OPEN ACCESS
Saudi Journal of Oral and Dental Research
Abbreviated Key Title: Saudi J Oral Dent Res
ISSN 2518-1300 (Print) |ISSN 2518-1297 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: http://scholarsmepub.com/sjodr/

Original Research Article

Epidemiological Study of Osteomyelitis in a Tertiary Centre: Single Centre Study

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DOI:10.21276/sjodr.2019.4.8.2 | **Received:** 21.06.2019 | **Accepted:** 24.07.2019 | **Published:** 16.08.2019

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Abstract

Backgroud: Osteomyelitis is an inflammatory process of bone and bone marrow contents. Bone changes are primarily seen in the soft tissue followed by the calcified tissue. It is usually caused by pyogenic bacteria or mycobacterium. ***Objective:*** To determine the epidemiologic profile of patients with osteomyelitis admitted at a tertiary centre from 2006 to2016. ***Methodology:*** The present study was done retrospectively in which the data was collected from the year 2006-2016 from a tertiary centre and analyzed epidemiologically. ***Result:*** The female patients outnumbered the male patients and most of the patients were in their 3rd and 4th decade. Also, the maxilla was more commonly affected thand mandible. ***Conclusion:*** The study helps in assessment of the local data of a tertiary centre which is important in optimizing the local therapeutic protocols.

Keywords: Bone marrow, odentogenic infections, osteomyelitis, pyogenic infections, tertiary centre.

INTRODUCTION

The term "osteomyelitis" is derived from the two ancient Greek words, i.e, 'osteon' = bone and 'muelinos'= marrow and thus it means the infection of the medullary portion of the bone [1]. Osteomyelitis is an inflammation of medullary portion of the bone which subsequently extends to the periosteum. The infection establishes in the calcified portion of the bone when pus in the medullary cavity or beneath the periosteum leads to the obstruction of blood supply. As the ischemia sets, in the necrosis ensues (Figure-1). The conditions which affect the vascularity of bone which includes radiation, osteoporosis, osteopetrosis, bone malignancy, Paget's disease seem to play a crucial role in the etiopathogenesis of osteomyelitis [2]. The host defense mechanism is altered in most of the patients of osteomyelitis of jaw. The pathogenesis of osteomyelitis of the jaws is predominately due to odontogenic microorganisms. Osteomyelitis commonly occurs in the jaw. It is a dreadful disease which occasionally results in dysfunction and disfigurement due to loss of a major portion of the jaw bone and therefore osteomyelitis requires a prolonged therapy. By the virtue of better dental health care and advent of newer antibiotic agents, the incidence of osteomyelitis of the jaw has declined in present times. Although there is relatively low incidence of osteomyelitis of the jaw in modern times but still we do come across many cases. The various predisposing factors are: Less awareness about oral and dental hygiene in population, Malnutrition, Indiscriminate and inappropriate use of antibiotic agents which can give rise to antibiotic resistant strains of microorganisms. Other factors which can predispose an individual to osteomyelitis of jaw are: Virulence of the microorganism, Compromised vascular perfusion in the host bone at the local, regional or systemic level and conditions affecting host resistance or defense. Inflammation of bone and marrow referring to osteomyelitis generally implies the presence of infection [3]. In children, hematogenous origin is generally the most common mechanism of infection and is most often acute. On the other hand, chronic osteomyelitis is mostly the result of an infection after a surgical procedure or from inadequate treatment of acute hematogenous osteomyelitis. Apart from infection, compromised blood supply is also a critical

factor for the occurrence of osteomyelitis, hence, the maxilla is less frequently involved as compared to mandible because maxilla has better blood supply and the mandible is dense yet poorly vascularized cortical plates and only has single blood supply from the inferior alveolar nerve [4, 5]. Although in the present study the maxillary involvement is seen more than that of mandibular. Osteomyelitis can be of acute or subacute or chronic type on the basis of the clinical presentation. Usually both medical and surgical treatment is required for the Osteomyelitis of the jaws. The host defense mechanism is altered in most of the patients with osteomyelitis of the jaws, therefore steps should be taken to recognize and rectify these host factors that may result in faster healing and recovery. Whenever possible, the specimens should be obtained and tested for sensitivity, aerobic and anaerobic culture and Gram staining. Conventional radiographs and bone scans should be obtained in order to assess the existence of co-morbid factors such as periapical abscess and fractures, as well as presence and site of sequestra and also to determine the severity and extent of the disease. Sequestra and extremely mobile should be removed early in the course of the disease for better prognosis [3]. An appropriate course of antibiotics along with suitable supportive measures should be given to control the acute infection. Other treatment options include debridement, sequestrectomy, and resection of infected bone, decortications and immediate or late bone graft reconstruction [6]. The aim of the present study was to retrospectively analyze the epidemiology of osteomyelitis from a tertiary centre in 10 years from 2006 to 2016 and to describe the data in respect of age and sex distribution and the site involved.

MATERIALS AND METHODS

The present study is a retrospective study in which the data was collected from a tertiary centre which comprised of the patients suffering from osteomyelitis of the jaws reported from the year 2006 to 2016 which was analyzed epidemiologically and also described in terms of yearly distribution, site involved as well as age and gender distribution. All patients admitted in the hospital during the year 2006-2016 with history of swelling, discharging sinus and pain in the jaw and clinically/radio-graphically suspected as a chronic osteomyelitis irrespective of age and sex were included in the study. The total number of patients acquired from the data was 30. Routine blood test: Hb %, TLC, DLC, BT, CT, Fasting and PP Blood sugar, urine, etc. was done for all the patients. Orthopantomographs (OPG), Lateral Oblique view of the mandible, Occipito-mental view/PNS, X-ray chest PA view was done as per the requirement of the case were taken. The data for each patient i.e., date, OPD No., name, age, sex and site of involvement was organized and compiled into a raw data form and were analyzed. Some patients had undergone medical treatment while others surgical intervention customized to their clinical condition. The different treatment modalities were:

Definitive Antibiotic Treatment

Ceftrixone injection-1 g or Amoxyclav 1.2 g IV12 hourly for 5-7 days followed by capsule cepharadine 500mg- 6 hourly for 3-4 weeks or Cloxacillin injection 250mg 6 hourly for 5-7 days. In case of a drug allergy to any one of the selected antibiotics the other choice of antibiotic was given. In exceptional cases if a patient was allergic to both the antibiotics of choice was Cefotaxim injection 2g IV was administered 12 hourly. Metronidazole IV 100ml/ 500mg orally tds (8 hourly) was given in all study cases for 5-7 days. Other supportive treatments include: Non-narcotic analgesics were given in all cases for paincontrol in different doses and through different routes: Paracetamol 500mg tds, Diclofenac SR 100mg bd, Ibuprofen 400mg tds, Ibuprofen 400mg + Paracetamol 500mg bd, Inj i/m voveron 3ml 8 hourly, Tramadol 100mg bd. Intravenous fluid and electrolysis therapy for hydration (2 units in 24 hrs). Ringer Lactate, Dextrose 5% Nutritious diet- High protein diet such as yoghurt, milk, soymilk, cheese, egg white, nuts and seeds, beans, fish etc. High vitamin diets included green leafy vegetables, sprouts, fruits, almonds, carrot, egg, etc. Povidine iodine antiseptic mouthwash was given to maintain good oral hygiene. Mouth Rinses in the dilution of 1:2 thrice daily. Pre-surgical definitive antibiotic coverage was done at least for one week for every patient before final surgical intervention.

Surgical Intervention

Some patients had undergone surgical interventions, which comprised of following modalities: Sequestrectomy, saucerisation or resection, decortications was done according to the requirement of particular case depending upon the nature and size of the lesion.Any source of infected tooth, broken tooth or roots and/or external sinus tract were removed intra orally and curettage was performed on the sinus tract. Post-surgery antibiotics included mainly amoxicillin 500mg + clavulonic acid 125mg three times a day and metronidazole 500mg three times a day for 5-7 days was prescribed.

RESULTS

The data collected for the period of 10 years (2006-2016) revealed 30 patients, among which 15 were males and 15 were females who were suffering from osteomyelitis of the jaw The mean age of the females was 39.3 (Table-1) and that of the males was 44.7 (Table-2). In contrast to the conventional occurrence of osteomyelitis in mandible, the study in this population revealed that the maxilla was more commonly involved (approx 66.6%) as compared to that of mandible (33.3%) (Figure-2). The most common site involved in mandible was the body, followed by the angle and ramus of the mandible (Figure-3). The left and the right side of the mandible were equally

involved. The posterior region of maxilla was predominantly involved as compared to the anterior region (Figure-4) and the left side was more commonly involved than that of the right side (Figure-5).

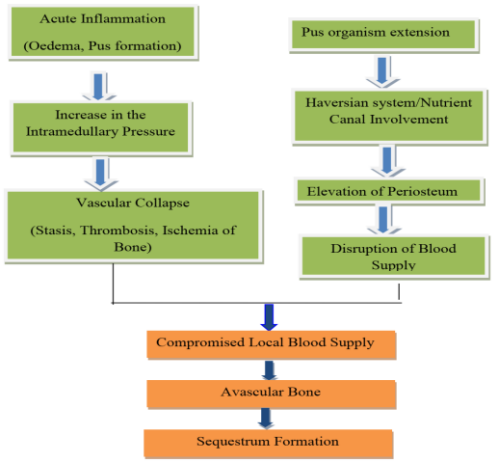

Fig-1: Pathogenesis of Osteomyelitis

Table-1: Parameters of the age of Females

Parameter	Value
Mean	44.67
SD	20.15
SEM	5.20
N	15
90% CI	35.50 to 53.83
95% CI	33.51 to 55.82
99% CI	29.18 to 60.15
Minimum	7
Median	52
Maximum	71

Table-2: Parameters of age of Males

Parameter	Value
Mean	39.33
SD	20.30
SEM	5.24
N	15
90% CI	30.10 to 48.56
95% CI	28.09 to 50.57
99% CI	23.73 to 54.93
Minimum	9
Median	38
Maximum	85

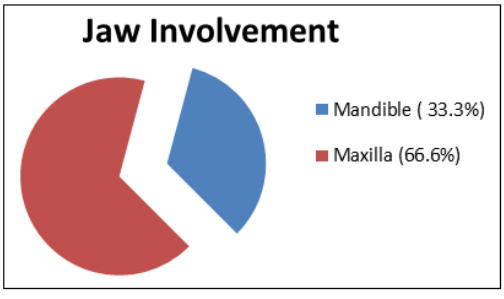

Fig-2: Comparison of the Jaw Involvement

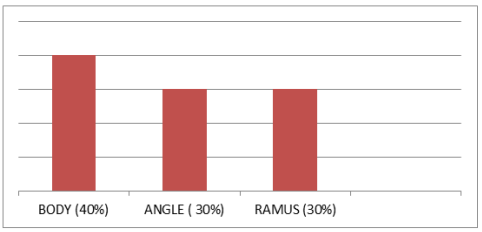

Fig-3: Distribution (%) of sites involved in mandible

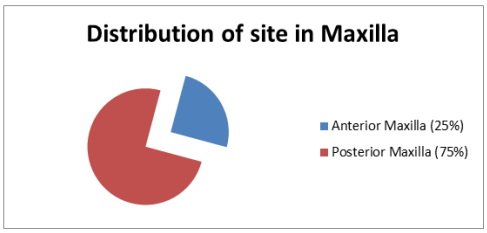

Fig-4: Distribution (%) of the sites involvement in Maxilla

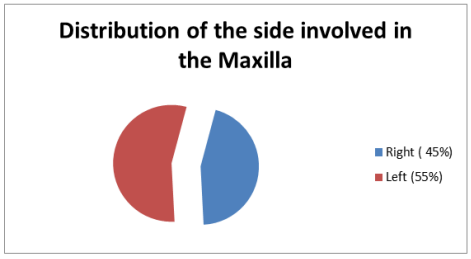

Fig-5: Distribution (%) of the sides involved in Maxilla

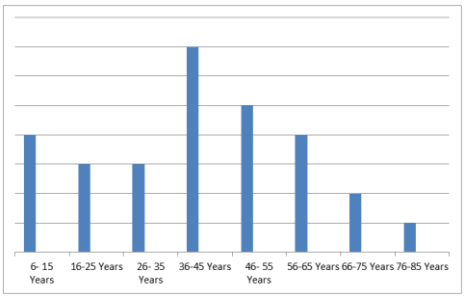

Fig-6: Age Distribution of Patients

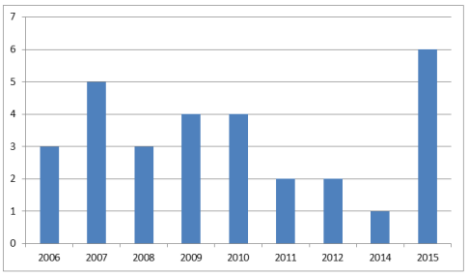

Fig-7: Annual number of patients from 2006-2016

DISCUSSION

The term "Osteomyelitis" was coined by Nelaton [7]. It is the inflammation of bone and bone marrow, that begins in the medullary cavity of bone and subsequently ends in the periosteum involving the haversian system [8]. There are various factors which are involved in the progression of disease such as bacteremia, fungal infection, trauma, surgical therapy

and systemic diseases that compromise the host defense mechanism like malnutrition, anemia, diabetes, osteoporosis, malignancy, radiation, osteopetrosis and Paget's disease [9]. When there is continuous spread of infection from the surrounding soft tissues and bones because of hematogenous seeding or due to direct inoculation of microbes into the bone, it results in origin of the diseas [10]. In either of these conditions, the vascular supply is compromised and thereby predisposing the infection. The entry of microbes into cancellous bone causes the compression of blood vessels preceeded by the inflammation and edema of marrow. Severe compromise in the vascularity leads to ischemia and necrosis of the bone. The stagnant and immobile blood leads to nidus for the development of focus of infection [11]. Osteomyelitis is commonly seen in the males (80.36%) than in females (19.64%), however, in our study, equal number of males and females were affected. Its peak incidence is in 30–39 years of age [12], likewise in the present study the peak incidence was 36-45 years of age. Facial bones involvement in osteomyelitis is rare, and among the jaw bones, involvement of maxilla is less common as compared to the mandible due to high vascularity of maxilla [9]. Though the prevalence of the disease has decreased by the advent of broad-spectrum antibiotics, however, it still remains as a challenging entity in low socioeconomic groups and developing countries [9]. Osteomyelitis occurring due to fungal infection is rare and occurs in an indolent manner [13]. In a prospective study by Urs *et al*., which was undertaken from the year 2011 to 2013 December, only five cases showed the characteristics of the fungal osteomyelitis. All the five cases were intraosseous primarily and have shown the radiographic changes in bone. Out of the five cases, maxilla was involved in three cases and two patients among these three cases presented with a history of uncontrolled diabetes [14]. A ten-year study (from January 2005 to December 2015) was done by Niranjan *et al*., the study was designed to evaluate the prevalence of fungal osteomyelitis of the jaws in the patients having diabetes mellitus. They reported in the study that 52% of all the osteomyelitis cases were that of fungal osteomyelitis, while 48% were nonfungal osteomyelitis. In this study, they also reported that the fungal osteomyelitis was frequently encountered in the patients above 40 years of age and also is more common in the males as compared to females [15]. It is seen that the fungal osteomyelitis most commonly involves maxilla and also it is commonly associated with diabetes mellitus [15]. Siddanagouda Biradar *et al*., in 2016 reported a case of mucormycosis in a diabetic patient. Urine analysis revealed 1.5% glucose & ketone bodies and albumin of more than 2% [16]. In a study by Peravali *et al*., maxillary to mandibular ratio is 1.07: 1, and according to a study by Koorbosch *et al*., the ratio is 1.6: 5. Also a study by Rangne and Ruud reported the ratio of 1:6. [17]. It is because the maxilla has a rich vascularity [14]. In case of maxillary osteomyelitis, usually diabetes mellitus is a propagating factor. The presence of ketone bodies in diabetic patients favours the suitable environment for the growth of fungus. Ketoreductase is the enzyme produced by the fungus that acts on the ketone bodies [14]. Vijaya bala *et al*., also reported a case of mucormycosis in a diabetic ketoacidosis patient [18]. Coming to our study, there was not any specification of the site on the basis of the gender. As mentioned in various literature and the case studies done by several authors, the mean age of females having osteomyelitis is relatively younger than that of the males. Likewise, in the present study, the females affected were more of the younger age group i.e., less than 40 years of age while the males affected were mostly older than 40 years. Thereby, the younger age group is predisposed to the disease when exposed to similar risk factors. (Table 1 & 2) Conventionally, the mandible is more commonly affected than the maxilla because the latter has high vascularity, however in the present study maxilla had been affected more than the mandible (Figure-2). The site involved in the mandible is mostly the body region (40%) followed by ramus (30%) and the angle area (30 %) (Figure-3). So, the tooth bearing area is more commonly involved. Whereas site involved in the maxilla is mostly the posterior region as compared to that of anterior and also the left side of maxilla is more commonly affected as compared to its right side (Figure 4 & 5). In the present study, we have divided the patients into 8 age groups i.e., 6-15 years, 16-25 years, 26-35 years, 36-45 years, 46-55 years, 56-65 years, 66-75 years and 76-85 years, and the maximum number of patients reported were found to be in the age group of 36-45 years (Figure-6) followed by 46-55 years and almost equal in age groups 6-15 and 56-65 years and least in the age group 76-85 years, which implies that the young adult and children are commonly affected followed by the elderly patients. Also the annual number of patients reported to the hospital is maximum in the year of 2015 followed by 2007 and so on, which has been shown in Figure-7. Although there is a rare occurrence of the disease but the differential diagnosis of osteomyelitis includes tumors, which can be radiologically similar and also mimic the scintigraphic findings as well as the other bone destructive pathologies, metastases (especially originating from the prostate), fibrous dysplasia and Paget's disease. The cases especially with significant amount of periosteal reaction, the differential diagnosis of osteosarcoma has to be kept in mind [19-21]. The present study confirms the epidemiological data previously well described in the literature and shows the preponderance of disease in younger age group in the given population. Results from this study also highlight the differences that female patients outnumbered the male patients. It also helps in assessment of the local data of a tertiary centre which is important in optimizing the local therapeutic protocols.

CONCLUSION

Our study has certain limitations due to its retrospective nature. Some data might have lost or

incomplete and some patients did not report to tertiary centre after referral so exact number of patients or the prevalence of the disease cannot be assessed accurately. However, if the data of such type of patients can be collected and assessed from various tertiary centers then on the basis of epidemiological analysis of the disease, the need for medical care can be determined and accordingly can be treated. Moreover, if the disease is treated early with a prudent or judicious use of antibiotics and surgical intervention, it is entirely curable and the destructive bony changes can be completely reversed. Thereby, emphasizing the fact that a well-executed, timely treatment plan does have a high healing rate.

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