A retrospective analysis of emergency room visits of oral and maxillofacial surgery patients in a tertiary care hospital

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To investigate the present trends in the causes of patients visiting the emergency room of tertiary care hospital and were treated at the Department of Oral and Maxillofacial Surgery in order to prepare emergency room treatment guidelines. Increasing numbers of patients with damage to the oral and maxillofacial area visit the emergency room for treatment. This retrospective study analyzed 5,104 patients who had visited the emergency room of Pusan National University Yangsan Hospital and treated at the Department of Oral and Maxillofacial Surgery, between August 2012 and July 2017. The patients were divided into groups according to their injury types, such as trauma, infection, bleeding, temporomandibular joint disorders, and others. The number and frequency of patients in each type of injury group were analyzed as percentages (%) using SPSS 23.0 software. The male to female ratio of the patients visiting the emergency room was 1.98:1, with most patients aged below 10 years old. The majority of patients were in the trauma, infection, and bleeding groups. Fractures, especially mandibular fractures, were frequently present in the trauma group. In the oral and maxillofacial area, the results of the frequency, age, and type of injury treated in the emergency room from this study were not significantly different from those of other studies in the past. However, the reasons for the visit are still diverse and complex.

Key Words: Emergencies, Oral surgery, Tertiary care centers

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INTRODUCTION

With the rapid advances in modern civilization and increasing reach of the media, medical knowledge is increasingly generalized. There has been a notable increase in the number of medical institutions, significant improvement in medical standards, and access to treatment, while the reasons for hospital visits have diversified [1,2]. In the oral and maxillofacial region, such reasons may range from a

simple toothache to life-threatening multiple fractures or dental infections. The range of complications is very wide relative to the anatomical area. The frequency of damage in this region is also high, due to its exposure to the external environment [3,4].

Although there has been an increase in the number of patients visiting the emergency room due to oral or maxillofacial conditions, the number of emergency medical facilities and the size of the medical staff providing rapid

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and accurate treatment is small. The primary treatment provided during emergency care has a marked influence on patient prognosis; however, emergency treatment of the oral and maxillofacial areas is still not satisfactorily standardized [5].

In order to ensure correct primary treatment, a basic understanding of emergency medical conditions in the oral and maxillofacial regions is necessary [5-11]. Therefore, our department performs a study of emergency patients every 5 years, to establish trends that can be used to adapt treatment strategies [11]. The present study sought to compare the results of previous studies, in order to establish emergency room trends in the oral and maxillofacial field, with a view to improving the functioning of the emergency room to reflect the trends and injury types of patients and to be prepared to offer the appropriate treatment.

MATERIALS AND METHODS

Patients

This was a retrospective study conducted on 5,104 patients who visited the emergency room of Pusan National University Yangsan Hospital and who were then treated in the Department of Oral and Maxillofacial Surgery (OMS), between August 2012 to July 2017. This study was reviewed by the institutional review board of Pusan National University Dental Hospital and was approved from deliberation (IRB no. PNUDH-2018-027).

Statistical analysis

Based on the patient's medical records, radiographs, and clinical pictures, the patients were divided into trauma, infection, bleeding, temporomandibular joint disorders (TMD), and "others" groups. Within groups, patients were divided based on age and sex. Patients with abscess, the most frequent condition in the infection group, were divided according to the fascial area affected. The bleeding group was classified according to the cause of bleeding and the use of anticoagulant treatment. The TMD group was classified according to the etiology of the condition, while the "others" group included patients with neuropathic pain

and prosthetic or orthodontic appliance dislocation. The percentages were calculated using the IBM SPSS Statistics 23.0 (IBM Corp., Armonk, NY, USA) program, and duplicate cases were analyzed for two or more disease groups.

RESULTS

Total patients

Yearly distribution and sex distribution

The number of patients annually visiting the emergency room increased from 2013 to 2016, although the average patient sex ratio (male:female) for each year remained constant at 1.98:1 (Fig. 1).

Monthly distribution

The monthly distribution of patients across years was 11.0% in May, 9.7% in June, and 9.1% in July, followed by 6.7% in February and 6.8% in January. The trauma group accounted for the greatest proportion of patients visiting the emergency room, and the monthly distribution of trauma patients was highest in November (80.0%) and May (78.4%) and lowest in February (65.9%) (Fig. 2).

Age distribution

When comparing the number of patients by age, most patients were under 10 years old ($n=1,331$), while those over 70 years old was the least.

Soft tissue injuries occurred in 63.6% of patients below

Fig. 1. Sex distribution of patients referred to the Department of Oral and Maxillofacial Surgery for treatment by year.

Fig. 2. Monthly distribution of emergency room patients referred to the Department of Oral and Maxillofacial Surgery for treatment.

Fig. 3. Age distribution of emergency room patients referred to the Department of Oral and Maxillofacial Surgery for treatment.

10 years of age, and complex injuries were most frequent (46.8%) in patients in their 20s. The percentage of infected and bleeding patients increased with age (Fig. 3).

Etiology distribution

The most common cause of injury in patients overall was slip down (49.2%), followed by collision (16.8%).

According to the monthly distribution, the sports trauma averaged 8.0%, 2.4%, 9.8%, and 1.3% in June, July, September, and December, respectively (Fig. 4).

Fig. 4. Distribution of etiology of conditions in patients referred to the Department of Oral and Maxillofacial Surgery for treatment.

Trauma group

Age distribution

In the trauma group, 32.7% of patients were below 10 years of age, 11.9% were in their 40s, and 11.7% were in their 50s.

Trauma-type distribution

Among 3,821 trauma patients, only 12.6% had fractures; 51.7% had lacerations, and 15.8% had tooth injuries. Among patients into two or more trauma categories, most had lacerations and tooth injuries (9.7%), while few had a combination of fractures and tooth injuries (1.3%).

Etiology distribution

Of the total 3,821 patients in the trauma group, 48.8% experienced trauma due to slip down, 16.9% were involved in collisions, and 11.8% were involved in traffic accidents (Table 1).

Fracture group

Fracture site distribution

The site with the highest frequency of fracture sites was the mandible (29.8%), followed by the nasal bone (27.0%). When the distribution of fractures of the mandible was examined, 117 cases (33.2%) had a fracture of the condyle,

Table 1. Comparative analysis of characteristics of patients in the trauma group (N=3,821)

Characteristic	Data
Age (y)	
<10	1,250 (32.7)
10–19	436 (11.4)
20–29	414 (10.8)
30–39	397 (10.4)
40–49	454 (11.9)
50–59	448 (11.7)
60–69	226 (5.9)
70–79	140 (3.7)
80–89	54 (1.4)
≥90	2 (0.1)
Trauma type	
Fracture	482 (12.6)
Laceration	1,976 (51.7)
Tooth injury	602 (15.8)
Fracture+laceration	235 (6.2)
Fracture+tooth injury	49 (1.3)
Laceration+tooth injury	371 (9.7)
Fracture+laceration+tooth injury	102 (2.7)
Fracture+infection	4 (0.1)
Trauma cause	
Collision	647 (16.9)
Cut	473 (12.4)
Fall down	177 (4.6)
Fist trauma	223 (5.8)
Slip down	1,864 (48.8)
Sports trauma	192 (5.0)
Traffic accident	452 (11.8)
Puncture	120 (3.1)
Others	73 (1.9)

Values are presented as number (%).

followed by 71 cases (20.2%) with a fracture around the symphysis. Fractures of the ramus occurred in 13 patients (3.7%).

Of the 872 patients with fracture, only 507 cases (58.1%) had single fractures, 320 cases (36.8%) had double fractures, and 45 cases had more than 3 fractures.

Etiology distribution

The most common cause of fracture was slip down (38.6%), followed by traffic accidents (19.2%) (Table 2).

Table 2. Comparative analysis of characteristics of patients in the fracture group (N=872)

Characteristic	Data
Fracture site	
Orbital bone	147 (12.4)
Nasal bone	320 (27.0)
Naso-orbito-ethmoid complex	7 (0.6)
Zygomatico-maxillary complex	182 (15.4)
Maxilla	98 (8.3)
Alveolus	77 (6.5)
Mandible	352 (29.8)
Angle	64 (18.2)
Ramus	13 (3.7)
Body	40 (11.4)
Parasymphysis	71 (20.2)
Symphysis	47 (13.4)
Condyle	117 (33.2)
Fracture cause	
Collision	110 (12.6)
Fall down	58 (6.7)
Fist trauma	113 (13.0)
Slip down	337 (38.6)
Sports trauma	70 (8.0)
Traffic accident	167 (19.2)
Others	17 (1.9)

Values are presented as number (%).

Laceration group

Laceration site distribution

The lip was the most frequent site of laceration (34.2%), followed by the eyelid and eyebrow at 11.2%, and the chin at 9.9%.

Etiology distribution

The most common causes of lacerations were slip down (49.3%), collision (17.7%), and traffic accidents (12.4%) (Table 3).

Tooth injury group

Tooth injury-type distribution

The most frequent tooth injury was tooth fracture (32.0%), followed by avulsion (28.0%), and subluxation (26.3%).

Etiology distribution

Slip down was the most common cause of injury (53.3%),

Table 3. Comparative analysis of characteristics of patients in the laceration group (N=2,684)

Characteristic	Data
Laceration site	
Forehead	272 (9.2)
Eyelid, Eyebrow	332 (11.2)
Ear	42 (1.4)
Nose	89 (3.0)
Cheek	137 (4.6)
Lip	1,012 (34.2)
Frenum	89 (3.0)
Palate	68 (2.3)
Vestibule	47 (1.6)
Gingiva	281 (9.5)
Tongue	209 (7.1)
Buccal mucosa	45 (1.5)
Floor of mouth	8 (0.3)
Chin	293 (9.9)
Others	38 (1.3)
Laceration cause	
Collision	474 (17.7)
Cut	78 (2.9)
Fall down	142 (5.3)
Fist trauma	94 (3.5)
Slip down	1,322 (49.3)
Sports trauma	96 (3.6)
Traffic accident	332 (12.4)
Puncture	122 (4.5)
Others	24 (0.9)

Values are presented as number (%).

followed by collision (15.5%) and traffic accident (11.3%) (Table 4).

Infection group

A total of 768 patients visited the emergency room with infection; abscess accounted for 78.9% (606 patients) and other types of infection accounted for 21.1% (162 patients).

Abscess group

Site distribution

Among patients with abscess, abscesses occurred most frequently in the vestibule (39.7%), with the second-most frequent site of occurrence in the submandibular space (23.6%), and the lowest frequency in the infratemporal space (0.7%).

Table 4. Comparative analysis of characteristics of patients in the tooth injury group (N=1,124)

Characteristic	Data
Tooth injury cause	
Collision	174 (15.5)
Fall down	38 (3.4)
Fist trauma	73 (6.5)
Slip down	599 (53.3)
Sports trauma	67 (6.0)
Traffic accident	127 (11.3)
Others	46 (4.1)
Tooth injury type	
Avulsion	391 (28.0)
Intrusion	53 (3.8)
Extrusion	30 (2.1)
Subluxation	368 (26.3)
Tooth fracture	448 (32.0)
Concussion	108 (7.7)

Values are presented as number (%).

Treatment

Of the 606 patients with abscess, 141 underwent extraoral incision and drainage (I&D), 356 received intraoral I&D, 21 underwent only tooth extraction without I&D, 71 received medication and injection, 15 referred to other departments, and 2 were treated with curettage.

Of the 141 patients who underwent extraoral I&D, 111 (78.7%) were admitted to the hospital, 19 were received outpatient treatment, 4 were referred to other hospitals, and 7 were not followed up. Of the 465 patients who underwent other treatments, 61 were hospitalized, 283 received outpatient treatment, 8 were referred to other hospitals, and 113 received no follow-up.

Other infection group

Cellulitis was the most frequent cause (39.5%) of infection among the 162 patients in the other infections group, followed by 31 patients (19.1%) with others.

Other groups included postoperative infection, maxillary sinusitis, and infected cystic lesions (Table 5).

Bleeding group

Causes of bleeding

Of the 260 patients who visited the emergency room for bleeding, 205 (78.8%) had bleeding after dental treatments, such as extraction, implantation, periodontal treatment, and other prosthetic restorations.

The most common causes of bleeding were extraction (50.0%) and implantation (14.2%). Other factors included irritation due to foreign bodies in the oral cavity, and other treatments, such as apitherapy.

Table 5. Comparative analysis of characteristics of patients in the infection group (N=768)

Infection type	Data
Abscess	
Vestibular space	269 (39.7)
Canine space	52 (7.7)
Buccal space	58 (8.6)
Infratemporal space	5 (0.7)
Submental space	29 (4.3)
Sublingual space	23 (3.4)
Submandibular space	160 (23.6)
Submasseteric space	36 (5.3)
Pterygomandibular space	21 (3.1)
Temporal space	6 (0.9)
Deep neck infection	19 (2.8)
Other infection	
Cellulitis	64 (39.5)
Pericoronitis	17 (10.5)
Periodontitis	20 (12.3)
Sialadenitis	19 (11.7)
Osteomyelitis	7 (4.3)
Emphysema	4 (2.5)
Others	31 (19.1)

Values are presented as number (%).

Taking anticoagulant

Of the total 260 patients, 68 patients (26.2%) were taking anticoagulants, 169 (65.0%) did not take the medication, and 23 patients (8.8%) were unaware of this fact (Table 6).

Temporomandibular joint disorders group

Among 31 patients with TMD, temporomandibular joint (TMJ) dislocation occurred in 12 patients (38.7%), masticatory myopathy syndrome in 17 (54.8%), and internal derangement of the TMJ in 2 (6.5%).

Of 12 patients with dislocation, 6 (50.0%) had habitual dislocations while the other 6 had dislocations due to sudden opening or trauma. All patients were treated with closed reduction.

Patients with myofascial pain syndrome reported that the symptoms occurred after traffic accidents, fist trauma, or dental treatment, and were treated with medication.

“Others” group

Patients in the “others” group visited the emergency room with pulpitis, neuropathic pain, loss of orthodontic appliances or prostheses, and postoperative pain and edema.

DISCUSSION

This study reported that the overall sex ratio of patients treated in the department of OMS during the study period was 1.98:1 (male:female). On the other hand, Jang et al. [5] reported this ratio as 1.9:1, Baik et al. [10] as 1.72:1, and Kim et al. [11] as 1.73:1. It was not significantly different from the previous studies. In terms of age distribution

Table 6. Comparative analysis of characteristics in bleeding group (N=260)

Cause of bleeding	Taking coagulant	Not taking coagulant	Unknown	Data
Extraction	28	95	7	130 (50.0)
Implantation	9	28	0	37 (14.2)
Spontaneous bleeding	13	18	1	32 (12.3)
Periodontal treatment	11	13	0	24 (9.2)
Other dental treatment	3	10	1	14 (5.4)
Others	4	5	14	23 (8.8)

of these patients, most of the patients visiting the emergency room and requiring treatment at the department of OMS were younger than 10 years (26.1%), followed by those in their 50s (14.2%) and those in their 20s (12.1%). As compared to other studies, Jang et al. [5] reported the age distribution frequency to be in the order of below 10 years, 20s, and then 40s, while Baik et al. [10] reported this frequency order to be below 9 years, 20s, and then 30s. Unlike other reports, the high percentage of individuals in their 40s and 50s may be because many individuals in their 20s and 30s had left the geographical region due to the recent loss of industrial growth in the Busan and Gyeongnam regions. In general, the higher percentage of injury among individuals under 10 years of age could be attributed to the higher likelihood of home injuries and the increased interest of parents in their children's oral health, which could lead to emergency rooms visit even in the case of minor injury.

In this study, trauma, infection, and intraoral bleeding were the most common reasons for visiting the emergency room. In trauma group, the laceration was the most frequent cause and the tooth injury was the second highest cause. Jang et al. [5] reported the frequency of injury in the order of soft tissue damage, tooth trauma, acute toothache, infection, intraoral bleeding, TMD, and facial bone fracture, while Baik et al. [10] reported an order of trauma, dental infection, infection, and oral bleeding (highest to lowest, in both cases).

Most previous studies have shown that trauma is the most frequent cause of visits to the emergency room [7,12], the present study additionally found that the frequency of multiple trauma was also high. In the case of complex trauma, prior preparation is required so that appropriate diagnosis and priority treatment can be provided [8].

The major causes of fracture were seen in the order of slip down, traffic accidents, and fall down; Yoon [13], Moon et al. [14], and Baik et al. [10] previously reported that fall down was the main cause of fracture. In this study, the order of frequency of fractures were mandible, nasal bone, zygomatic bone, and blow out fractures. Nakamura and Gross [15] reported that the frequency of fractures was in the order of zygomatic bone, nasal bone, and mandible. Motamedi [8] stated the order to be mandible, zygomatic

bone, and maxilla; whereas Jang et al. [5] reported an order of mandible, maxilla, and nasal bone. This difference seems to have been influenced by differences in the range of care provided at each hospital. Especially, compared with the study of Kim et al. [11], which was carried out before the transfer of dental clinic from Pusan to Yangsan, it can be confirmed that the incidence of nasal bone fracture patients is increased. This is because, as mentioned in Kim et al. [16], there is a shortage of plastic surgery emergency room that can be visited in case of fracture of nasal bone in Gyeongsangnam-do province, so many came to this department.

In the laceration group, the most frequent cause was slip down, as also reported by Jang et al. [5] Soft tissue damage frequently occurred in the order of lips, eyelids, eyebrows, and chin. Park et al. [17] stated that lip is easily damaged due to the protruding structure close to the hard tissue (i.e., teeth) and the damage can be easily recognized. Also, both eyebrows and chin are protruding parts, which easily lead to laceration, which is not different from previous studies.

In the tooth injury group, tooth fracture, avulsion, and tooth subluxation exhibited frequencies in a decreasing order of magnitude, and were mainly due to slip down and collisions. Only 15.8% of the total trauma group were injured only in the teeth. A total of 1.3% of cases were accompanied by fracture, 9.7% of cases were accompanied by laceration, and 2.7% of teeth with fracture and laceration. This seems to be due to visiting a local dental clinic on the day of the injury or the next day rather than looking for an emergency room in the event of tooth-only injury.

In the infection group, abscess was the most frequent cause (78.9%). Kim et al. [12] reported a higher incidence of buccal space abscess followed by submandibular space abscess, while Jang et al. [5] reported an order of submandibular space abscess, buccal space abscess, and canine clearance abscess. Most patients with abscess were treated by I&D or tooth extraction. The incidence of complications, such as acute airway obstruction, was very high in cases of deep neck infections. Therefore, most of these cases were treated after consultation with other departments. Patients with other infectious diseases were referred to our clinic when they had complications of cellulitis, secondary infection, or maxillary sinusitis.

In the bleeding group, 78.8% of patients visited the emergency room due to bleeding that persisted after dental treatments, such as extraction, implantation, and periodontal treatment, but only 26.2% of them were taking anticoagulants. Dental treatment is the main cause of intraoral bleeding and few patients presenting medical factors, such as being under anticoagulant therapy. It is important to record full history of the patient before dental treatment and have thorough knowledge of procedures such as hemostasis and exercising post-operative caution.

Of 12 patients with TMD, 50% had habitual dislocation. All patients were treated with closed reduction. Masticatory myofascial pain syndrome occurred after traffic accident, injury, and recent dental treatment, in patients without pre-existing TMD. In this study, the number of patients who visited our clinic for TMD was very low compared to those in other hospital reports. This may be because the emergency medical department only refers patients to the oral-maxillofacial surgeon if additional evaluation and treatment is needed after pre-treatment. Other patients included patients with dental pain, neuropathic pain, loss of intraoral devices such as orthodontic appliances and prostheses, and postoperative pain and edema.

In conclusion, there was no significant difference in the type and frequency of injuries and the cause of injuries among the patients visiting the emergency room and treated at the department of oral maxillofacial region in comparison with previous studies in various regions. Also, there was no significant difference when comparing with previous study conducted before the transfer of dental hospital from Pusan to Yangsan. However, the causes of emergency room visits, such as infection, hemorrhage, and TMD, vary widely and are complicated. Thus, it is necessary to acquire thorough knowledge in dentistry to perform accurate diagnosis and provide appropriate treatment, and to cooperate closely with other dental departments, such as pediatric dentistry, conservative dentistry, and oral medicine.

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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