Pediatric maxillofacial and dental trauma: A retrospective review of pediatric emergency management in Riyadh, Kingdom of Saudi Arabia

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Abstract

Background: Due to the high prevalence of oral and maxillofacial (OMF) trauma in city of Riyadh, a special focus on pediatric trauma is needed. The purpose of this audit was to assess the protocol followed by the OMF unit at King Khalid University Hospital (KKUH) on pediatric trauma patients. The trauma incidence, mechanism of injury, volume, the type of pediatric trauma operated and dental management were analyzed.

Materials and Methods: A quantitative retrospective review of 223 patients, at pediatric emergency unit of KKUH, Riyadh, KSA from January 2017 to July 2018, was done. The data retrieved included variables such as, age, gender, and cause of injury, site of injury, type of injury, and assessment of jaws, and teeth. Data regarding the type of investigations, treatment protocol, follow up visit, and dental management, were extracted from the medical records.

Results: Of the 223 pediatric patients presenting to the emergency unit, 116 (52%) were under the age of 5 years. A total of 64.4% of patients reported “self-fall” as the cause of injury. Soft-tissue injuries were common in 63 (56.8%) of patients in the form of lacerations 87 (41.2%). Involvement of the teeth in the injury was observed in 57 patients, in which 33 (57.9%) patients were reported to have tooth/teeth avulsions, 15 (26.3%) patients had luxation and 9 (15.8%) patients were reported to have tooth/teeth avulsions, 15 (26.3%) patients had luxation and 9 (15.8%) patients had luxation.

Keywords: Dental injury; Maxillofacial trauma; Pediatric; Protocol.
1. Introduction

Over the past few decades, the function of the hospital emergency department (ED) has changed from a position that mainly handles severe injuries and other medical emergencies to a source of primary care. The visit to the ED of any health facility is generally led by an emergency team who assist patients presenting with acute conditions due to injury, accident, disaster or poor health condition that requires immediate medical care and management (Wong et al., 2012). On the other hand, dental emergency visits can be described as the treatment of patients with orofacial problems that interfere with their lives or the function of their organs (Agostini et al., 2001). Dental emergencies are defined as facial bone fractures, facial space infections, soft-tissue lacerations, acute dentoalveolar abscess, dento-alveolar injuries and uncontrolled hemorrhage as defined by the American Dental Association (ADA) and the American Association of Oral and Maxillofacial Surgeons (AAOMS) (Deluke, 1976).

The etiology of maxillofacial trauma differs depending on the predominant socioeconomic, cultural, and environmental factors (Andreasen et al., 2018). The type of injury can vary from simple soft tissue or dentoalveolar injury to more complex maxillofacial skeletal fractures (GLENDOR, 2009, Hecova et al., 2010, Wright et al., 2007, Guedes et al., 2010). Most pediatric maxillofacial injuries include dentoalveolar and soft-tissue injuries, while the occurrence of facial fractures is just 1% to 14.7% (Kumaraswamy et al., 2009). However, most dental emergencies in hospital EDs do not meet the definition of emergency as described by the ADA and AAOMS. Some studies have observed that dental decay is the main cause of most emergency visits (Quiñonez et al., 2009, Sakai et al., 2005).

The Oral and Maxillofacial Surgery (OMFS) unit of King Khalid University Hospital (KKUH), accepts both adult and pediatric trauma cases. The team covers all OMFS emergency disciplines (infection, trauma, pathology, and dental pain) and they work on a rolling rotation of one week to manage all emergencies. The purpose of the study was to assess the protocol followed by our OMFS unit at KKUH on pediatric trauma patients who were managed between January 2017 and July 2018. We also analyzed the incidence, mechanism of injury, volume, the type of pediatric trauma operated on, and their dental management. The outcome of this study enables us to compare the magnitude of this problem with other hospitals in the region and internationally. Furthermore, the findings of this study will serve as a reference point that may influence the formulation of future patient management protocols.

2. Methods

2.1. Study design

A quantitative retrospective review of 223 medical records was performed between 1 January 2017 to 31 July 2018 at the pediatric emergency unit at (KKUH), Riyadh, Kingdom of Saudi Arabia (KSA). The target population was children aged 0 to 12 years who had a maxillofacial emergency. Only children presenting for maxillofacial emergencies were included, while children attending regular dental health problems were excluded. After receiving ethical approval from the institutional IRB committee (E- 17–2748), the data was collected using a structured data collection form. The form included variables such as time, date of patient’s visit, age, gender, cause of injury, site of injury, type of injury, assessment of midfacial, mandible, and teeth. The type of investigations, the specialty of consultant attended, treatment protocol, follow up visit, and dental management data were retrieved. Data were analyzed using SPSS software after calculating descriptive statistics (frequencies, percentages, mean and standard deviation) which were used to describe the categorical and quantitative study variables. The confidentiality of personal information of the patients was maintained.

3. Results

Of the 223 pediatric patients presenting to the emergency unit, 116 (52%) were under the age of 5 years and 132 (59.2%) were males. A total of 64.4% of patients reported “self-fall” as the cause of injury (Table 1). The lower facial region, which was observed in 189 (84.7%) patients, was the most common site of injury. Soft-tissue injuries were reported in 63 (56.8%) patients, in the form of lacerations 87 (41.2%). Involvement of the teeth in the injury was observed in 57 patients, among whom 33 (57.9%) patients reported to have tooth/teeth avulsions, 15 (26.3%) patients had tooth luxation and 9 (15.8%) patients had crown fractures (Table 2). Investigations were conducted in 72 patients, of which plain radiography was used in 33 (45.8%), CT scan in 36 (50%), and CT with contrast in 3 (4.2%) patients. Antibiotics and analgesics were used as immediate treatment in 183 (82.1%) patients. More than 90% (201) of patients were attended by the OMFS team (Table 3). Regarding management, 144 (64.6%) patients received definitive management, in which soft-tissue management was carried out in 93 (64.6%) patients. Nine (6.2%) patients underwent reduction and fixation of the dentoalveolar fracture using an arch bar, while other unspecified definitive management was
Conservative management was performed in 96 (43.1%) patients, including antibiotic and analgesic prescription, parental reassurance, and follow-up for cases of undisplaced fractures or dental trauma that may require specialized management (Table 4).

Regarding anesthesia for management, 75 (59.5%) patients were managed under local anesthesia (LA), while 42 (33.3%) were managed under LA combined with conscious sedation in the ED. Nine (7%) patients were managed under general anesthesia (GA). Three (1.5%) cases were seen by a pedodontist at the ED, and the remaining cases were evaluated by the OMFS team and managed either under general or local anesthesia. The patients followed by pedodontists were treated for extractions (9 patients, 30%), pulpectomy (3 patients 10%), restoration (3 patients, 10%) and other (12 patients, 40%) were under follow-up (Table 5). The high percentage of extractions revealed that the patients were delayed in their presentation for actual management, which was due to the lack of an
established protocol for the immediate treatment of pediatric patients with dental injuries.

4. Discussion

This retrospective study reported 223 patients for pediatric emergency who presented with maxillofacial injuries. Data collection included a descriptive analysis of cause, type of injury, the investigations performed, and case management. Our data showed that 52% of the patients were below the age of 5 years. This finding was similar to other studies. Maxillofacial injuries have been reported to account for 75% during pediatric age versus adolescence (Petersson et al., 1997). Because of the higher cranial mass-to-body ratio, children are more vulnerable to craniofacial trauma (Wymann et al., 2008). It was reported that the incidence of pediatric facial fractures ranges from 1% to 14% in children of below 16 years of age and less than 1% in children of less than 5 years of age (Sakai et al., 2005). This finding was consistent with our findings as we reported an incidence rate of 5% for mandibular fractures versus adolescence (Petersson et al., 1997). Because of the high prevalence of craniofacial trauma (Wymann et al., 2008). It was reported that the angle fracture. Regarding the face and neck, the oral cavity is less often affected by violence, but the health worker can easily detect lesions at this level (bruising of the hard palate, fractured teeth, lacerations, burning of mucosae, etc.) during the examination (McAndrew and Marin, 2012, Nelms et al., 2009). Updated evidence-based guidance is needed to aid dentists, pediatricians, surgeons, teachers, parents, schools, and sports staff in the prevention and first aid of children and adolescents in the event of dental trauma. It is also prudent to conduct an orderly assessment of the medical and legal suggestions (Flaherty et al., 2014).

Soft-tissue injuries 63(56.8%) were common in the form of lacerations in 87 (41.2%), while 25% of children suffered from dental trauma in the form of teeth avulsion in 33 (14.7%) patients, luxation in 15 (6.7%) patients, and crown fracture in 9 (4%) patients. Other studies have shown crown fractures, followed by concussion and subluxation in the permanent dentition (Diaz et al., 2010, Alonge et al., 2001), subluxation was followed by concussion and subluxation in the permanent dentition (Wymann et al., 2008). It was reported that the incidence of pediatric facial fractures ranges from 1% to 14% in children of below 16 years of age and less than 1% in children of less than 5 years of age (Sakai et al., 2005). This finding was consistent with our findings as we reported an incidence rate of 5% for mandibular fractures versus adolescence (Petersson et al., 1997). Because of the high prevalence of craniofacial trauma (Wymann et al., 2008). It was reported that the angle fracture. Regarding the face and neck, the oral cavity is less often affected by violence, but the health worker can easily detect lesions at this level (bruising of the hard palate, fractured teeth, lacerations, burning of mucosae, etc.) during the examination (McAndrew and Marin, 2012, Nelms et al., 2009). Updated evidence-based guidance is needed to aid dentists, pediatricians, surgeons, teachers, parents, schools, and sports staff in the prevention and first aid of children and adolescents in the event of dental trauma. It is also prudent to conduct an orderly assessment of the medical and legal suggestions (Flaherty et al., 2014).
due to child neglect and/or abuse,” we emphasized that health professionals, including dentists, are legally required to report any suspicion of abuse (Cagetti et al., 2019).

Trauma diagnosis and treatment should be carried out according to definite protocols that initially involves the detailed collection of medical history and the circumstances of the traumatic event, along with the clinical examination and radiological investigations, a second phase that involves definitive therapeutic management and a third phase of monitoring the patient. Trauma management, particularly in children, deals with treating soft tissues, bone trauma and care of life-threatening injury which are based on clinical and radiographic examinations (Karim et al., 2010, Bell et al., 2007). A protocol for triage and assessment of pediatric patients who have had a craniofacial injury has been published in the literature (Haug and Foss, 2000). Certain injury patterns should lead the emergency physician to suspect child abuse. These include multiple physical injuries to the head and neck, missing or broken teeth, fracture malunion, and multiple fractures in various stages of healing (Cagetti et al., 2019).

More than 90% of the patients in our study were attended by the OMFS team. Both definitive and conservative management was performed in these patients. Under definitive management, soft tissue management was performed in 93 patients. About 89.2% were discharged after maxillofacial care was provided. Of 57 patients who presented with dental trauma, 30 patients underwent treatment by the pedodontist. Twenty-seven (47.4%) patients were seen in the ED by the OMFS, and then referred to the pedodontist for a follow up visit, whereas 60 (31.7%) patients did not present for the follow up visit or were not accepted for evaluation. Dental treatment by the pedodontist was delayed for 27 patients waiting for the recall visit, and 60 patients were not referred. The latter was not clear from the patient record if the parents refused the treatment or did not attend their follow-up visit. According to dental trauma guidelines, immediate treatment and general assessment should be performed for crown fractures and tooth avulsions. A dental trauma certificate should be issued to the patient at that time (Cagetti et al., 2019). It has been recommended that facial trauma requires a multidisciplinary approach: the management of facial bone fractures is the responsibility of the maxillofacial surgeon, while the dentist is responsible for dental and oral soft-tissue lesions. Only parents and/or caregivers are permitted to consent to dental treatments in pediatric trauma patients. However, urgent diagnostic and therapeutic procedures (such as wound sutures, reduction of displaced teeth, re-plantation of the tooth, managing pulp exposure, etc.) should be performed, if necessary, to avoid worse outcomes (Cagetti et al., 2019). Because there is no pedodontist for on-call duty in KKUH, all patients are examined by the OMFS team. If the patient needs a pedodontist consultation, they are referred to the pediatric dental clinic for management. Thus, general dentists/pediatric dentists need to be equipped and knowledgeable about the latest guidelines and should attend refreshing courses on management of orofacial injuries (Al Mahmoud et al., 2019, Alyasi et al., 2018). However the limitation of the study was that it is retrospective and based on the availability and accuracy of the information in the clinical notes.

It can be concluded that clinicians (pediatricians, ED staff, or dentists) facing maxillofacial trauma in an ED need to have access to useful and practice guidelines. The study also showed the need for more manpower-oriented training such as a pedodontist and a general dentist to join the OMFS team to manage pediatric patients. The regional referral hospitals should also be equipped to decentralize the management of these patients to the KSU Dental University Hospital. Additionally, we emphasize educating the parents and school teachers through regular community dental education programs.

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Ethical approval

The ethical approval and facilitating latter of this study were obtained from King Saud University (ethic approval no. E-17–2748 dated 29.11.2017).

Patient consent

A written informed consent was obtained from all the participants who participated in this study.

Declaration of Competing Interest

The authors declared that there is no conflict of interest.

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References

AGOSTINI, F. G., FLAITZ, C. M. & JOHN HICKS, M. 2001. Dental emergencies in a university-based pediatric dentistry postgraduate outpatient clinic: a retrospective study. Journal of dentistry for children, 68, 316-321.

AL. MAHMoud, A., AL. HALAbI, M., HUSSEIN, I. & KOWASH, M. 2019. Knowledge of management of traumatic dental injuries of emergency department physicians and residents in the United Arab Emirates. Journal of Dentistry for Children, 86, 24-31.

Alonge, O.K., Narendran, S., Williamson, D.D., 2001. Prevalence of fractured incisal teeth among children in Harris County, Texas. Dent. Traumatol. 17, 214–217.

Alyasi, M., AL. HALAbI, M., Hussein, I., Khamis, A. & Kowash, M. 2018. Dentists’ knowledge of the guidelines of traumatic dental injuries in the United Arab Emirates. Eur J Paediatr Dent, 19, 271-6.

Andreasen, J.O., Andreasen, F.M., Andersson, L., 2018. Textbook and color atlas of traumatic injuries to the teeth. John Wiley & Sons.

Bell, R.B., Osborn, T., Dierks, E.J., Potter, B.E., Long, W.B., 2007. Management of penetrating neck injuries: a new paradigm for civilian trauma. J. Oral Maxillofac. Surg. 65, 691–705.

Cagetti, M.G., Marcoli, P.A., Berengo, M., Cascone, P., Cordone, L., Defabianis, P., de Giglio, O., Esposito, N., Federici, A., Laino, A., 2019. Italian guidelines for the prevention and management of dental trauma in children. Italian J. Pediatrics 45, 1–14.

Costello, B.J., Papadopoulos, H., Ruiz, R., 2005. Pediatric cranio-maxillofacial trauma. Clinical Pediatric Emergency Medicine 6, 32–40.
Deluke, D., 1976. Emergency dental care for the community: what is the responsibility of the hospital? J. hospital dental practice 10, 43–45.

Diaz, J.A., Bustos, L., Brandt, A.C., Fernandez, B.E., 2010. Dental injuries among children and adolescents aged 1–15 years attending to public hospital in Temuco, Chile. Dent. Traumatol. 26, 254–261.

Donaruma-Kwoh, M.M., Wai, S., 2010. Oropharyngeal lesions and trauma in children. Clinical Pediatric Emergency Medicine 11, 112–121.

Flaherty, E., Perez-Rossello, J., Levine, M., Henrikkus, W., 2014. American Academy of Pediatrics Committee on Child Abuse and Neglect. Evaluating children with fractures for child physical abuse. Pediatrics 133, e477–e489.

Gassner, R., Bosch, R., Tuli, T., Emshoff, R., 1999. Prevalence of dental trauma in 6000 patients with facial injuries: implications for prevention. Oral Surgery Oral Medicine Oral Pathology Oral Radiology Endodontology 87, 27–33.

Gassner, R., Tuli, T., Haehl, O., Moreira, R., Ulmer, H., 2004. Craniomaxillofacial trauma in children: a review of 3,385 cases with 6,060 injuries in 10 years. J. Oral Maxillofac. Surg. 62, 399–407.

Gassner, R., Tuli, T., Haehl, O., Rudisch, A., Ulmer, H., 2003. Crano-maxillofacial trauma: a 10 year review of 9543 cases with 21,067 injuries. J. Cranio-maxillofacial surgery 31, 51–61.

Glendor, U., 2009. Aetiology and risk factors related to traumatic dental injuries—a review of the literature. Dent. Traumatol. 25, 19–31.

Glendor, U., Andersson, L., 2007. Public health aspects of oral diseases and disorders: dental trauma. Community oral health. London, Quintessence, pp. 203–214.

Guedes, O.A., Alencar, A.H.G.D., Lopes, L.G., Pecora, J.D., Estrela, C., 2010. A retrospective study of traumatic dental injuries in a Brazilian dental urgency service. Brazilian Dental J. 21, 153–157.

Haug, R.H., Foss, J., 2000. Maxillofacial injuries in the pediatric patient. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology 90, 126–134.

Hecova, H., Tzigkounakis, V., Merglova, V., Netolicky, J., 2010. A retrospective study of 889 injured permanent teeth. Dent. Traumatol. 26, 466–475.

Karin, T., Khan, A.H., Ahmed, S.S., 2010. Trauma of facial skeleton in children: An indian perspective. Indian J. surgery 72, 232–235.

Kumaraswamy, S., Madan, N., Keerthi, R., Singh, D.S., 2009. Pediatric injuries in maxillofacial trauma: a 5 year study. J. maxillofacial oral surgery 8, 150–153.

Lauridsen, E., Hermann, N.V., Gerds, T.A., Kreiborg, S., Andreasen, J.O., 2012. Pattern of traumatic dental injuries in the permanent dentition among children, adolescents, and adults. Dent. Traumatol. 28, 358–363.

McAndrew, M., Marin, M.Z., 2012. The Role of the Dental Professional in Identification and Referral of Victims of Domestic Violence. NY State Dent. J. 78, 16.

Minnazzi, M.S., Gabrielli, M.A., Gabrielli, M.F., Trivellato, A.E., 2017. Treatment of mandibular condyle fractures. A 20-year review. Dent. Traumatol. 33, 175–180.

Nasser, M., Pandis, N., Fleming, P.S., Fedorowicz, Z., Ellis, E. & Ali, K. 2013. Interventions for the management of mandibular fractures. Cochrane database of systematic reviews.

Nelms, A.P., Gutmann, M.E., Solomon, E.S., Dewald, J.P., Campbell, P.R., 2009. What victims of domestic violence need from the dental profession. J. Dent. Educ. 73, 490–498.

Petersson, E., Andersson, L., Storsten, S., 1997. Traumatic oral vs non-oral injuries. Swed. Dent. J. 21, 55–68.

Quihnonez, C., Gibson, D., Jokovic, A., Locker, D., 2009. Emergency department visits for dental care of nontraumatic origin. Commun. Dent. Oral Epidemiol. 37, 366–371.

Silva, S.M.B.D., Machado, M.A.D.A.M., 2005. Urgency treatment profile of 0 to 15 year-old children assisted at urgency dental service from Bauru Dental School, University of Sao Paulo. J. Applied Oral Science 13, 340–344.

Shayegan, A., De Maertelaer, V. & Vanden Abbeele, A. 2007. The prevalence of traumatic dental injuries: a 24-month survey. Journal of Dentistry for Children, 74, 194-199.

Vyas, R.M., Dickinson, B.P., Wasson, K.L., Roostaeian, J., Bradley, J.P., 2008. Pediatric facial fractures: current national incidence, distribution, and health care resource use. J. Craniofacial Surgery 19, 339–349.

Wong, N., Tran, C., Pukallus, M., Holecombe, T., Seow, W., 2012. A three-year retrospective study of emergency visits at an oral health clinic in south-east Queensland. Aust. Dent. J. 57, 132–137.

Wright, G., Bell, A., McGlashan, G., Vincent, C., Welbury, R.R., 2007. Dentaloulveolar trauma in Glasgow: an audit of mechanism and injury. Dent. Traumatol. 23, 226–231.

Wymann, N.M.E., Holzle, A., Zachariou, Z., Iizuka, T., 2008. Pediatric craniofacial trauma. J. Oral Maxillofac. Surg. 66, 58–64.

Zeng, Y., Selle, B. & Milgrom, P. 1994. Epidemiology of dental injury visits to an urban children’s hospital. Pediatric dentistry, 16, 419-419.