUCTION

Fascial space infections of odontogenic origins are routinely treated as an out-patient procedure. They may be preceded by dental infections or other causes such as tonsillitis, mandibular fractures or gunshot injuries to the facial region. Untreated or rapidly spreading odontogenic

infections can be potentially life threatening secondary to airway compromise or septicemia.<sup>1</sup> The present study is a review of patients with orofacial space infections who required emergent surgical incision and drainage in the maxillofacial unit of Aminu Kano Teaching Hospital, Kano, Nigeria. The importance of early presentation is highlighted.

## MATERIALS AND METHODS

This is a retrospective study of patients with orofacial space infections that were seen and managed at the maxillofacial unit of the Aminu Kano Teaching Hospital, Kano, Nigeria between January 2007 and December 2010. With permission from the ethics committee of our institution, patients' case files were retrieved and information such

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as age, sex, educational level, sources of infection, spaces involved, and presence of underlying systemic conditions were obtained and analyzed. A *P* value of <0.05 was considered significant.

## RESULTS

A total of 53 patients with fascial space infection were seen over the period of study, 12 of them were excluded owing to insufficient data. Of the 41 patients reviewed, males accounted for 26 (63.4%) and females 15 (36.6%). Age ranged from 4 months to 80 years with a mean of  $32.8 \pm 18.3$  years. There was no statistical difference between the mean age of male and female patients ( $t = -962, P = 0.342$ ).

The age distribution of patients is shown in Table 1. The predominant age group is the 21-30 years accounting for 36.6%. This was followed by the 41-50 years age category (17.1%). Patients in the less than 1 year category accounted for 7.3% with the youngest being 4 months old. All the patients were managed under local anesthesia and none of them needed any form of intubation for airway management.

Table 2 shows the educational level of the patients. About half of the patients (46.3%) had Arabic education without any form of western education. This was followed by secondary education accounting for 26.8%. Only 1 (2.4%) of the participants had tertiary education.

Submandibular space was the most frequently involved accounting for 43.9% of the cases. This was followed by bilateral and simultaneous involvement of submandibular, sublingual, and submental spaces (Ludwig angina) in 36.6% of cases. Buccal space and submasseteric space infection represented 7.3 each [Table 3].

The source of infections was of odontogenic origin in 92.7% of cases and about 53.7% of these were as a result of dental caries-related sequelae. The other sources of infections that were of odontogenic origin included chronic periodontitis (34.1%) and pericoronitis (4.9%). The source of the remaining 7.3% of cases was unknown [Table 4]. Seven of the cases (17.1%) had one form of underlying systemic condition, distributed as diabetes mellitus (5), hypertension (1), and HIV seropositive status (1) respectively.

More of the patients (58.5%) presented within 1 week of onset of symptoms while the remaining 41.5% were seen after 1 week of onset.

The use of herbal medications was observed in 36.6% of the participants, while 58.5% denied using any form of such medications prior to presentation to the hospital. This information was not available in the remaining 4.9% of cases.

Overall, the mean duration of stay in the hospital was  $10.7 \pm 8.6$  (range 4-31) days. The total length of hospital stay was less than 1 week in majority of cases (43.9%).

This was followed by those who stayed for a period of 1-2 weeks (34.1%), Table 5.

Two of the cases were discharged from the Accident and Emergency Unit after treatment and so were not admitted.

**Table 1: Age group distribution of patients with orofacial space abscess**

Age groups (years)	Frequency (n)	Percentage
<1	3.0	7.3
1-10	2.0	4.9
11-20	4.0	9.8
21-30	15.0	36.6
31-40	5.0	12.2
41-50	7.0	17.1
51-60	3.0	7.3
61-70	0.0	0.0
Over 70	2.0	4.9
Total	41.0	100.0

**Table 2: Educational level of patients with orofacial space abscess**

Education	Frequency (n)	Percentage
Below school age	3.0	7.3
Primary	7.0	17.1
Secondary	11.0	26.8
Tertiary	1.0	2.4
Arabic	19.0	46.3
Total	41.0	100.0

**Table 3: Anatomical spaces involved**

Space (s)	Frequency (n)	Percentage
Submandibular	18.0	43.9
Submasseteric	3.0	7.3
Buccal space	3.0	7.3
Ludwig angina*	15.0	36.6
Others	2.0	4.9

\*Ludwig angina: Bilateral and simultaneous involvement of submandibular, submental, and sublingual spaces

**Table 4: Source of infections**

Source of infection	Frequency (n)	Percentage
Caries-related sequelae	22.0	53.7
Chronic periodontitis	14.0	34.1
Pericoronitis	2.0	4.9
Unknown	3.0	7.3
Total	41.0	100.0

**Table 5: Length of hospital stay**

Duration (week)	Frequency (n)	Percentage
<1	18.0	43.9
1-2	14.0	34.1
3-4	4.0	9.8
Over 4	3.0	7.3
Not admitted	2.0	4.9
Total	41.0	100.0

Patients who stayed for the period of less than 1 week were considered as short hospital stay, while those who stayed for a period of 1 week or above were considered as long hospital stay. The use of herbal medications ( $\chi^2=9.73$ ,  $r=0.51$ ,  $P=0.002$ ) prior to presentation and the time of presentation ( $\chi^2=4.89$ ,  $r=0.35$ ,  $P=0.027$ ) from onset of symptoms were found to be significantly associated with duration of hospital stay.

The outcome was satisfactory with complete resolution, without any residual problem, in 48.8% of cases. Resolution with some morbidity in the form of persistent limitation of mouth opening, orocutaneous fistula, and progression to necrotising fasciitis Figure 1, observed in only one case, collectively accounted for 46.3% of cases.

We recorded 2.0 (4.9%) mortality in a male and a female who were over 70 years of age. Both patients had an underlying systemic condition, diabetes mellitus, and hypertension which were observed in the female and male respectively.

The outcome was observed to be significantly associated with the presence of underlying systemic conditions ( $\chi^2=10.44$ ,  $r=0.34$ ,  $P=0.005$ ), time of presentation ( $\chi^2=12.28$ ,  $r=0.55$ ,  $P=0.002$ ), and age ( $\chi^2=54.48$ ,  $r=0.69$ ,  $P=0.000$ ) [Table 6].

Our data showed that the risk of sustaining any form of morbidity in patients presenting with fascial space infections of the head and neck region was approximately eight times higher in those patients who are over 40 years of age than those below ( $OR=8.1$ ,  $CI=1.46-45.1$ ,  $P=0.01$ ). The presence of an underlying systemic condition increases the chance of death by 1.4 irrespective of the age category ( $OR=1.4$ ,  $P=0.026$ ).

## DISCUSSION

Fascial space infections of the head and neck region are mainly caused by bacterial infections arising from pre-existing dental caries-related sequelae such as pulpitis and apical periodontitis, pericoronitis or periodontal diseases. Other documented causes include tonsillitis, gunshot injuries, peritonsillar or parapharyngeal abscesses, mandibular fracture, oral lacerations/piercings, or submandibular sialodentitis.<sup>2</sup>

Predisposing factors include recent dental treatment, systemic illnesses such as diabetes mellitus, malnutrition, alcoholism, compromised immune system such as acquired-immuno deficiency syndrome (AIDS), and organ transplantation. Clinical presentation ranges from toothache, limitation of mouth opening, fever, malaise, and dysphagia. In their most severe form, fascial space infections can lead to death, which usually results from an acute airway obstruction or multiorgan failure.<sup>2</sup>



**Figure 1:** Necrotising fasciitis arising from untreated odontogenic infection

**Table 6: Factors influencing treatment outcome**

Factors	$\chi^2$	r	P value
Age	54.48	0.69	0.000 (S)
Gender	0.78	0.14	0.678 (NS)
Time of presentation	12.28	0.55	0.002 (S)
Systemic disease	10.44	0.34	0.005 (S)
Use of herbal medications	21.66	0.73	0.000 (S)

The treatment of fascial space infections includes aggressive intravenous high dose antibiotics (usually penicillin or cephalosporins and metronidazole), analgesic and fluid therapy in addition to establishment of surgical drainage and elimination of the source of infection. In the present study, the suspected culprit teeth were extracted in about 92.7% of the patients and surgical drains in the form of corrugated rubber sheet were instituted after stab incisions in all the patients. All the procedures were done under local anesthesia and there was no need for tracheostomy in any of the cases. The potential airway loss, especially in Ludwig's angina, was arrested after the initiation of incision and drainage.

Our report shows that life-threatening orofacial infections, including Ludwig's angina can be managed under local anesthesia. This sharply contrasts earlier published reports in the literature where majority of Ludwig's angina cases were treated under general anesthesia.<sup>2-6</sup> The management of orofacial space infections under local anesthesia have the advantages of safety, economy, and less technique sensitive when compared to treatment under general anesthesia especially in developing countries where resources may be limited and competent anesthetists may be few or not available. In addition, patients are not exposed to the potential morbidity and mortality associated with general anesthesia.

Odontogenic infections were identified as the main source of fascial space infections in this study. The cause is usually

unknown in infants<sup>3,4</sup> and this agrees with the result of the present study. Ductal openings of salivary glands may be probable portal of entry in infants. The causative bacteria of fascial space infections are usually a mixture of aerobes and anaerobes including oral organisms such as streptococci or staphylococci.<sup>5-7</sup> In the present study, we were unable to do anaerobic culture because of lack of such facilities in our institution and this had great influence on the result of our cultures which were limited to mainly streptococci and staphylococci in most of the specimen examined, while no growth were recorded in some instances. The observed culture negative media may be due to antibiotic usage prior to presentation or inability to culture anaerobes as earlier explained.

Odontogenic infections are responsive to penicillins and cephalosporins<sup>2</sup> and this probably influenced the choice of antibiotics prescription in our centre with combinations of cefuroxime, metronidazole with or without gentamicin being the most frequently prescribed antibiotics combinations. Gentamicin is usually added when there is evidence of severe septicaemia and toxicity which agrees with published report on management of severe orofacial infections.<sup>8</sup> All the patients responded very well to our empirical regimen as described above and there was no occasion of change of antibiotic due to resistance as revealed by the sensitivity tests.

The mean age of 32.8±18.3 obtained in this study is similar to other published reports on head and neck infections.<sup>4-6</sup> The submandibular space was the most common single space involved followed by the buccal space. This supports the findings of Ndukwe *et al.*<sup>9</sup> from Ile-Ife, South West, Nigeria. In contrast, Akinbami *et al.*<sup>10</sup> from Port Harcourt, Nigeria reported submasseteric space as the most common single space involved. Other studies found multiple space involvement as commonest presentation.<sup>4-6</sup>

The prevalence of 36.6% for Ludwig's angina obtained in this study is much higher than what has previously been reported.<sup>3,4,9</sup> Ludwig's angina is a rapidly and frequently fatal progressive gangrenous cellulitis and edema of the soft tissues of the neck and floor of mouth. Airway compromised has been leading cause of death. The two mortalities recorded in this study were observed in patients with Ludwig's angina. The cause of their death was not known as no autopsy was carried out. Probable causes may include septicemia or inadequate drainage. It is however unlikely a result of airway obstruction as there were no signs of airway obstruction after initiation of drainage in all the patients.

In the developed world, fatal dental infections are rare in patients with intact immune response.<sup>7,11</sup> In the third world, where people are malnourished owing to poverty, fatalities

are more common. Another possible contributory factor to poor outcome in the developing world is late presentation with consequent delayed surgical intervention. This was well supported by the result of this study. In addition, the use of herbal medication, older age, and presence of underlying systemic diseases were also found to adversely affect morbidity and mortality.

## CONCLUSION

Preexisting dental infections are the commonest causes of fascial space infections of the head and neck region. Regular dental visits may enhance early detection and treatment of dental ailments, thereby preventing development of fascial space abscess or cellulitis. In cases of established infections, early recognition and treatment is necessary to prevent considerable morbidity and mortality, especially in older patients with an underlying systemic condition.

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