SCIENTIFIC ARCHIVES OF DENTAL SCIENCES (ISSN: 2642-1623)

Volume 2 Issue 12 December 2019

Research Article

Pattern and Treatment of Space Infection in Khartoum Teaching Dental Hospital, Sudan (2018)

Faroug Awad Mustafa Elmakawi*, Alaa Salah Al-Hassen, Egama Mohammed Abker, Sundus Mohammed Abdu-Almahamuod, Marya Abdullah Mohsen, Maisoun Mohamad Asad, Nojwd Hussein Saleh and Noof Adnan Saleh

Consultant of Oral and Maxillofacial Surgery, Harkan Dental Care, Saudi Arabia

***Corresponding Author:** Faroug Awad Mustafa Elmakawi, Consultant of Oral and Maxillofacial Surgery, Harkan Dental Care, Saudi Arabia.

Received: September 03, 2019; **Published:** November 11, 2019

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.

Objectives: To access the frequency and the clinical pattern of space infection among patient manage in KDTH with outcome.

Methodology: Hospital-based cross-sectional descriptive study in Khartoum Teaching Dental Hospital, Khartoum, Sudan. The population sample covered all patients with odontogenic fascial space infection above 13 years attending the hospital, 138 patients (50%) male and (50%) female, in a period extending from 2012 to 2018. The data collected retrospectively from hospital medical records and prospectively from the outpatient.

Results: The most common affected age group was (31 - 40 years) with percent (31.2%), and the least common age groups are (71 - 90 years) (13%). The most common affected tooth is the 3rd molar tooth (160%). The most common cause of infection was Pulpits (30.8%). Mandible was the most common site (85.3%). Ludwig's Angina was the most recorded in multiple spaces (37.5%), but in single space the buccal was recorded (62.2%). The most common clinical sign of admission is swelling of the face (43.1%). All patients treated by extraction, most of the interventional treatments modalities used in treatment were incision and drainage (34.5%). Metronidazole is the most described antibiotic (19.8%). (3.1%) were not totally recovered, (93.8%) fully recovered, deaths recorded in this study (3.1%).

Conclusion: Equal male and female affected by odontogenic fascial space infection, the predominant age group is the (31 - 40) years, mandibular third molar are the most causative single tooth where the lower third molars and lower second and third molars are the most common causative multiple teeth, the buccal space is the space most commonly involved in single space infection and Ludwig angina is the most recorded type of infection in multiple space involve.

Keywords: Odontogenic; Facial Space Infections; 3rd Molars

Abbreviation

KDTH: Khartoum Dental Teaching Hospital; MFSI: Maxillofacial Space Infection; CT: Computed Tomography; MRI: Magnetic Resonance Imaging; PT: Patient; IOPA: Intra Oral Peri-Apical; OPG: Orthopantomogram

Background of Study

Fascial spaces are potential spaces that exist between the layers of fasciae and the underlying organs and other tissues [1] space infections may be odontogenic in origin or other causes such as tonsillitis, mandibular fractures or lymphadenitis [2,3]. Odontogenic infections arising from pulpits, periapical abscess, pericoronitis and periodontal abscess [4]. Deep Fascial Space Infections associated either with odontogenic causes or other causes: Vestibular, Buccal, Subcutaneous, Infraorbital, Infratemporal, Peri mandibular spaces, Submandibular, Sublingual, Submental, Masticator space, Sub masseteric, Pterygomandibular, Superficial temporal, Deep temporal, Lateral pharyngeal, Retropharyngeal, Pretracheal, Dan-

ger space, Prevertebral. Some spaces associated with certain tooth such as deep Fascial Space Infections Associated with Maxillary Teeth: Infraorbital, Buccal, Infratemporal, Maxillary and other paranasal sinuses, Cavernous sinus thrombosis. Deep Fascial Space Infections Associated with Mandibular Teeth: Space of the body of the mandible, Peri mandibular spaces, Submandibular, Sublingual, Submental, Masticator space, Sub masseteric, Pterygomandibular, Superficial temporal, Deep temporal [5].

The basic principles of patient evaluation must be observed if an accurate diagnosis and appropriate treatment are to be achieved. Inaccurate diagnoses and inappropriate therapy complicate or prevent proper care, it is based on a good history, including a review of systems, physical examination appropriate laboratory and imaging studies, Computed tomography (CT scan), Magnetic resonance imaging (MRI), Nuclear medicine, Xeroradiography [6]. The main inflammatory response of the body's start by Signs of infection. Rubor, or redness, tumor, or swelling, calor, or heat, dolor, or pain, functiolaesa, or loss of function, is difficulty in chewing, swallowing, and respiratory embarrassment, fever and lymphadenopathy [7]. Specific signs associated with specific space infections: canine space associated with obliteration of nasolabial fold, Buccal space associated with Gum boil, Sub mandibular associated with Dysphagia and trismus, Sublingual Space causes raised floor of the mouth, the tongue may be pushed superiorly. This will bring about airway obstruction. Sub masseteric associated with complete limitation of mouth opening. Ludwig angina associated with impaired speech, and hoarseness of voice [6].

Treatment of odontogenic infection

Treatment of odontogenic infection may involve medical, surgical, dental therapy or combination. Definitive treatment of the affected tooth is important. Once the tooth has been identified, endodontic elimination of infected pulp, deep periodontal scaling or extraction must be performed [7].

Incision and drainage

Rid the body of toxic purulent material decompress the tissue allowing better perfusion of blood containing antibiotic and defensive element increased oxygenation of infected area. Following principles should be possible with incision and drainage:

1. Incision in healthy skin mucosa impossible.
2. Place the incision in esthetically acceptable area.
3. When possible place the incision in dependent position to encourage drainage by gravity.
4. Dissect bluntly, with closed surgical clamp or finger.
5. Place Adrian (sterile latex or catheter) and stabilize with suture.
6. Consider use of through and through drain bilateral submandibular space infection.
7. Do not leave drain in place for an overly extended period, remove them when drainage become minimal.
8. Clean wound margin daily under sterile condition to remove clot and debris [7].

Antibiotics therapy

The choices of antibiotic for therapy of odontogenic infection depend on laboratory result and sensitivity test. Use of antibiotics therapy in combination with surgery indicted a cut in deep facial space infection, deep orofacial laceration, dental infection or oral surgery in the compromised host and prophylaxis for dental surgery in the PT with valvular cardiac diseases.

Penicillin is preimperial antibiotic of choice in treatment of most of dental infection and beta lactamase stable antibiotics (clindamycin), erythromycin is poorly absorbed and less effective in odontogenic infection than penicillin or clindamycin but newer macrolide (azithromycin) are tolerated better than erythromycin. amoxicillin clavulanic acid a potent inhibitor of B-lactamase used in severe infection, first and second-generation cephalosporin are quite useful in odontogenic infection, tetracycline is not recommended for server infection but it analogous minocycline and doxycycline. Quinolones have limited activity against anaerobic thus justifying there use in odontogenic infection is difficult [7].

Literature Review

The term maxillofacial space infection (MSI) refers to infections in the potential spaces and fascial planes of the maxillofacial region, a region with a complex anatomy [2]. Preexisting dental infections are 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 the possibility of life-threatening complications, such as respiratory obstruction, necrotizing fasciitis, descending mediastinitis, pericarditis, artery rupture, brain abscess, and Sepsis. 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 [2,3]. Premedical workup included case history taking, physical examination, complete hematological test, urine analysis, appropriate imaging studies like Intra Oral Peri-Apical (IOPA) radiograph,

Orthopantomogram (OPG). Treatment of the causes may involve medical, surgical, dental therapy or combination [1].

This chapter provides a summary of available literature related to the Maxillofacial Space Infections. The primary focus was on literature addressing the prevalence of MSI, tooth associated with certain space, treatment and outcome.

Han X., *et al*. (2016) did a retrospective study of medical condition of 127 patients, men (59.1%) and women (40.9%), Their ages ranged from 1 to 85 years (mean 45.39 - 21.18 years), the authors found that the commonest cause of MSI was odontogenic infection (57.5%). The submandibular space was the most common space involved. Sixteen patients developed life-threatening complications, and the dominant complication was respiratory obstruction. MSI remain potentially life threatening. Even though adequate antibiotic therapy and incision and drainage of abscess were given, and the treatment strategy of patients with NEUT% less than 85.0% should be aggressive [8].

Babar., *et al.* (2016) The main age of patients (28 ± 7 years). The most common causes of odontogenic infection were periapical infection due to necrotic pulp in (83%), sequence by pericoronitis in (13.1%) patients. All patient presented with swelling of facial while (36.9%) had severe and (60%) had moderate pain associated with swelling. Mean mouth opening at the time of presentation was (24 ± 12 mm), and (30.8%) had fever. The most common space involved in odontogenic maxillofacial infections is combined buccal and submandibular space, followed by buccal space (29.2%). 64 patients were treated as inpatient with mean length of hospitalization 2 days. Most common surgical management was extraction of tooth with intra –oral incision and drainage of abscess in (69. 2%) cases [9].

In (2016) Yousif research about pattern of odontogenic facial space infection in 75 patients involve (56%) males and (44%) females mostly (30.7%) with ages of 21 - 30 years old while 1 - 10 years and 61 - 70 years were the least common ages. 48% of patients had Ludwig 's angina, 85.3% affected the mandible mostly (36%) in the third molar and 44% causes pulpits. Swelling of the face were the most common clinical findings (46.4%). (86.6%) treated with incision and drainage and 48.32% received metronidazole which 56% not totally recovered, 40% fully recovered and no deaths [10].

Rasteniene R., *et al*. (2015) review of 1,077 patients with severe odontogenic maxillofacial infections. The authors found that multiple spaces were involved in (42.9%) of cases. Penicillin in combination with gentamicin or metronidazole was prescribed in (69%) of cases. The sensitivity of a microorganism to penicillin remains high, therefore, penicillin can be the drug of first choice for treatment of odontogenic maxillofacial infections [11].

Rasteniene R., *et al.* (2015) of the 285 patients reviewed, males accounted for 166 and females 119. The mean length of hospitalization was (8.3 ± 4.9 days). The length of hospitalization was related to coexisting systemic conditions but not to the higher severity of dental or periodontal diseases. The most important determinants regarding longer hospitalization were indicators of infection severity such as an extension of the odontogenic infection and the need for an extraoral incision to drain the infection [12].

Jansisyanont P., *et al.* (2015) a retrospective study on 112 patients was performed and results with (68.7%) of patients having more than one space infection, commonly involved space was the submandibular (46.4%) followed by the pterygomandibular space (28.6%) [13].

Bali R., *et al*. (2015) to review the complication of odontogenic infections. The study done was based on PubMed and Google Scholar, and an extensive published work search was undertaken. The results showed that the Life-threatening infections of odontogenic or upper airway origin may extend to potential spaces formed by fascial planes of the lower head and upper cervical area. Complications include airway obstruction, mediastinitis, necrotizing fasciitis, cavernous sinus thrombosis, sepsis, thoracic empyema, Lemierre's syndrome, cerebral abscess, orbital abscess, and osteomyelitis. The incidence of these "space infections" has been greatly reduced by modern antibiotic therapy. However, serious morbidity and even fatalities continue to occur [14].

Pourdanesh F., *et al*. (2013) did retrospective study of 310 patients. The article presents that the patient younger than 35 years old represent (62.6%) of odontogenic space infection mostly the buccal space infection followed by (22.5%) had multi space and only 17 cases had Ludwig 's angina. Mandibular third molar are the most common teeth involve. The most common antibiotic used were penicillin G and metronidazole, or cefazolin and metronidazole and streptococci were the most detected bacteria. (24.3%) of patients were hospitalized for 4 days and 1% died of Ludwig 's angina [15].

Zheng L., *et al*. (2012) shows that patients with diabetes mellitus have increased risk for multiple space infection, longer hospitalization and increased complications that may ends in death [16].

Osunde OD., *et al*. (2012) the result show that the total of 53 patients of facial space infection seen over period of study there are 41 patients review. Account male (63.4%) and female (36.6%). Their age ranges from 4 months to 80 years (mean 23.8 - 18.3 years). There was no statistical difference between the mean age of female and male patients. The most frequently involved single space an accounted for (43.9%) of the cases is the submandibular space followed by Ludwig angina which accounted (36.6%) and (7.3%) represent buccal and sub masseteric space and there is (92.7%) of cases the source of infection odontogenic origin. The outcome with complete resolution (48.8%) and resolution with some morbidity (46.3%). The outcome was absorbed associated with age and time of presentation and with presence underline systemic conditions [3].

Mathew GC., *et al*. (2012) total of 137 patients was detected, (66.4%) were men. Mean patient age was 4 years. The most common odontogenic space involved was the submandibular space. and the most common teeth associated with it were the lower third molars. And the most common causes was pulpal (70.8%). Twenty patient represent with complication Multiple space, diabetes, were associated with complication [17].

Ishfaq M., *et al*. (2012) did a retrospective study for 155 patients, The involved tooth and presenting signs was collected through history, clinical examination and Radiology which results were more common in females and in the third decade of life. The most common teeth involved in infection were permanent second molar.

The submandibular space was the most common space involved in odontogenic infections. Pain and swelling were the common presentations of facial space infections [4].

Sánchez R., *et al*. (2011) of the 151 patients reviewed, equal male and female with mean age of 40.3 years. The most common tooth is posterior tooth in mandibular, due to caries [18].

Zhang., *et al*. (2010) did a retrospective study of 212 patients with a diagnosis of MSI. Male accounted for 125 and female 87. Their ages ranged from 1 to 80 years (median 47.5 years). The submandibular space was the space most commonly involved in both single space and multiple space infections (37.5% and 29.1%, respectively). One hundred and two patients (48.1%) self-medicated before admission, and the time from onset of symptoms until presentation was longer in those who self-medicated compared with those who did not. The authors found that the management of MSI should be more aggressive when the above risk factors are present, in order to avoid life-threatening complications [2].

Rao DD., *et al.* (2010) to compare between maxillofacial space infection in a group of patients with diabetes and others without diabetes did a 4-year prospective study that shows *Streptococcus* species with submandibular space are common in both groups [19].

Gupta M., *et al.* (2010) evaluate a series of patients with space infection. 256 (172 males, 84 females) patients with severe odontogenic space infection included in this study. All the medically compromised patients and pregnant females and infections due to non-odontogenic causes were also included. Their ages ranged from 1.5 to 75 years (major of them less than 30 years). The most commonly space infected was vestibular followed by submandibular and buccal space infection. Sources of infection were of erupting 3rd molar or carious 2nd or 1st molar. Out of 20 immunocompromised patients, 3 patients lost their life because complications precipitated by their medical state [1].

Boscolo-Rizzo., *et al*. (2009) Identified risk factors for complications. Anterior visceral space involvement and diabetes mellitus were the most important predictive factors in the model. Airway obstruction and spread of the infection to the mediastinum are the most troublesome complications of submandibular space infections. Therefore, the maintenance of a secure airway is paramount [20].

Justification

In Sudan, the KTH is the main hospital that treat the space infection patients. It in felt worthily to know the way of treatment, most common space with tooth involved, sexes, the drugs used and death.

Oral facial infections remain among the top reasons for seeking healthcare in the world. Dentists, regardless of their focus of practice, remain the frontline practitioners for diagnosis and management of oral and facial infections. Facial spaces infection is one of the most common life-threatening conditions that may lead to death. In the United States of America fatality involving Oro-facial infection is low due to the proper use of antibiotics and prompt interventions. Without proper management of odontogenic infections complications such as facial cellulites, mediastinitis, brain abscess, septicemia and thromboembolism could result. The first challenge for this problem is scarcity of dental hospitals or clinics that contain septic unit for management of F.S.I, and this explain increase number of patient from outside Khartoum, in addition to that increase morbidity rate of F.S.I despite of presences of Primary dental treatment for odontogenic causes.

Objectives of the Study

General objective

To access the frequency and the clinical pattern of space infection among patient manage in KDTH with outcome.

Specific objectives:

1. To know the prevalence of MSI in Khartoum in males and females considering the age (in male above 12 years, in female above 10 years).
2. To determine the most common space involved and associated tooth.
3. To described signs and symptoms of space infection.
4. To determine the risk factors for life-threatening complications, death and time takes for resolution according to the patient health.
5. To determine the most common investigation and treatment.

Methodology

Study design

The research has been done in two-part Retrospective and Prospective study design according to Khartoum Dental Teaching Hospital data.

Study area

The research was done in Khartoum Dental Teaching Hospital state.

Study type

Non-probability sampling (convenience).

Study population

Required of patients admitted in Khartoum Dental Teaching Hospital diagnosis of oral odontogenic space infection from 13 to 90 years in duration of prospective study new diagnosis patient during 2018 and retrospective study during period from 2012-2017.

Inclusion criteria

Patients with maxillofacial space infection with odontogenic origin both sexes, age range from 13 to 90 years.

Exclusion criteria

1- According to age: patient below 13 years.

2- Space infection due to non-odontogenic causes.

Sample size

138 patients with maxillofacial space infection of sexes, treatment and age from 13 to 90 years.

Variables

138 patients with:

- Oral odontogenic space infection
- Teeth associated
- Sexes
- Ages from 13 to 90 years
- Treatment

65 from patient add another variable are:

- Medical fit
- Investigation
- Associated phenomena
- Drugs and route of administration
- Causes
- Hospital
- Recovery
- Self medication
- Vital sign

Data collection technique and tools

The Retrospective data collected from the previous files from the Khartoum Dental Teaching Hospital archive.

The prospective data collected by asking direct question for patient and doctors in Khartoum Dental Teaching Hospital.

Ethical consideration:

1- Scientific and ethical approval from International University of Africa had been obtained.

2- Written consent had been taken from Khartoum Dental Teaching Hospital Administrations prior to collection of data.

3- This information obtained will remain strictly confidential.

Data analysis

Data analysis by the statistical package of social sciences program. The frequency and distribution had been calculated and analyzed by using frequency and percent and then the chi-square test had been performed to asses' relation between factor and percent.

Results

A total of 138 patients with odontogenic fascial space infections were enrolled in this study. Including 69 males (50%) and 69 females (50%) (Figure 1).

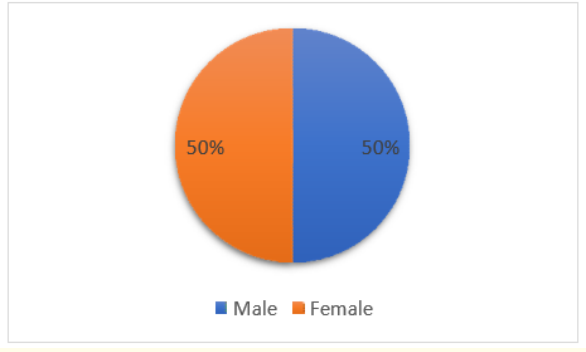

Figure 1: *Distribution of samples according to gender.*

The age ranges from 13-90 years with mean of (34 ± 4 years). The age distribution of patients is shown in table 1. The predominant age group is the (31 - 40) years accounting for (31.2%), this was followed by the (21-30) years age category (28.3%), and the least common age group is (71 - 90) years with percent (1.4%).

Age in Years	Frequency	Percent
13 - 20	22	15.9%
21 - 30	39	28.3%
31 - 40	43	31.2%
41 - 50	15	10.9%
51 - 60	6	4.3%
61 - 70	5	3.6%
71 - 90	2	1.4%
Not mentioned	6	4.3%
Total	138	100.0%

Table 1: *Distribution of samples according to the age group.*

A single tooth as a cause of infection was diagnosed in 119 cases (86.3%). The most frequent causal tooth was a lower left third molar, which caused infections in 19 cases (16%) (Table 2). In 19 cases (13.7%) where the cause was multiple teeth, the most common affected teeth were lower third molars and lower second and third molars (15.8%) in each group (Table 3). Mandible was found to be the most common site (81.2%) (Table 4). Left side odontogenic fascial space infection is predominated (54,3%) (Figure 2). Most performed investigation was OPG (48.2%) (Table 5). The most common cause of infection was pulpitis (30.8%) (Table 6).

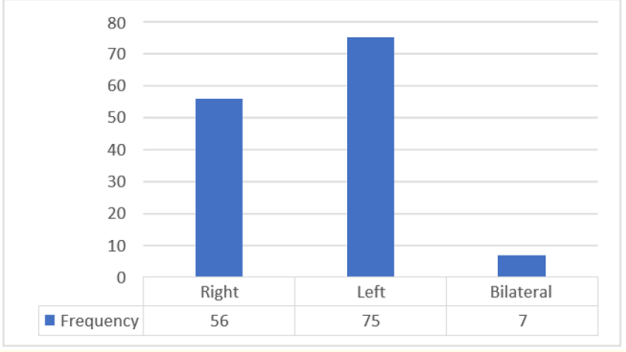

Figure 2: *Shows the side of odontogenic fascial space infections.*

Single Tooth	Frequency	Percent
11	1	0.8%
13	1	0.8%
15	3	2.5%
22	1	0.8%
23	2	1.7%
24	3	2.5%
25	2	1.7%
26	2	1.7%
27	3	2.5%
28	2	1.7%
30	1	0.8%
31	1	0.8%
34	2	1.7%
35	1	0.8%
36	18	15.1%
37	11	9.2%
38	19	16.0%
44	2	1.7%
45	1	0.8%
46	17	14.3%
47	11	9.2%
48	15	12.6%
Total	119	100.0%

Table 2: *Distribution of samples according to the single affected tooth.*

Multiple		
Tooth	**Frequency**	**Percent**
11, 23	1	5.3%
18, 35, 46, 47	1	5.3%
23, 24	2	10.5%
24, 38	1	5.3%
26, 27, 36	1	5.3%
36, 37	2	10.5%
36, 38	1	5.3%
37, 38, 47	1	5.3%
37, 38, 47, 48	1	5.3%
38, 48	3	15.8%
45, 46	1	5.3%
46, 48	1	5.3%
47, 48	3	15.8%
Total	19	100.0%

Table 3: *Distribution of samples according to the multiple affected teeth.*

Site	Frequency	Percent
Mandible	112	81.2%
Maxilla	23	16.7%
Both Mandible and Maxilla	3	2.2%
Total	138	100.0%

Table 4: *Show the site of odontogenic fascial space infections.*

Investigation	Frequency	Percent
OPG	40	48.2%
Hepatitis test	1	1.2%
CT Scan	1	1.2%
Cultural Sensitivity Test	1	1.2%
Periapical	8	9.6%
Electrolytes	2	2.4%
CBC	5	6.0%
Random Blood Glucose	3	3.6%
Renal Function Test	1	1.2%
PT	1	1.2%
INR	1	1.2%
Not mentioned	19	22.9%
Total	83	100.0%

Table 5: *Show types of investigation carried for the patients.*

Causes	Frequency	Percent
Periapical abscess	1	1.5%
Pericoronitis	4	6.2%
Periodontitis	7	10.8%
Pulpitis	20	30.8%
Not Mentioned	33	50.8%
Total	65	100.0%

Table 6: *Show the etiology of odontogenic fascial space infection.*

The infection involves one space in 90 patients (65.2%) and spread of infection to involve two or more anatomic space in 48 patients (34.7%). The buccal space was the space most commonly involved in single space infection (62.2%) (Table 7). Ludwig angina (37.5%) was the most recorded type of infection in multiple space involve (Table 8).

Single		
Space	**Frequency**	**Percent**
Buccal	56	62.2%
Canine	8	8.9%
Lateral pharyngeal	2	2.2%
Sub lingual	1	1.1%
Sub mandibular	14	15.6%
Sub masseteric	8	8.9%
Temporal	1	1.1%
Total	90	100.0%

Table 7: *Distribution of the space involved in single space infection.*

Multiple		
Space	**Frequency**	**Percent**
Bilateral Sub mandibular	1	2.1%
Bilateral Sub mandibular, Bilateral sub mental	1	2.1%
Bilateral Sub mandibular, Sub masseteric, Sub mental	1	2.1%
Canine, Buccal	2	4.2%
Lateral pharyngeal, Sub masseteric	1	2.1%
Ludwig angina	18	37.5%
Parotid, Sub masseteric	1	2.1%
Sub mandibular, Buccal	2	4.2%
Sub mandibular, Sub mental	7	14.6%
Sub masseteric, Buccal	4	8.3%
Sub masseteric, Sub mandibular	8	16.7%
Sub masseteric, Sub mandibular, Sub mental, Sub lingual	1	2.1%
Sub masseteric, Temporal	1	2.1%
Total	48	100.0%

Table 8: *Distribution of the space involved in multiple space infection.*

Most of the patients were medically fit (72.3%) and medically compromised patients were with percent of (27.7%) (Figure 3). The most recorded comprised patients were diabetic patient (14.5%) (Table 9). The use of herbal medication was observed in 7 patients (10.8%), while (89.2%) denied using any form of such medications prior to presentation to the hospital (Figure 4).

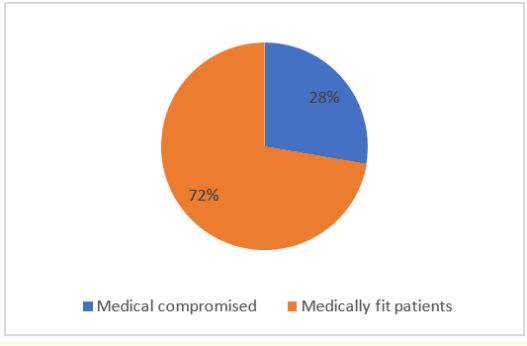

Figure 3: *Show of the medical status of odontogenic fascial space infections patients.*

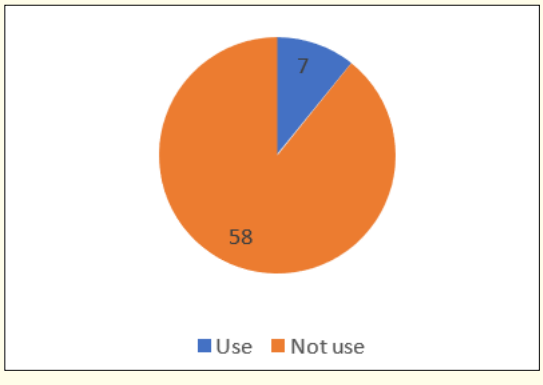

Figure 4: *Show of the uses of self-medication prior hospital admission.*

Medical Fit	Frequency	Percent
Diabetes mellitus	10	14.5%
Hepatitis (B)	1	1.4%
HIV	2	2.9%
Hypertension	3	4.3%
Pregnancy	4	5.8%
Renal	1	1.4%
Romatoid	1	1.4%
Medically fit patients	47	68.1%
Total	69	100.0%

Table 9: *Show of the disorders associated of odontogenic fascial space infection.*

More of the patients (21.5%) presented within one week of onset of symptoms (Table 10). The most common clinical sign of admission is swelling of the face (43.1%) (Table 11).

Duration		Frequency	Percent
Years	1	4	6.2%
	3	1	1.5%
Month	1 to 4	10	15.4%
	5 to 8	3	4.6%
	9 to 12	1	1.5%
Days	3 to 7	14	21.5%
	8 to 15	6	9.2%
	16 to 23	4	6.2%
	Not Mentioned	22	33.8%
	Total	65	100.0%

Table 10: *Show of duration of odontogenic fascial space infection.*

Associated Phenomena	Frequency	Percent
Difficulty opening mouth	18	15.5%
Discharge	5	4.3%
Pain	26	22.4%
Swelling	50	43.1%
Difficulty on breathing	1	0.9%
Trismus	3	2.6%
Elevated ear loop	1	0.9%
Not mentioned	11	9.5%
Total	115	99.1%

Table 11: *Show of cause of odontogenic fascial space infections patients admission.*

Regarding the vital signs the calculation for all cases showed the following results: the majority of patient admission with normal vital signs, (15.4%) admission with high blood pressure, (16.9%) with high temperature, (10.8%) with high pulse rate, and (4.6%) with low Respiratory rate (Table 12).

Vital Sign	High	Low	Normal	Total
Blood pressure	10 (15.4%)	1 (1.5%)	54 (83.1%)	65
Temperature	11 (16.9%)	1 (1.5%)	53 (81.5%)	65
Pulse rate	7 (10.8%)	2 (3.1%)	56 (86.2%)	65
Respiratory rate	1 (1.5%)	3 (4.6%)	61 (93.8%)	65

Table 12: *Show of vital signs recorded in data.*

A causal tooth was removed in all patients, most of the interventional treatment modalities used in treatment is the drainage with incision (34.5%) (Table 13). An intra-oral incision was made in 16 cases (24.6%), extra-oral incision was need in 18 cases (27.7%) and an intra-oral incision combined with an extra-oral incision was made in 9 cases (13.8%) (Table 14).

Treatment	Frequency	Percent
Extraction	138	61.9%
Drainage without incision	9	4.0%
Drainage with incision	77	34.5%
Total	224	100%

Table 13: *Show of the interventional treatments modalities used in the study.*

Incision	Frequency	Percent
Intraoral	16	24.6%
Extraoral	18	27.7%
Intraoral and Extraoral	9	13.8%
Not mentioned	22	33.8%
Total	65	100.0%

Table 14: *Show of the types of incision performed to the patients.*

Distribution of drug therapy show in table 15. Metronidazole is the most used antibiotic (19.8%). The most common route of admission is intravenous (30.8%) (Table 16).

Drugs	Frequency	Percent
Analgesic	1	0.4%
Benzine penicillin	2	0.8%
Ceftriaxone	33	13.6%
Clindamycin	2	0.8%
Dexamethasone	29	11.9%
Dextrose	1	0.4%
DNS	39	16.0%
Metronidazole	48	19.8%
Folic acid tabs	2	0.8%
Geldanamycin	1	0.4%
Gentamycin	1	0.4%
Maxical	6	2.5%
Maxil	7	2.9%
Metformin	1	0.4%
NS	20	8.2%
Oxacillin	1	0.4%
Penicillin	1	0.4%
Vortex	39	16.0%
Not mentioned	9	3.7%
Total	243	100.0%

Table 15: *Description of the drugs used for treatment.*

The mean length of hospital stay was (4.2 ± 3 days) with the shortest treatment lasting 2 days and the longest treatment lasting 10 days. The total length of hospital stay was 3 days in majority of cases (24.6%) (Table 17). Out of the 65 patients (93.8%) were fully recovered, (3.1%) not totally recovered, two patients with underlying systemic condition died (the mortality rate was 3.1%) (Figure 5).

Route	Frequency	Percent
IV	20	30.8%
Oral	14	21.5%
IV and Oral	11	16.9%
Not mentioned	20	30.8%
Total	65	100.0%

Table 16: *Show of route of drugs- admission.*

Hospitalization	Frequency	Percent
2 days	1	1.5%
3 days	16	24.6%
4 days	6	9.2%
5 days	3	4.6%
7 days	6	9.2%
10 days	1	1.5%
Not mentioned	32	49.2%
Total	65	100.0%

Table 17: *Show of the length of hospital stay.*

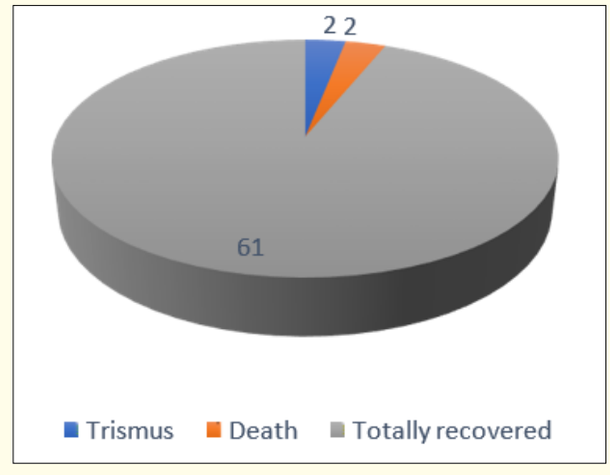

Figure 5: *Show of the recovery status of the patients.*

Typical bilateral submandibular and submental swelling.

Deep temporal space infection with spread to the right parotid space and the orbit. This patient developed right optic neuritis with permanent loss of vision. A, frontal view; B, lateral view showing pre-auricular swelling.

Front view of Ludwig's angina patient with "croaking toad" appearance.

Diffuse submandibular space infection.

Masticator space infection involving the right mandibular 3rd molar, showing marked swelling of the face and neck.

Clinical photograph showing healing incisions used for surgical decompression.

The outcome was observed to be significantly associated with the presence of underlying systemic conditions (p = 0.0016), time of presentation (p = 0.020), but not significantly associated with age (p = 0.80).

The use of self-medication before admission were found to be not significantly associated with time from onset of symptoms until presentation (p = 0.063), and with severity of clinical signs (p = 0.95).

The associated phenomena were observed to be not significantly associated with the presence of underlying systemic conditions (p = 0.94), age (p = 0.99), and gender (p = 0.58).

There is no significantly associated between age and gender of patient (p = 0.16), gender and space involved (p = 0.65), or between space infected and type of incision performed (p = 0.9174).

Discussion

Fascial space Infections in the head and neck region, which commonly arise from odontogenic causes should be handled with every sense of urgency; otherwise, within a short time, they will result in acute emergencies fascial space infection mainly caused by bacterial infection arising from pre- existing dental caries-related sequalae and Other documented cause, peri tonsillar or Para pharyngeal abscesses.

In the present study 50% of females and 50% of males had odontogenic infection, Ishfaq M., *et al*. reported in his study that 65.16% of females and 34.84% of males had odontogenic infections with male to female ratio 1:1.87, in another study by Yousif Eltohami female were predominant, having primary facial space infection (56%), male (44%) [4,10].

In the present study, the age of patients varied from 13 to 90 years with main age range 31 - 40 years. Ishfaq M., *et al*. studied 155 patients with facial space infections with an age range of 1to 70 years with main age range form 21 - 30 years [4].

In the present study, the most common single tooth affected was permanent mandibular third molar (16.0%), followed by permanent mandibular left first molar (15.0%), followed by permanent mandibular right first molar (14.3%). This finding disagreed from the finding of Ishfaq M., *et al*. was reported permanent mandibular second molars were involved in (37.42%), permanent maxillary first molars in (19.35%), while permanent mandibular third molars in (14.84%) of cases, Rasteniene., *et al*. reported in their study left second molar causes infection in cases (17.5%), Yousif., *et al*. third molar molars (36%). The most common multiple tooth involved were permanent left and right mandibular third molar (15.3%) and permanent right mandibular second and third molar (15.3%), there was no previous studies discussed the multiple tooth involved [4,10,11].

This study shows the most common site was mandible (81.2%). This was similar to study carried by Yousif., *et al*. The most affected side in this study was left (54.3%) [10].

The present finding showed that most used investigation was OPG (48.2%), in Yousif., *et al*. study DPT (42.64%) was most performed investigation [10].

Most of the previous studies showed that the most common cause of fascial space infection was odontogenic in origin. The leading cause of infection was Pulpitis (30%) in this study. Gupta M., *et al*. and Yousif Eltohami agreed that pulpits were leading cause. in Yousif study it represents (44%), and in Manisha at el represent (25%) [1,10].

This study showed that the most common single space infection was buccal (62.2%), followed by submandibular (15.6%) and sub masseteric space infection (8.9%). And the most predominant multiple space infection was Ludwig angina. According to Yousif., *et al*. study Ludwig's Angina (48%) was the most recorded type of infection then Sub masseteric (18.89%) and Submandibular space infection (12.22%). Zhang., *et al*. stated the submandibular space was the most commonly involved in both single space and multiple space infections (37.5% and 29.1%, respectively). Ishfaq M., *et al*. reported the primary most common space was submandibular (46.45%) then buccal space (30.32%). In the multiple space, submandibular and sublingual were involved in 3.78% cases. Osunde., *et al*. declined Submandibular space was the most frequently involved accounting for 43.9% of the cases. Then followed by bilateral and simultaneous involvement of submandibular, sublingual, and submental spaces (Ludwig angina) in36.6% of cases. Buccal space and submeter space infection represented 7.3 each. Rasteniene., *et al*. finding Two or more anatomic spaces were involved in 42.9% of cases, 37.3% of which involved the floor of the mouth, Ludwig angina was found in 68 cases. Guptam., *et al*. stated vestibular was most common space infected followed by submandibular and buccal space infection. But same patient had more than one space infection thus having multiple space infection [1-4,10,12,16].

The medical status of patients in the current study, most of the patients were medically fit (72.3%), and medically compromised patient were (27.7%) the most recorded compromised were patient were diabetic mellitus (14.5%), this finding agreed with Yousif., *et al*. but in the Guptam., *et al*. finding 7 patients were immune compromised, 40 patients were diabetic, 2 patients were chronic renal failure, 20 patients were pregnant, Rasteniene., *et al*. reported 30 patients had diabetic mellitus, 59 had arterial hypertension and 41 patients had hepatitis B or C [1,10,11].

Most of the patients (87.2%) did not used self-medicated in this study. This finding is in line with Rasteniene., *et al*. and Osunde., *et al*. studies. But contrary to Zhang., *et al*. who showed that (48.1%) of the patients were self-medicated [2,3,11].

Our study showed that the majority of PT (21.5%) visit the dentist early in less than ten days, and this reduces the later complication, other studies showed that the majority of patients customarily delay a visit to the dentist despite complicated oral health status. Sometimes this delay be coming life-threatening.

Similar to Yousif., *et al*. and Ishfaq., *et al*. studies, this study finds that the most common associated phenomena that patients come with is swelling in (43.1%) of the patients, followed by pain (23.3%) and the latest common associated phenomena is difficulty in breathing and elevated ear loop (both are 0.9% of the patients). But different associated phenomena were reported in other studies, as in Rasteniene., *et al*. study which says that all the patients came with pain, then limited mouth opening is (35%), and limited mouth opening and dysphagia in (10.4%) only. Also, Zhang., *et al*. reported that (88.6%) of the patients were admitted with respiratory difficulty, and (30.4%) with severe restricted mouth opening [2,4,11].

The study showed that most of the patients recorded normal vital signs at admission blood pressure (83.1%), pulse rate (86.2%), respiratory rate (93.8%), temperature (81.5%) of patients. This study differs from Zhang., *et al*. who showed that most of the patients (70.6%) admitted with high temperature 39.1°C. And also, it differs from Yousif., *et al*. study which shows low blood pressure in most of the patients at admission (64.3%), high pulse rate (80%), normal temperature (50%), and low temperature (50%). But it agrees with Yousif., *et al*. in that most of the patients recorded normal respiratory rate at admission (61.5% in Yousif's study) [2,10].

Concerning the surgical treatment, the present study declared that the Most interventional treatments used was extraction (57.4%) this fact different from Gupta M., *et al*. how reported that incision and drainage extra- orally or intra-orally, was the predominant surgical intervention [1].

The present findings showed that the most common incision was extraoral incision (41.5%), followed by intraoral incision (38.5). In the Rasteniene., *et al*. finding intra-oral incision was made in 45 cases, extraoral incision were needed in 974 cases and an intraoral incision combined with an extraoral incision was made 58 cases [11].

This study showed that the most common antibiotic used was Metronidazole (19.8%). These findings were similar to the findings of Yousif Eltohami and different from the findings of Rasteniene R., *et al*. who reported that penicillin and gentamycin were the predominant treatment used. The route of attestation of used antibiotics in this study is intravenous route (30%), similar to Rasteniene R., *et al*. study which showed that Intravenous penicillin alone or in a combination with gentamicin or metronidazole was prescribed in 69% of cases [10,11].

This study showed that the length of hospital stays (hospitalization) for the most of PT (24.6%) is three days, in Rasteniene R., *et al*. study, delayed presentation was associated with more serious infections and longer hospital stay. longer hospitalization relates

to different direct and indirect indicators related to the severity of such infections such as involvement of more than one tooth or spread of infections into multiple spaces [11].

This study shows that most of the patients (93.8%) were totally recovered after treatment. This is differing from Yousif., *et al*. and Osunde., *et al*. studies which find that less than half of the patients were completely recovered (48.8%) and there was some morbidity [3,10].

In this study, most of the patients were house-wife (20%), this result is similar to Yousif., *et al*. study, but not to Zhang., *et al*. in which farmers represents (54.7%) [2,10].

Conclusion

The most common etiology of odontogenic fascial space infection was pulpitis. The buccal single space was the most commonly involved. Outcome ranges from the complete recovery of the majority of the patients to the death of some cases which had underlying medical conditions.

Recommendation

1. Further research should be done to provide enough data about fascial space infection in Sudan.
2. The general population should be educated about oral hygiene instruction and the importance of regular dental checkup.
3. Number of dental hospitals in Sudan should be increased to provide maximum coverage and also should be cost-effect.
4. Increase dental awareness about the effects that space infection can have not only to the oral cavity, but also on the other part of their bodies.

Bibliography

1. Gupta M. Virendra Singh. A retrospective study of 256 patients with space infection. J Maxillofac Oral Surg. 2010;9(1): 35-37.
2. Zhang C., Tang Y, Zheng M, Yang J, Zhu G, Zhou H, Zhang Z, Liang X. Maxillofacial space infection experience in West China: a retrospective study of 212 cases. Int J Infect Dis. 2010;14(5):e414-e417.
3. Osunde OD, Akhiwu BI, Efunkoya AA, Adebola AR, Iyogun CA, Arotiba JT. Management of fascial space infections in a Nigerian teaching hospital: A 4-year review. Niger Med J. 2012;53(1):12.
4. Ashfaq M, M Khan, Q ud Din. Odontogenic Primary Facial space infections-A study. JKCD. 2012;2:2.
5. Hupp JR, MR Tucker, E Ellis. Contemporary Oral and Maxillofacial Surgery-E- Book. Elsevier Health Sciences; 2013.
6. Neelima AM. Textbook of oral maxillofacial surgery. Jaypee brother's medical publisher ltd, 2008. 1: p. 549-565.
7. Topazian RG, MH Goldberg, JR Hupp. Oral and maxillofacial infections. Elsevier Health Sciences; 2002.
8. Han X, An J, Zhang Y, Gong X, He Y. Risk factors for life-threatening complications of maxillofacial space infection. J Craniofac Surg. 2016;27(2):385-390.
9. Babar A, Nighat Ara, Syed Gulzar Ali Bukhari. Odontogenic maxillofacial infections in a tertiary care hospital. Pakistan Oral & Dental Journal. 2016;36(3).
10. Yousif I Eltohami, Amal H Abuaffan, Israa Bakry, Israa Abdulla, Israa Mahmod, Ala M Abdulla. Pattern of Odontogenic Fascial Space Infections among a Sample of Sudanese Patients. Indian Journal of Dental Education. 2016;9(4).
11. Rastenienė R, Pūrienė A, Aleksejūnienė J, Pečiulienė V, Zaleckas L. Odontogenic maxillofacial infections: A ten-year retrospective analysis. Surg Infect (Larchmt). 2015;16(3):305-312.
12. Rastenienė R, J Aleksejūnienė, A Pūrienė. Determinants of length of hospitalization due to acute odontogenic maxillofacial infections: a 2009-2013 retrospective analysis. Med Princ Pract. 2015;24(2):129-135.
13. Jansisyanont P, W Kasemsai, P Bamroong, Factors related to the treatment outcome of maxillofacial fascia space infection. Journal of Oral and Maxillofacial Surgery, Medicine, and Pathology. 2015;27(4):458-464.
14. Bali RK, Sharma P, Gaba S, Kaur A, Ghanghas P. A review of complications of odontogenic infections. Natl J Maxillofac Surg. 2015;6(2):136-143.
15. Pourdanesh F, Nima Dehghani, Mohadese Azarsina, and Zahra Malekhosein. Pattern of odontogenic infections at a tertiary hospital in tehran, iran: a 10-year retrospective study of 310 patients. J Dent (Tehran). 2013;10(4): 319-328.
16. Zheng L, Yang C, Zhang W, Cai X, Kim E, Jiang B, Wang B, Pu Y, Wang J, Zhang Z, Zhou L, Zhou J, Guan X. Is there association between severe multispace infections of the oral maxillofacial region and diabetes mellitus? J Oral Maxillofac Surg. 2012;70(7):1565-1572.
17. Mathew GC, Ranganathan LK, Gandhi S, Jacob ME, Singh I, Solanki M, Bither S. Odontogenic maxillofacial space infections at a tertiary care center in North India: a five-year retrospective study. Int J Infect Dis. 2012;16(4):e296-302.
18. Sánchez R, Mirada E, Arias J, Paño JR, Burgueño M. Severe odontogenic infections: epidemiological, microbiological and therapeutic factors. Med Oral Patol Oral Cir Bucal. 2011;16(5):e670-e676.

19. Rao DD, Desai A, Kulkarni RD, Gopalkrishnan K, Rao CB. Comparison of maxillofacial space infection in diabetic and non-diabetic patients. Oral Surgery, Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010 Oct;110(4):e7-e12.

20. Boscolo-Rizzo P, MC da Mosto. Submandibular space infection: a potentially lethal infection. Int J Infect Dis. 2009;13(3):327-33.

Volume 2 Issue 12 December 2019