

## Pattern of Odontogenic Fascial Space Infections among a Sample of Sudanese Patients

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### Abstract

*Background:* Odontogenic facial space infections are very common in Sudan with different clinical presentation. Early diagnosis and appropriate treatment is necessary to prevent life threaten complications. The aim of this study is to describe the pattern of admitted odontogenic fascial space infections among Sudanese population. *Methodology:* A cross sectional descriptive hospital based study was performed. A medical chart review was filled retrospectively identifying patient with odontogenic fascial space infection admitted to the Khartoum dental teaching hospital in the oral maxillofacial surgery clinic from 2013 to 2016. *Results:* Seventy five patients 56% male and 44% female diagnosed with odontogenic fascial space infections were recruited in the study. The most common affected age group was 21-30 years old with percent (30.7%), and the least common age groups are 1-10 years and 61-70 years. The most common affected tooth is the 3<sup>rd</sup>. molar tooth (36%). The most common cause of infection was Pulpits (44%). Mandible was the most common site (85.3%). Ludwig's Angina was the most recorded (48%). The most common clinical sign of admission is swelling of the face (46.4%). Most of the interventional treatments modalities used in treatment were incision and drainage (86.6%). Metronidazole is the most described antibiotic (48.32%). (56 %) were not totally recovered, (40%) fully recovered, no deaths recorded in this study. *Conclusion:* Male was affected more by odontogenic fascial space infection than female, predominant age in the third decade; mandibular 3<sup>rd</sup> molars are the most causative tooth, majority of cases where found to be Ludwig's angina patients.

**Keywords:** Odontogenic Facial; Space Infections; 3<sup>rd</sup> Molars.

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### Introduction

Fascial space infections are potential spaces that exist between the fasciae and the underlying organs and other tissues. Pus tends to accumulate in specific regions which area actually spaces until pus has been formed Bacterial infections of the head and neck region remain a major hazard worldwide. The fascial space infections usually odontogenic in origin, microbial culture showed mixed aerobic and anaerobic gram positive cocci and anaerobic gram negative rods. Odontogenic infections arising from caries, pulpits, periodontitis and Preicoronitis , causes over 70% of the space infection . Submandibular space

was the most common single space followed by the Buccal space, the mandible were more involved than the maxilla and scalp for all age groups, there is high incidence in males [1].

Infections from the origin focus can spread along the tissues lead to facial cellulites involving deeper facial space, untreated or rapidly spreading odontogenic infections can be potentially life threaten. Management by medical support of the patients, administration of proper antibiotics in appropriate dosage, removal of the cause, incision and surgical drainage, identification of the etiological bacteria constant evaluation of resolution of infection. Indications for hospitalization of patients with infections of fascial spaces (fever>101F), dehydration, trismus, marked pain, significant for spreading swelling, elevation of the tongue, bilateral sub mandibular swelling, difficulty in breathing or swallowing, leukocytosis, systemic disease known to modify the patient ability to fight infections, need for extra oral drainage [2].

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Fating NS et al did a study about Detection of Bacterial Flora in orofacial space Infections and their antibiotic Sensitivity Profile in Dec 2011. Twenty-six patients with space infection of odontogenic origin were selected irrespective of their age and gender. Pus samples were collected and processed in the microbiology laboratory for the growth of anaerobic and aerobic bacteria and antibiotic sensitivity profile. Demographic profile of the patients showed that male patients were more commonly involved and most patients fell in to the third and fourth decade of age groups. Most common site of involvement was sub mandibular space [3].

Osunde OD et al did a 4 years study about management of fascia space infections in a Nigerian Teaching Hospital. The authors found that a total of 53 patients with fascia space infections 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  $32.8 \pm 18.3$  years). 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 infections represented 7.3% each. Sources of infections were of odontogenic origin in 92.7% of cases and were unknown in the remaining 7.3% [4].

The high prevalence of fascial space infections among Sudanese population and their impact on patient's life style and psychological behavior in addition to its life threaten complications.

No previous studies discuss the pattern of odontogenic fascial space infections in Sudanese population. Therefore, this study aims to describe the pattern of odontogenic fascial space infections among Sudanese patients.

## Materials and Methods

Descriptive retrospective cross-sectional study carried in Khartoum Teaching Dental Hospital, the main center of Oral and Maxillofacial surgery in Sudan. A total of 75 patient's files from the period 2013-2016 years who was admitted for odontogenic fascial space infections were analysis in this study.

The age ranges from 5-80 years, divided in 7 age groups, the most common one was 21-30 years old (30.7%).

## Results

Seventy five patients who get diagnosed with odontogenic fascial space infection were recruited in the study (56%) were male and (44%) were female Figure 1.

The age ranges from 5-80 years, divided in 7 age groups, the most common age group was (21-30) years old with percent (30.7%), and the least common age groups are (1-10) years. and (61-70) years (2.7%) in each groupe Table 1. The predominate profession of the patients was house wife (38.8 %) Table 2.

The most common affected tooth was the 3<sup>rd</sup>. molar tooth (36%) Table 3. Most performed investigation was DPT (42.64%) Table 4. Mandible was found to be the most common site (85.3%) Table 5. Left side odontogenic fascial space infection is predominate (38.7%) then the right side and the bilateral infections Figure 2. The most common cause of infection was pulpitis (44%) Table 6.

According to the study Ludwig's Angina (48%) was the most recorded type of infection then Submasseteric (18.89 %) and Submandibular space infection (12.22%) Table 7. The duration of infection varies between (1-6) days (32%) and (7-12) days (26.7%) Figure 3. Most of the patient were medically fit (63%) and medically compromised patients were with percent of (37.2%). Figure 4 the most recorded comprised patient were diabetic patients (21.3%) Table 8. The most common clinical sign of admission is swelling of the face (46.4%) Table 9.

Regarding the vital signs the calculations for all cases showed the following results: The blood pressure records at admission were low (64.5%) and at release were also low by (54%). The pulse rate was high at admission (80%) and as well high at release (63%). The respiratory rate was normal at admission and release by the same percent (60)%. The temperature was normal and low by (50)% for both at admission and normal with (72.3)% at release for all the patients in the date Table 10.

Most of the interventional treatments modalities used in treatment is the drainage and incision (86.6%) Table 11. Antibiotics usage was 100% for all seventy five cases. The most common route of admission is intervenes (54.7%). Metronidazole is the most used antibiotic (48.32) Table 12.

Out of the 75 patients (56 %) were not totally recovered, (40%) fully recovered, no death recorded in this study Figure 5. And finally the result of patient referral was, (77 %) of the patient had not been referred to another hospital and (23 %) had been referred Figure 6.

**Table 1:** Distribution of the sample according to the age group

Age Group	Frequencies	Percentage
1-10 years.	2	2.7%
11-20 years.	5	6.7%
21-30 years.	23	30.7%
31-40 years.	15	20%
41-50 years.	12	16%
51-60 years.	8	10.7%
61-70 years.	2	2.7%
Over 70 years.	5	6.7%
Not mentioned	3	4%
Total	75	100%

**Table 2:** Distribution of the patient's according to the occupation

Occupation	Frequencies	Percentage
House Wife	29	38.8%
Business man	12	16%
Unemployed	1	1.3%
Student	9	12%
Farmer	6	8%
Worker/ Employee	6	8%
Driver	4	5.3%
Other	4	5.3%
Not mentioned in sheet	4	5.3%
Total	75	100%

**Table 3:** Distribution of the sample according to the affected tooth

Tooth	Frequencies	Percentage
8	27	36%
6	8	10.7%
7	6	8%
6,7,8	5	6.7%
8,7	2	2.7%
2	1	1.3%
5	1	1.3%
2,1 Right - 1,2,3,5,6,left	1	1.3%
5 Right- 6,5 left	1	1.3%
7,6	1	1.3%
7,6 lower right- 8 upper	1	1.3%
8,5,4	1	1.3%
8,7 left and right	1	1.3%
C upper- and lower- ED lower	1	1.3%
6,4 upper- 6,7 lower	1	1.3%
Not mentioned	17	22.7%
Total	75	100%

**Table 4:** Shows type of investigation carried for the patients

Investigations	Frequencies	Percentage
DPT	55	42.64%
CBC	14	10.85%
NO Investigation needed	6	4.65%
X Ray	5	3.88%
Random blood Test	6	4.65%
CT Scan	4	3.10%
Electrolytes	3	2.33%
Cultural Sensitivity Test	3	2.33%
Periapical	2	1.55%
RFT	2	1.55%
PT	1	0.78%
INR	1	0.78%
CBC	2	1.55%
RBS	1	0.78%
RBG	3	2.33%
LLFT	1	0.78%
Radiolucency	1	0.78%
OPT	1	0.78%
Sensitive serum creatinine	1	0.78%
CRC	1	0.78%
ICT	1	0.78%
Bleeding profile	1	0.78%
VG	1	0.78%
RBC	1	0.78%
TWBCs	1	0.78%
ECG	1	0.78%
RBs	1	0.78%
Urine	3	2.33%
Digital DPT	1	0.78%
Renal function test	1	0.78%
TWBCs	1	0.78%
Aspiration	1	0.78%
DPT and CBC	2	1.55%
Total	129	100%

**Table 5:** Shows the site of odontogenic fascial space infections

Site	Frequencies	Percentage
Mandible	64	85.3%
Maxilla	4	5.3%
Both mandible and maxilla	4	5.3%
Not mentioned	3	4%
Total	75	100%

**Table 6:** Shows the etiology of odontogenic fascial space infections

Causes	Frequencies	Percentage
Pulpitis	33	44%
Periodontitis	12	16%
Preicoronitis	10	13.3%
Other	4	5.3%
Not mentioned	16	21.3%
Total	75	100%

**Table 7:** Shows Types of odontogenic fascial space infections

Type of infection	Frequencies	Percentage
Ludwig's Angina	36	48%
Submandibular and Submasseteric	6	8%
Submandibular	5	6.7%
Submasseteric	6	8%
Buccal	8	10.7%
Submasseteric and Infected Cyst	1	1.3%
Submasseteric, Temporal and Pterygo-mandibular	2	2.7%
Retro molar, Submasseteric and Buccal	2	2.7%
Submasseteric and Temporal	2	2.7%
Lateral Pharyngeal Infection	2	2.7%
Multiple face infection	4	5.3%
Not mentioned	1	1.3%
Total	75	100%

**Table 8:** Shows the disorders associated of odontogenic fascial space infection

Condition	Frequencies	Percentage
Diabetes mellitus	16	21.3%
Hypertension	7	9.3%
Pregnancy	6	8%
Hepatitis (B)	1	1.33%
Irritable bowel syndrome	1	1.33%
Aids	1	1.33%
Medically fit patient	48	64%
Total	80	100%

**Table 9:** Shows cause of odontogenic fascial space infections patients admission

Cause of Admission	Frequencies	Percentage
Swelling	70	46.4%
Pain	40	26.5%
Difficulty opening mouth	24	15.9%
Discharge	12	7.9%
Fever	1	0.7%
Fatigue	1	0.7%
Trismus	1	0.7%
Difficulty on breathing	1	0.7%
Not mentioned	1	0.7%
Total	151	100%

**Table 10:** Shows vital signs recorded in the data

Vital sing	Recorded in data (%)	No recorded in Date (%)
Blood pressure	41.3%	58.7%
Pulse rate	40%	60%
Respiratory Rate	33.3%	66.7%
Temperature	24%	76%

Table 10.1 showed that most of the patient recorded low blood pressure at admission (64.3%), this percent had been reduced to (54)% at release, and (41.9)% of the patient were also released normal blood pressure.

**Table 10.1:** Cross tabulation, Blood Pressure (BP) at admission and Release

		Normal	BP at Release		Total
			Low	High	
BP at Admission	Normal	5	1	0	6
	Low	6	14	0	20
	High	2	2	1	5
Total		13	17	1	31

**Table 10.2:** Cross tabulation, Pulse Rate (PR) at admission and release

		Normal	PR at Release		Total
			Low	High	
PR at Admission	Normal	0	0	0	0
	Low	2	1	3	6
	High	1	5	18	24
Total		3	6	19	30

In table 10.2 most of the patient administered with high pulse rate (80%), the other (20%) %were normal at discharge.

**Table 10.3:** Cross tabulation, Respiratory Rate (RR) at admission and Release.

		Normal	RR at Release		Total
			Low	High	
RR at Admission	Normal	10	1	5	16
	Low	1	0	0	1
	High	4	1	5	10
Total		15	2	10	26

It clear that in table 10.3, (61.5%) of patient check in with normal respiratory rate ,(38.4%) got high respiratory rate. AT release (57.6%) of patient were normal (38.4%) were high.

**Table10.4:** Cross tabulation, Temperature at admission and Release

		Normal	Temperature at Release		Total
			Low	High	
Temperature at Admission	Normal	8	0	1	9
	Low	5	3	1	9
	High	0	0	0	0
Total		13	3	2	18

In Table 10.4 at admission (50%) were normal (50%) were low. At release (72.2%) were normal and (11.1%) were high.

**Table 11:** Shows the interventional treatments modalities used in the study

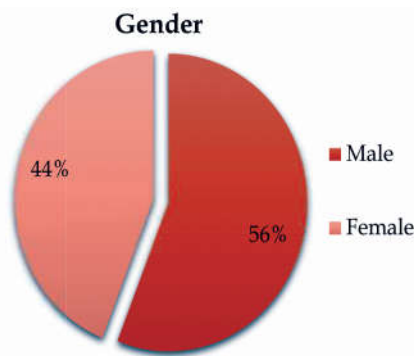
Treatment	Frequencies	Percentage
Extraction	47	62.2%
Drainage	65	86.6%
RCT	1	1.33%
Aspiration	1	1.33%
Oral hygiene instruction	1	1.33%
Consultation	1	1.33%
Not perform surgical treatment	5	6.6%
Total	121	100%

**Table 12:** Shows different route of the drugs admission

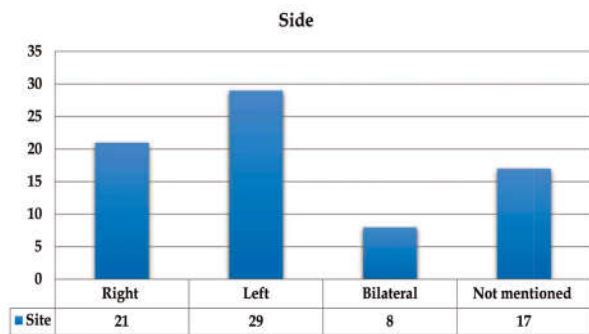
Route of Admission	Frequencies	Percentage
IV	41	54.7%
Oral	18	24%
IV and Oral	15	20%
Not mentioned	1	1.3%
Total	75	100%

**Table 13:** Describe the antibiotic used for treatment

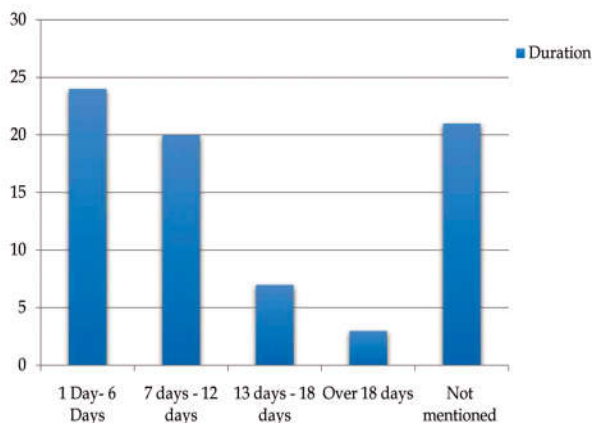
Antibiotic	Frequencies	Percentage
Ceftriaxone	35	23.49 %
Metronidazole	72	48.32%
Maxil	17	11.41%
Clindamycin	6	4.03%
Ciprofloxacin	6	4.03%
Amoclan	6	4.02 %
Gentamycin	4	2.68%
Tetracycline	1	0.67%
Doxycycline	1	0.67%
Benzylepencilin	1	0.67%
Total	149	100%



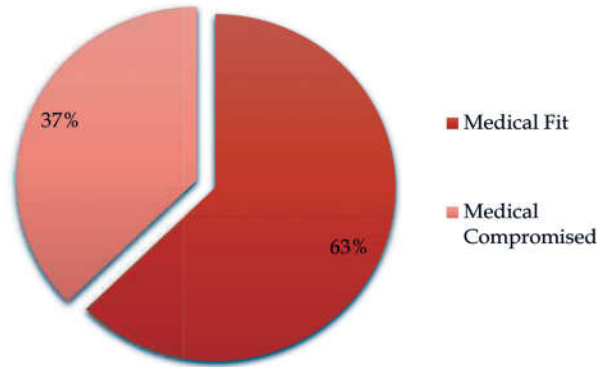
**Fig. 1:** Shows distribution of the sample according to gender



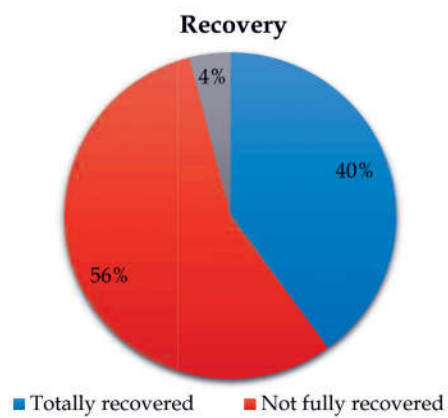
**Fig. 2:** Shows the site of odontogenic fascial space infections involvement



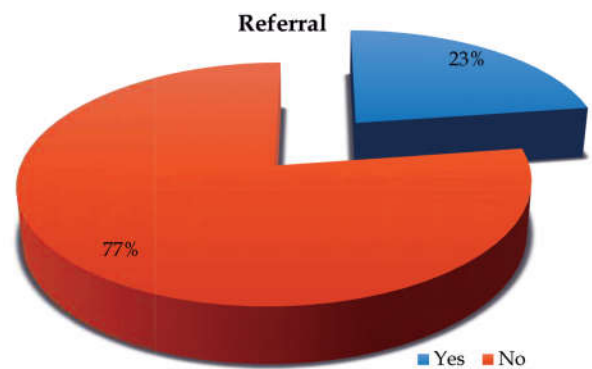
**Fig. 3:** Shows duration of odontogenic fascial space infections



**Fig. 4:** Shows the medical status of odontogenic fascial space infections patients



**Fig. 5:** The recovery status of the patients. Out of the 75 patients (56%) were not totally recovered, (40%) fully recovered figure 5



**Fig. 6:** The figure shows if the patient had been referred to another hospital or not.

Out of 75 patients (77%) had not been referred to another hospital and (23%) had been referred Figure 6.

**Discussion**

Odontogenic fascial space infections are potential spaces that exist between the fasciae and the

underlying organs and other tissues. This condition is known globally by its high incidence of occurring especially in Sudan.

The most common age in the present study ranged from (21-30) years old. This finding agreed with Osunde OD (32.8± 18.3years) [4], disagreed from the findings of Fating NS (30-40) years [3], Igoumenakis [15] and Fomete B [10].

In the present study the disease affected male more than female (56%) which is in line with the findings of the studies by Fating NS. [3] and Osunde OD (63.4%). [4].

The present findings showed that the most common site was Mandible (85.3%). This was similar to the study carried by Fating NS, Osunde OD (43.9%), Dvori S, Marioni G (85.9%), Rao DD, Fomete (37.7%), Alotaibi N (29%), Kamat RD, Lin RH(40.9%), Singh M, Mathew GC, Zhang C(37.5%), Sato FR(81.9%), Kinzer S. [3-6,8,10,12,13,16,18,20,24-26]. The most affected side in this study was left side (29%), there was no previous study that discussed the side of infection.

The leading cause of infection was Pulpitis (44%) in this study. Most of the previous studies showed that the most common cause of fascial space infection was odontogenic in origin. Study by Marioni's and Mathew's GC agreed that pulpitis was the leading cause. [20]

The predominant type of odontogenic fascial space infections recorded was Ludwig's Angina (48%) followed by submasseteric (18.89%) and submandibular space infections (12.22%) there was a great variation when it comes to the most leading type of space infection. Fating NS stated that "the most common type was Submandibular space infection which also most frequently involved single space and accounted for 43.9% of the cases. This was followed by multiple space involvement (Ludwig's angina) which accounted for 36.6%. Buccal space and submasseteric space infections both represent 7.3%. [4] Marioni G declined submandibular space infection involvement in (85.9%), masticatory space infection in (32.9%) in (65.9%) the infection occupies more than one space [6].

The submandibular, submental and submasseteric spaces were more likely to be involved in the income patient group [21], Zhang C stated that the submandibular space was the most common involved in both single and multiple space infections (37.5% and 29.1%, respectively) [24].

The medical status of the patient in the current study, most of the patients were medically fit (63%)

and medically compromised patients were of (37.2%) the most recorded compromised patient were diabetic patients (21.3%).

Leading clinical sign of admission was swelling (46.4%) followed by pain (26.5%), difficulty in mouth opening (15.9%) and discharge (7.9%), Alotaibi N agreed with this study, The majority of patients presented with dental abscess (68%) [12]. Gupta M and Singh V got different findings (Trismus and dysphagia were present in over 70% of the cases) [13].

In the present study, most of the patients recorded low blood pressure at admission (64.3%), this percent had been reduced to (54%) at release, and (41.9%) of the patients were released with normal blood pressure, Pulse Rate (PR) at admission and release, most of the patients administered with high pulse rate (80%) the other (20%) recorded low pulse rate at admission. At release (63.3%) were also high, only (10%) were normal at discharge.

In the present study respiratory Rate (RR) at admission and Release (61.5%) of patients checked in with normal respiratory rate (38.4%) got high respiratory rate. At release (57.6%) of patients were normal, (38.4%) were high. There were few studies that discussed vital signs values during infection, Dvori S recorded normal to slightly elevated values during hospitalization [5]. There was no additional study that discussed the vital signs in details.

Concerning the surgical treatment the present study declared that the most interventional treatments used was the incision and drainage (86.6%) this fact agreed with Gupta M and Singh study (100%). [23], Sato (46.67%) [25] Singh (100%) and extraction with (100%) on his patient [18]. Antibiotics usage was (100%) for all seventy five cases. The leading route of admission was intravenously (54.7%) these findings agreed with Marioni G study that included (71.8%) who took intravenous antibiotic therapy [6].

This study showed that the most common antibiotic used was Metronidazole (48.32%). These findings were similar to the findings of Martine [17] and different from the findings of Fating who reported that clindamycin, gentamycin and linezolid were the predominant treatment used [3] Amoxicillin was reported by Rao dd et al and Singh M [8,18] respectively as the most used antibiotics.

Less than half of the patients in the current study were completely recovered, these findings were similar to Osunde OD study, resulted in that the outcome was satisfactory with complete resolution of (48.8%) of the patients and some morbidity [4].

## Conclusions

- Male was affected more with odontogenic infections and it more common in the 3<sup>rd</sup>. decade of life. The most common teeth affected were the 3<sup>rd</sup>. mandibular molars.
- Swelling, difficulty in breathing and pain were the main clinical presentations of the fascial space infections.
- Incision and drainage are the most imperative surgical treatment of odontogenic fascial space infection.

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### Special Note!

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