

ORIGINAL RESEARCH



Odontogenic Infections: A 1-year Retrospective Study

¹Benjamin Mahmoodi, ²Jens Weusmann, ³Adriano Azaripour, ⁴Benedikt Braun
⁵Christian Walter, ⁶Brita Willershausen

ABSTRACT

Objectives: The purpose of this study was to analyze the prevalence, demographic patterns and management of odontogenic infections in patients undergoing treatment in an outpatient dental emergency service of a university hospital.

Materials and methods: In a retrospective study of the year 2012, all patients suffering from odontogenic infections were included. Demographic data, diagnosis and the conducted treatment were analyzed. Odontogenic infections were defined as pulpitis, apical and marginal periodontitis, abscesses and pericoronitis.

Results: A total of 2,058 out of 4,209 emergency patients suffered from odontogenic infections. The majority (45.0%) had an apical periodontitis, 20.8% abscesses, 17.3% a marginal periodontitis, 16.3% a pulpitis and 5.8% a pericoronitis. Mean age was 37.5 ± 17.0 years standard deviation (SD) (1.2-96.4). Most patients were 20 to 29 years (24.6%), followed by the age group of 30 to 39 year old patients (21.0%). Males were affected more frequently (55.5%) than females (45.5%). Most of the patients (64.5%) of the patients received a dental or surgical treatment. Antibiotics were prescribed in 31.7% of cases. Amoxicillin was the most common prescribed antibiotic (54.5%).

Conclusion: Odontogenic infections represent one of the main reasons for consulting the emergency service. Due to the high number of cases and the severe complications, dentists have to be familiar with the surgical management of odontogenic infections as well as the appropriate use of antibiotics.

Clinical significance: Nearly half of all patients who sought treatment in the emergency service had an odontogenic

infectious disease. This should be considered for the organization and planning of the service.

Keywords: Abscess, Antibiotics, Dental emergency services, Odontogenic infections, Pulpitis.

How to cite this article: Mahmoodi B, Weusmann J, Azaripour A, Braun B, Walter C, Willershausen B. Odontogenic Infections: A 1-year Retrospective Study. *J Contemp Dent Pract* 2015;16(4):253-258.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Odontogenic infections are a common public health problem. These diseases usually originate from pulpal diseases, deep periodontal pockets or pericoronitis. The primary cause of these infections is the polymicrobial flora resident in the oral cavity entering sterile tissues^{1,2} resulting in inflammation and possibly abscess formation.^{2,3}

The incidence of odontogenic infections requiring hospital care has increased in the last 10 years.^{4,5} Most odontogenic infections are mild and respond well to dental care, surgical treatment, and antimicrobial therapy.^{4,7} However, when left untreated or without adequate therapy, the infection can potentially spread, causing maxillofacial infections that require hospitalization.^{4,8} Severe odontogenic infections may cause fever, trismus, or dysphagia^{9,10} and can even develop to life threatening infections due to airway blocking, brain affection, mediastinitis or sepsis.¹¹⁻¹⁵ In most cases, patients seek medical care due to pain. In greater stages further symptoms, such as problems to swallow or the airway block follow.

Outside the regular consulting hours of dental offices, patients suffering from odontogenic infections receive treatment in dental emergency services. For correct diagnosis, evaluation of its severity and initiation of further treatment or referral, the primary dental

^{1-4,6}Department of Operative Dentistry, University Medical Center of the Johannes Gutenberg-University Mainz Augustusplatz, Mainz, Germany

⁵Department of Oral and Maxillofacial and Facial Plastic Surgery, University Medical Center of the Johannes Gutenberg University Mainz, Augustusplatz, Mainz, Germany

Corresponding Author: Benjamin Mahmoodi, Assistant Professor, Department of Operative Dentistry, University Medical Center of the Johannes Gutenberg-University Mainz Augustusplatz 2, 55131 Mainz, Germany, e-mail: benjamin.mamoodi@unimedizin-mainz.de

clinician needs to be familiar to all aspects of this group of diseases. Appropriate pain management, dental and surgical intervention and potentially antimicrobial therapy^{7,16} are essential for the treatment success.

There is only little data about patients with odontogenic infections treated as outpatients.^{17,18} Most studies refer to hospitalized patients treated in the oral and maxillofacial surgery.^{4,7,9,10,19,20}

The dental medical association of Rhineland-Palatine (Germany) provides dental emergency services by the private practices. Besides this service, the University Hospital in Mainz, offers additional out-of-hours service for an urgent dental treatment needs. The city of Mainz has about 2,00,000 inhabitants and is located in the metropolitan area of the Rhine-Main region, which counts approximately 5.5 million inhabitants. The dental emergency outpatient service is an important drop-in

center for patients from the region with a large catchment area.

The objective of this study was to retrospectively analyze the odontogenic infection cases treated by the dentists in the dental emergency outpatient service within 1 year to investigate the stage and origin of infection, the conducted dental or surgical therapy and the use of antibiotics and painkillers.

MATERIALS AND METHODS

A retrospective, descriptive study was conducted including all patients with odontogenic infections that required medical consultation from the outpatient dental emergency service of the University Medical Center in Mainz within the year 2012. The data were obtained from the electronic patient records.

The outpatient dental emergency service offers clinical sessions in addition to the regular consulting hours, which are Monday to Thursday 5:00 pm to 0:00 pm, Friday 3:00 pm to 0:00 pm, and Saturday and Sunday (and on holidays) 8:00 am to 0:00 pm.

Inclusion criteria were odontogenic infections, such as pulpitis, apical periodontitis, marginal periodontitis, pericoronitis, and abscesses in the dentomaxillofacial region. A combination of multiple diagnoses was possible. Exclusion criteria were patients who needed hospitalization and received treatment in the department of oral and maxillofacial surgery as well as non-dental infections.

In addition to demographic data, the primary localization and stage of infection were evaluated. Furthermore, the applied diagnostic tests for dental and periodontal assessment (i.e. cold bite test, percussion, measurement of pocket depths, and bleeding on probing) and the performed dental (trepanation, subgingival

Table 1: Demographic characteristics of all patients and the patients with odontogenic infections

Age group res. gender	All patients		Odontogenic infections		
	n	%	n	%	
0 to 9	471	11.2	114	5.5	
10 to 19	398	9.5	137	6.7	
20 to 29	918	21.8	507	24.6	
30 to 39	775	18.4	433	21.0	
40 to 49	721	17.1	409	19.9	
50 to 59	468	11.1	261	12.7	
60 to 69	228	5.4	107	5.2	
70 to 79	162	3.8	68	3.3	
80 to 89	59	1.4	17	0.8	
90 to 99	9	0.2	5	0.2	
Male	2283	54.2	1142	55.5	p = 0.351
Female	1926	45.8	916	45.5	
Total	4209	100	2058	100	

Table 2: Demographic characteristics for different diagnoses

	Pulpitis		Apical periodontitis		Marginal periodontitis		Abscess		Pericoronitis	
	n	%	n	%	n	%	n	%	n	%
Total	336	16.3	926	45.0	356	17.3	428	20.8	119	5.8
0 to 9	32	9.5	32	3.5	15	4.2	34	7.9	3	2.5
10 to 19	25	7.4	44	4.8	23	6.5	25	5.8	27	22.7
20 to 29	89	26.5	229	24.7	63	17.7	86	20.1	59	49.6
30 to 39	76	22.6	214	23.1	66	18.5	86	20.1	19	16.0
40 to 49	63	18.8	208	22.5	80	22.5	81	18.9	8	6.7
50 to 59	34	10.1	105	11.3	54	15.2	74	17.3	2	1.7
60 to 69	7	2.1	55	5.9	27	7.6	27	6.3	0	0
70 to 79	7	2.1	32	3.5	21	5.9	10	2.3	1	0.8
80 to 89	3	0.9	5	0.5	6	1.7	3	0.7	0	0
90 to 99	0	0	2	0.2	1	0.3	2	0.5	0	0
Male	194	57.7	502	54.2	204	57.3	250	58.4	57	47.9
Female	142	42.3	424	45.8	152	42.7	187	41.6	62	52.1
Average age ± SD (min-max)	33.9 ± 16.5 (3.0-87.2)		38.5 ± 15.8 (4.2-90.6)		41.5 ± 18.5 (1.2-96.4)		38.3 ± 18.0 (1.7-95.2)		25.9 ± 10.4 (5.7-76.5)	

Table 3: Distribution of the frequency of different antibiotics being used in this study

	Pulpitis		Apical periodontitis		Marginal periodontitis		Abscess		Pericoronitis	
	n	%	n	%	n	%	n	%	n	%
Totally prescribed	40	11.9	291	31.4	103	28.9	241	56.3	46	38.7
Penicillin	0	0	17	1.8	4	1.1	9	2.1	1	0.8
Amoxicillin	29	8.6	156	16.8	66	18.5	103	24.1	26	21.8
Amoxicillin + clavulanic acid	4	1.2	61	6.6	20	5.6	101	23.6	13	10.9
Clindamycin	2	0.6	24	2.6	6	1.7	16	3.7	4	3.4
Cephalosporin	0	0	1	0.1	1	0.3	7	1.6	1	0.8
Makrolid	1	0.3	0	0	1	0.3	0	0	0	0
Metronidazol	0	0	2	0.2	0	0	0	0	0	0
Not named	1	0.3	13	1.4	1	0.3	2	0.5	0	0
Total	336		926		356		428		119	

Table 4: Distribution of the procedures performed by the dentists

	Pulpitis		Apical periodontitis		Marginal periodontitis		Abscess		Pericoronitis	
	n	%	n	%	n	%	n	%	n	%
Trepanation	151	44.9	463	50.0	26	7.3	78	18.2	3	2.5
Subgingival curettage	11	3.3	21	2.3	120	33.7	10	2.3	32	26.9
Incision	3	0.9	50	5.4	60	16.9	298	69.9	37	31.1
Prescription antibiotic	37	11.0	274	29.6	99	27.8	238	55.6	44	37.0
Prescription painkillers	70	20.8	250	20.8	88	24.7	122	28.5	32	26.9
Total	336		926		356		428		119	

curettage), surgical, and/or medical (antibiotics and painkillers) management was recorded.

For statistical analysis Microsoft Excel 2010 (Redmond, WA, USA) and SPSS 22 (IBM, Armonk, NY, USA) were used. The Chi-square test was used for analysis of uneven distributions between two groups.

RESULTS

A total of 4,209 patients received treatment at the dental emergency service in the year 2012 (Table 1). The average age of all patients was 35.4 ± 19.4 years standard deviation (SD) (0.2-98.1 years) with 17.9% (n = 754) being under the age of 18 years (Table 1).

48.9% (n = 2,058) suffered from odontogenic infections (Table 2). The average age for those patients was 37.5 ± 17.0 years SD (1.2-96.4 years).

The distribution of the odontogenic infections is displayed in Table 2. 5.2% (n = 107) of the 2,058 patients had a combination of diagnoses; e.g. most patients with periapical process also suffered from an abscess (n = 50; 2.4%) and a pulpitis (n = 46; 2.2%), or had a concomitant marginal periodontal disease (n = 22; 1.1%).

Pulpitis: Three hundred and thirty-six patients (16.3%) suffered from pulpitis. Among those 13.7% (n = 46) suffered from an apical and 3.9% (n = 13) from a marginal periodontitis. Three patients (0.9%) had a concomitant abscess.

A total of 151 (44.9%) of the pulpitic patients were treated by trepanation, five of them additionally received

a prescription for antibiotics (1.5%), eight for analgesics (2.4%), and nine a combination of both (2.7%), 37 patients (11%) received a prescription for antibiotics, nine patients (2.7%) for antibiotics as sole therapy, and 19 patients (5.7%) received a combination of antibiotics and painkillers.

Apical periodontitis: Nine hundred and twenty-six patients (45.0%) had an apical periodontitis. Fifty patients (5.4%) with an apical periodontitis had already developed an abscess, which required an incision, 46 patients (5.0%) also suffered from pulpitis, and 22 (2.4%) had a concomitant marginal periodontal disease. In 463 cases (50.0%), a trepanation was performed. Of those, 110 (11.9%) received additional prescription for antibiotics, 72 (7.8%) for analgesics, and 48 (5.2%) received prescriptions for both antibiotics and analgesics. Of those patients who were not trepanated 181 cases (19.5%) received prescriptions for antibiotics, 178 (19.2%) cases were treated with analgesics, and 105 cases (11.3%) received both antibiotics and analgesics.

Considering all patients with apical periodontitis, 274 (29.6%) patients were treated with antibiotics, 250 (27.0%) patients with analgesics, and 153 (16.5%) were treated with both antibiotics and analgesics. Sixty-four (6.9%) patients received antibiotics, 69 (7.5%) patients received analgesics as a sole therapy each.

Marginal periodontitis: Three hundred and fifty-six patients (17.3%) suffered from marginal periodontitis. In 120 cases (33.7%), a subgingival curettage was provided,

116 patients (32.6%) were treated with topical agents, and 60 (16.9%) needed an intrasulcular incision.

Ninety-nine patients (27.8%) received antibiotic treatment, of which 26 (7.3%) received solely antibiotics. Eighty-eight patients (24.7%) received analgesics, of which 33 (9.3%) received this treatment as sole therapy.

Pericoronitis: One hundred and nineteen patients (5.8%) suffered from a pericoronitis. Incisions were provided in 37 of the cases (31.1%), 44 patients (37.0%) received antibiotics, and 19 (16.0%) were treated with both. Thirty-two patients (26.9%) received curettage as treatment of which 14 (11.8%) additionally received antibiotic therapy. Eighteen patients (15%) received antibiotics as sole therapy.

Abscesses: Four hundred and twenty-eight patients (20.8%) had an abscess. Two hundred and ninety-eight (69.9%) received an incision and of those 152 (35.5%) received an additional antibiotic treatment. Two hundred and thirty-eight out of 428 (55.6%) received antibiotic therapy, while 59 patients (13.8%) got antibiotics only.

In 78 of the abscess cases (18.2%) the inflamed tooth could be clinically identified and trepanned, 27 (6.3%) with a simultaneous incision, in 25 times (5.9%) with an antibiotic and in 17 cases (4.0%) with a combination of those three measures. In 8 cases (1.9%), sufficient treatment could be reached by trepanation only.

Antibiotics: Six hundred and fifty three (31.7%) out of the 2,058 patients got a prescription for antibiotics. Out of those, 181 patients (8.8%) got antibiotics as a sole therapy. Amoxicillin was the most common prescribed antibiotic (54.5%) followed by Amoxicillin in combination with Clavulanic acid (28.6%) (Table 3).

Treatment: All measures taken by the dentist are summarized in Table 4. All other patients received either a minor treatment (recommendation of a mild painkiller, rinsing, and reduction of occlusion) or already had an antimicrobial therapy running which they had been advised to continue. Altogether 64.5% of all patients received a dental or surgical treatment.

DISCUSSION

There is only little data about patients treated by an outpatient emergency service. Most studies include only a small number of patients, referring only to the treatment of hospitalized patients.^{4,7-9,19,20} Even fewer studies analyze out-patient emergency cases.

Nearly half of the patients (48.9%) visiting the dental emergency outpatient service in the present study suffered from odontogenic infections. This is in accordance with a recently performed study from Hamburg, Germany analyzing 58,161 patients seeking

treatment in a dental emergency outpatient care unit with 77% of the patients suffering from odontogenic infection if periodontitis and pulpitis are taken into account as well.

The high percentage can be explained by the emergency character of the provided service that is usually limited to pain management and treatment of traumas and infections.

The average age of patients suffering from infections was 37.5 ± 17.0 years. Comparable age ranges were observed in other studies.^{4,8} Patients suffering from periodontal disease had the highest average age and patients with pericoronitis had the lowest average as one could expect. Except for the nonadults (< 20 years) the age distribution of odontogenic infection patients was comparable with the distribution of the other emergency patients seeking treatment for non-odontogenic infections.

The highest proportion was in the age group of 20- to 29-year-old (24.6%), followed by 30- to 39- (21.0%) and 40- to 49-year-old (19.9%). These findings correlate with the results of Cachovan et al.¹⁷

The gender difference evaluated in our study shows that males more often suffer from odontogenic infections than females (1.2 : 1). This observation is consistent with other studies.^{4,7,8,17} This may be explained by the fact that males have worse oral hygiene habits than females^{21,22} and use preventive medical and dental health services less often.²³ Hwang et al⁸ found out that the gender difference was even more pronounced in severe cases of odontogenic infections that required hospitalization than in patients treated outpatient.

In our study, nearly two-third of the infection patients came due to apical disease and abscesses. Other studies observed much higher incidence of pulpitis.^{17,18} A necrosis of the pulp eventually will end in a periapical inflammation. This process can occur with or without any clinical symptoms,²⁴ making the diagnosis of the stage of endodontic infection very difficult and hard to distinguish.

Unfortunately, the offered treatment does not contain the full spectrum of dentistry, e.g. X-rays are not performed during emergency hours so that the diagnosis is almost always made on clinical findings only. Possibly this could explain the discrepancies between our findings and other studies concerning the endodontic lesions. The distribution of the other diagnoses in this study corresponds well with the literature.¹⁸

The prescription of antibiotics varies according to the diagnosis. Altogether 653 patients (31.7%) received an antibiotic prescription in combination with other measures while only 181 patients (8.8%) got a sole antimicrobial therapy. Compared to other studies, much

more patients received a dental or surgical treatment (64.5%) and fewer antibiotics.

In the study of Daily and Martin,¹⁸ 64% of all adult and 48% of child patients attending to the emergency dental clinics received treatment by antibiotics solely, while only 4% of the adults and 10% of the children received a surgical intervention combined with antimicrobial therapy. Their study were conducted prospectively in way shorter time period (11 weeks), avoiding the bank holidays. Data were collected by a questionnaire interviewing dentists and not by viewing the case records. They came to the conclusion that antibiotics are used inappropriate by dental professionals in emergency services. They found out that three-quarters of the pulpitis patients were prescribed antibiotics without any dental or surgical intervention. We recorded that only 2.7% of the pulpitis patients got antibiotics solely while nearly half of them (44.9%) were treated by trepanation. There is evidence in literature showing that the prescription of antibiotics does not relieve pain caused by pulpitis. Local treatment is necessary for an appropriate pain management.^{25,26}

In our series, 69.9% of the patients with an abscess received an incision. In 56.3% of cases, an antibiotic was prescribed while 35.5% received a combination of both. Only 13.8% (n = 59) of the abscess collective got antibiotics as sole therapy. Cachovan et al reported that about 70% of the patients suffering from abscesses and infiltrates were prescribed an antibiotic, 30% needed a surgical intervention of which every fourth got a combination with antibiotics.¹⁷ Dailey reported the prescription of antibiotics in 82% of abscess cases of which 10% received a surgical intervention in addition.¹⁸

Amoxicillin alone was the most common used antibiotic in our trial, followed by Amoxicillin in combination with Clavulanic acid. Both have been shown to possess good antimicrobial activity against pathogens of orofacial infections,²⁷ though the combination with Clavulanic acid should be administered for the management of severe cases of odontogenic infections.

A limit of this study is that in most cases the following treatment was performed by a general dentist's office and not in our institution, therefore, no sufficient follow-up data could be analyzed.

CONCLUSION

Odontogenic infections present a significant public health problem and one of the main reasons for consultation of the dental emergency service. Nearly half of the patients are in the age group between 20 and 40 years with a predominance of male patients. Compared to the literature, surgical or dental interventions were more often

performed with a more restrictive use of antibiotics. Since most studies do not provide a follow-up a comparison and evaluation of treatment success is impossible. A multicenter prospective study with follow-up data would be desirable to compare the different treatment protocols. But, surgical skills as well as knowledge about antimicrobial management of odontogenic infections are indispensable for an appropriate treatment.

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