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ORIGINAL ARTICLE

Pattern of management of oro-facial infection in children: A retrospective

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KEYWORDS

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Abstract *Background:* The purpose of this study was to determine the distribution and management of orofacial infection in children treated at one of the major hospitals in Jeddah City, Saudi Arabia over a 12-month period during the year 2014.

Methods: Data from the clinical records of 94 children (33 girls, 61 boys; aged 2–14 years) who presented for treatment of orofacial infection at the emergency dental department of the military hospital in Jeddah during a 12-month period. Patients were treated with antibiotic therapy. A favorable outcome was determined based on length of hospital stay.

Results: The results indicated that the most common cause of odontogenic infection in Saudi children was dental caries (88%). The primary posterior teeth (84%) were considered to be a major source of infection. The most commonly affected teeth were the primary first molars (34%), followed by the primary second molars (31%). Six children were hospitalized; four of these stayed less than 4 days, which was considered a short hospital stay. The most common treatment was antibiotics as 93% received a type of antibiotic.

Conclusions: The most common cause of odontogenic infection was dental caries which has been treated with antibiotic prescription and dental procedures.

1. Background

Orofacial infections are a common health care concern in children and are a frequent cause of dental consultation worldwide (Gendron et al., 2000; Nair et al., 2014). More than 500 bacterial species are thought to constitute normal oral microbiota (Gendron et al., 2000). Oral microorganisms are often the causative agents in osteomyelitis, aspiration pneumonia, bacterial endocarditis, halitosis, periodontal disease, abscesses, pulpitis,

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dental caries in children, cerebral infarction, coronary heart disease, and preterm low birth weight (Li et al., 2000). In many cases, acute infection of the oral cavity occurs as a result of neglected dental caries. Early management and recognition of orofacial infections in children is crucial to prevent systemic involvement (Cachovan et al., 2013).

Most orofacial infections are considered to be odontogenic in origin, whereas others are self-limiting in nature (Heimdahl et al., 1985; Planells et al., 2006). Many of these cases result from neglected dental caries; these infections can progress to facial cellulitis and systemic toxicity if untreated (Sandor et al., 1998). Odontogenic infections are polymicrobial, with anaerobic and mixed aerobic bacteria (Brook, 2003). In pediatric facial infections, disease can progress quickly, producing significant systemic symptoms, including fever, dehydration, and airway compromise (Sandor et al., 1998; Dodson et al., 2000). Because of the possibility of progression to systemic disease, early management and recognition of orofacial infections in children is necessary (Dodson et al., 1989; Parker and Khateery, 2001).

In children, unlike adults, the location of various anatomic infections is thought to be a helpful guide for diagnosis and management (Flynn and Halpern, 2003). Dentists must understand that although a disease might present initially as a simple infection, it requires appropriate and early management. Rapid and thorough initial assessment is the key to successful management.

Many studies have reported a higher incidence of dental caries in children in Saudi Arabia than in other countries (Flynn and Halpern, 2003). However, few studies have reported the incidence of orofacial infection in children (Achembong et al., 2014).

The primary focus of this study was to determine the incidence and management of orofacial infection among children aged of 6–14 who visited one of the major hospitals in Jeddah City, Saudi Arabia, over a 12-month period.

2. Methods

An ethical approval was obtained through the King Fahad Armed Force Hospital (KFAFH) Research Ethics Committee.

2.1. Study design

Clinical data were examined from the records of children treated at KFAFH for orofacial infection during a 12-month period of December 2013– December 2014.

2.2. Data collection

We collected data from all cases of orofacial infection in children aged 2–14 who presented for treatment at the emergency dental department of (KFAFH) in the city of Jeddah during a 12-month period. Two hundred files were pulled but any file with missing data on patient's age and medical condition was excluded from the study ending up having 93 cases. Treating clinicians completed a standardized data collection sheet to record information relating to patient demographics, medical history, dental history, history of current episode of facial swelling of odontogenic origin, clinical and radiographic findings and management, also, whether dental treatment under general anesthesia was needed, length of hospital stays, use of antibiotics singly or in combination, and other treatment modalities. Infections were classified by anatomic location as either upper face or lower face, with or without extra-oral or intraoral swelling. Medical records of all included subjects were reviewed.

A hospital stay of less than 4 days and resolution of infection without surgery was considered a successful outcome. An unfavorable clinical outcome was defined as 4 days or more of hospitalization and the need for surgery.

All children with a clinically visible facial swelling of odontogenic origin were included in the study. Children with a facial swelling of non-odontogenic origin or intra-oral abscess with no clinically evident facial swelling were excluded.

2.3. Data analysis

The gathered data were entered into a computer and statistical analysis was performed with SPSS version 16 (SPSS, Inc., Chicago, IL, USA). Differences between the groups were determined with an unpaired Student's *t*-test. The group data on the presence of symptoms, infection location, and antibiotic use were then analyzed with a chi-square test. A p value less than 0.05 was considered statistically significant.

3. Results

A total of 94 children (33 girls, 61 boys; mean age 7 years) with orofacial infection visited the hospital during the study period. Most of the patients (53 cases) were children aged 2–14 years.

Odontogenic infections accounted for all cases in this study. Before swelling appeared, the clinical symptoms included frequent toothache, less common trismus, and fever. The most common cause of odontogenic infection was dental caries (88%). However, in 25 (12%) cases the type of disease was not grouped under any of the above categories (conditions such as acute necrotising ulcerative gingivitis (ANUG), gingival abscess, referred to pain in the teeth secondary to maxillary sinusitis, anticipated infections in traumatic dental extractions or infective endocarditis prophylaxis).

Table 1 summarized the study findings such as infection sources generally involved the primary posterior teeth (84%). The most commonly affected tooth was the primary first molar (34%), followed by the primary second molar (31%). The mandibular primary posterior teeth were more commonly affected than the maxillary primary posterior teeth (54.4% versus 45.6%). Extra-oral swelling was present in 64% of patients. The upper face was more commonly affected than the lower face (55.5% versus 44.5%) but that didn't reach to statistical differences. Dental pain was noted in 95% of children, with pain preceding the facial swelling. However, only 83% of children were taking analgesics. In 60% of children, the size of the swelling over the 24 h prior to presentation had been increasing. Treatment modalities included various antibiotics (singly or in combination) and dental procedures (Table 1). The most common treatment was antibiotic therapy, which was used in 87 patients (93%). The most commonly prescribed antibiotic was penicillin, singly in 78 cases and in combination (i.e. penicillin plus metronidazole) in nine cases. Seventy-four patients needed surgical extraction, 12 had root canal treatment, eight required incision and drainage, and in one case periodontal treatment was performed. Of the 94 patients included in this

Table 1 Data summary for the study population.

Variables	No. cases	% of cases
Medical condition		
Patients medically free	82	87
Patients with medical problems	12	13
Odontogenic causes of orofacial infections		
Caries	83	88
Others	11	12
Teeth involved		
Lower primary molars	43	54.4
Upper primary molars	36	45.6
Swelling		
Extra-oral	60	63.8
Intra-oral	34	36.2
Upper/lower face involvement		
Upper face	52	55.5%
Lowe face	42	44.5
Treatment modalities		
Extraction	74	78.7
Root canal therapy	12	12.8
Incision and drainage	8	8.5
Antibiotic used		
Penicillin	78	82.9
Metronidazole	9	7.1

Table 2 Age group in correlation to odontogenic cause and teeth involved.

Age group	Odontogenic cause		Teeth involved	
	Caries No. (%)	Others No. (%)	Anterior teeth No. (%)	Posterior teeth No. (%)
2–5 years	35 (37.2)	1 (1.1)	24 (66.7)	12 (33.3)
6–9 years	40 (42.6)	1 (1.1)	3 (7.3)	38 (92.7)
> 10 years	8 (8.5)	9 (9.6)	0	17 (100)

$P < 0.05$.

study, eight required hospitalization. Four patients had to undergo general anesthesia to treat their oral infection.

Eight of the 94 children with orofacial infection required hospitalization. Of these, four had to undergo general anesthesia to treat their oral infections. Six of the hospitalized children stayed less than 4 days in the hospital (favorable outcome), while two had to stay more than 4 days (unfavorable outcome).

Ages of children were grouped into three categories (2–5 years, 6–9 years and above 10 years) and correlate to various study variables. It shows that children aged between 9 years and less, the cause of oro-facial infection was of odontogenic origin ($P < 0.05$) as shown in Table 2. Also, upper anterior teeth were more involved in children aged 2–5 years (66.7%) compared to children aged 6–9 years or children aged 10 years and above where posterior teeth were more involved (respectively 92.7%, 100%).

4. Discussion

Despite progress in diminishing the rate of caries with preventive dental programs, children in poor socioeconomic groups remain greatly affected by this condition (Achembong et al., 2014). In children, untreated dental caries can often cause infection and pain (Foster and Fitzgerald, 2005). Dental infections are likely to occur in populations with a high prevalence of children with dental caries, such as Saudi Arabia. Several studies have reported the level and prevalence of dental caries in children in Saudi Arabia (Al-Malik and Rehbini, 2006), but to our knowledge, none have indicated the prevalence of dental infection within this population.

Ninety-four children with orofacial infections visited our hospital during the study period. Most cases of orofacial infection were in children aged 6–12 years, followed by children aged 0–5 years. Most cases (88%) resulted from untreated dental decay. Acute infections of the oral cavity generally result from neglected dental caries in those who delay dental visits or who visit the dentist only when in pain. Previous studies have shown that the proportion of children with dental sepsis increases markedly with caries experience (Pine et al., 2006; Evan, 2006). Our results correlate well with a previous study done in another region of Saudi Arabia (Parker and Khateery, 2001). That retrospective study evaluated various data from the records of 373 patients in Al Madinah. The results indicated that orofacial infections constituted approximately 25% of total maxillofacial and oral surgery admissions. Many of these infections were seen in younger patients. However, the length of hospital stay was similar to various previous studies (Lin and Lu, 2006; Thikkurissy et al., 2010).

Infection of dental origin is one of the most common diseases affecting the orofacial region (Chow et al., 1978; Akinbami et al., 2010). Some of these cases were patients who were initially seen by a general dental practitioner for simple dental infections. Others presented late to the dentist. If such infections spread beyond the confines of the periodontal membrane, acute dentoalveolar infection develops. Therefore, these patients visit our clinic with serious complications resulting from improper, poor management. Unfortunately, children often present for dental care only after signs of an infection, toothache, or swollen jaw develop, making them irritable, frightened, and difficult to manage. We found that the source of infection was most often the primary posterior teeth. The most commonly affected teeth were the primary first molars; the mandibular posterior teeth were more often affected (54%) than the maxillary posterior teeth (45%). These results agree with those of other studies (Kudiyirickal and Hollinshead, 2012; Veronez et al., 2014; Gonçalves et al., 2013). More children presented with infection in the upper face (50 cases) than in the lower face (44 cases).

In children, the location of infection (lower or upper face) can indicate the differential diagnosis and appropriate empirical treatments. Pediatric odontogenic infections and their management continue to be a challenge for clinicians because they are uncommon. Hence, individual clinicians usually do not see enough cases to develop a systematic treatment plan. Children with facial swelling, pain, and fever should be evaluated immediately. The failure to recognize and correctly manage infection early can lead to serious complications (Chow et al., 1978).

A better understanding of the clinical behavior of pediatric infections allows earlier diagnosis and rational management. Early diagnosis is particularly important when treating pediatric facial infections because the symptoms can progress quickly, producing various systemic symptoms including fever, dehydration, and compromised airways, with late adverse sequelae

resulting from growth alterations. Aggressive management is important for quicker infection resolution and reduced morbidity. It should be noted that antibiotic resistance is increasing in bacterial cultures from odontogenic infection. However, treatment with penicillin has a high success rate (González-Martínez et al., 2012). Dental care providers must understand that although this disease often presents initially as a simple infection, it requires appropriate and early management. Thus, a rapid and thorough initial assessment is the key to successful management. The failure to recognize and correctly manage the infection early will lead to rapid progression of disease, resulting in serious, possibly disastrous complications.

Most of the infections in the present study resulted from untreated dental caries. Therefore, it is essential to improve oral health awareness and to emphasize the importance of prevention, routine examinations, and early intervention to treat caries and minimize oral sepsis. A child with facial swelling, pain, and fever should be evaluated immediately; failure to recognize and correctly manage infection early will lead to serious complications. Suppurative odontogenic infections often extend deep into the neck and head as well as into potential spaces in the orofacial fascia. These complications can be life threatening. This contiguous spread often causes odontogenic infections, which then cause jaw osteomyelitis or other systemic illness via hematogenous spread.

In this study, different antibiotics were used to treat odontogenic infection. Penicillin alone or in combination with other drugs was prescribed most often (González-Martínez et al., 2012). The cause of odontogenic infections is generally endogenous oral flora and not introduced non-resident bacteria. These infections are typically polymicrobial (Sandor et al., 1998). Approximately 50% of odontogenic infections are caused by anaerobic bacteria alone, 44% involve a combination of aerobic and anaerobic bacteria, while only 6% are caused by aerobic bacteria alone. With the increasing rate of penicillin resistance, clindamycin is now considered the first line of therapy because of its broad spectrum of activity (Sandor et al., 1998).

Numerous studies have reported initial treatment with clindamycin or penicillin plus metronidazole; second-line treatments include clindamycin or amoxicillin–clavulanate plus metronidazole (Sandor et al., 1998; Ehrenfeld, 1992). Bacteria play an essential role in odontogenic infections, but antimicrobial treatment is not always sufficient. For instance, patients with fistulas associated with chronic infection or draining abscesses usually need extraction of the offending tooth. Other disease processes include deep fascial space infections, pericoronitis, periodontal abscesses, and acute periapical abscesses, all of which may require antimicrobial therapy. However, antimicrobials are not a suitable replacement for debridement or surgical drainage and should be utilized instead as adjunctive therapy. Airway maintenance during abscess drainage is a condition sine qua non (Ehrenfeld, 1992; Chunduri et al., 2012). Initiating antimicrobial therapy soon after diagnosis and before surgery limits the infection period and minimizes related risks such as bacteremia.

The results indicated that individuals with high dental caries had a considerable proportion of dental caries that remained untreated whereas, the proportion of children with infection markedly enhanced the experience of caries. Our results do not support the non-intervention policy for deciduous caries if oral infection is to be prevented. It is essential to offer additional treatments and interventions for caries. The data indicate that during treatment of primary teeth numerous teeth are affected by caries, which increases the risk of dental infection. Additional studies on deciduous caries are required to determine strategies for preventing oral infection. The focus of this study was clinical management; collected data included type of antibiotic used, complications, and operations performed.

Facial infections were classified as upper or lower face infection. Upper face infections originate from the maxillary dentition, sinus, and orbits. Lower face infections originate from the mandibular teeth, salivary glands, and submandibular region. Accurate diagnosis and institution of appropriate chemotherapeutic or surgical therapies should result in rapid resolution of the symptoms. If the initial treatment response is poor, alternative infectious causes and therapies should be considered, along with hospitalization to manage the infection.

Despite progress in caries prevention resulting from preventive dental programs, children in poor socioeconomic groups remain greatly affected. Extensive dental caries, difficulty controlling childhood tooth infections, and a child's general health deficiencies can limit preservation of infected teeth, leading to their extraction. In children, dental sepsis can be defined as dental abscesses that present as draining sinuses or localized swelling adjacent to traumatized tissue or teeth with caries. In addition to pain, such infections can cause acute abscess related to deciduous teeth, potentially leading to serious and rare sequelae such as recurrent fever, brain abscesses, and orbital cellulitis (Pine et al., 2006). Moreover, chronic abscesses cause great damage to developing permanent teeth. Infection of dental origin is one of the most common diseases affecting the orofacial region. Dentists must understand that this condition may initially present as a simple infection, but that it requires appropriate and early management. Some patients may develop different problems as a result of orofacial infection. These include gross loss of facial skin, prolonged hospitalization, emergency tracheostomy, and urgent need for intubation (Norrby-Teglund et al., 2005; Maki, 2010).

The limitation of the present study is that its retrospective nature limited our ability to draw more specific conclusions.

5. Conclusions

Based on this study's results, the following conclusions can be made:

1. The most common cause of odontogenic infection was dental caries.
2. A significant decrease in the length of stay was observed when the tooth was extracted within 48 h compared to extractions that occurred after 48 h.
3. Antibiotic therapy is the first-line treatment for oro-facial infections.
4. Antibiotics can shorten the length of hospital stay and delay dental or surgical interventions.

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