

# Etiology, Prevalence, and Management of Oral and Maxillofacial Soft Tissue Injuries in Children at the Komfo Anokye Teaching Hospital, Kumasi-Ghana

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## Abstract

**Background:** Maxillofacial injury may vary from simple soft tissue lacerations to complex fractures of the orofacial region. Soft tissue injuries, whether isolated or in combination with other injuries, form part of the frequent traumatic craniofacial injuries seen at the emergency department. The force of impact and the injury type is directly related to the severity of the injury sustained. This study aimed to analyze the etiological factors, prevalence, and management of oral and maxillofacial soft tissue injuries at the Komfo Anokye Teaching Hospital. **Methods:** This was a prospective study that involved children presenting with oral and maxillofacial injuries at the Accident and Emergency Department and the Oral and Maxillofacial Surgery unit of the Komfo Anokye Teaching Hospital in Kumasi between the period of April to October 2020 (6 months). Patient selection was by convenience sampling targeting all children with injuries who met the inclusion criteria. Inclusion criteria were children below the age of 18 years whose parents or caregivers consent to participation. Children with maxillofacial injuries as a result of burns were excluded from the study. **Results:** During the study period a total of 134 children were reviewed with oral and maxillofacial injuries at KATH. Of these, 107 (78.9%) were recorded cases of orofacial soft tissue injuries. There were 63 (58.9%) males and 44 (41.1%) females and the male-to-female ratio was 1.5:1. The age range of patients studied was 8 months – 17 years, with mean age  $\pm$  SD being  $9.5 \pm 5.3$  years. Road Traffic Crash (50.5%) was the most common etiology of which Motor cycle crash constituted 24.3% and

Pedestrian knockdown was 19.6%. Falls (42.1%) were the next most common etiology. The lips (19.8%) and the forehead (18.5%) were the most frequently injured sites on the face while the tongue (3.3%) had the most injuries intra-orally. Laceration (45.7%) was the most frequent injury reviewed, followed by abrasions (35.8%). Most of the soft tissue injuries underwent primary closure (56.3%). A complication rate of 21.2% was recorded in this study and hypertrophic scarring (11.3%) was the most observed.

## Keywords

Laceration, Soft Tissue Injury, Etiology, Maxillofacial Injury, Prevalence, Management, Children

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## 1. Introduction

Maxillofacial injury encompasses soft and hard tissue injuries of the face extending from the frontal bone superiorly to the mandible inferiorly, and the pterygoid plates more posteriorly. These injuries vary from simple soft tissue lacerations to complex fractures of the maxillofacial region [1].

Soft tissue injuries, whether isolated or in combination with other injuries, form part of the frequent traumatic craniofacial injuries seen at the emergency department and may account for nearly 10% of all emergency department visits [2] [3] [4].

Soft-tissue facial injuries are common in children involved in maxillofacial trauma due to the greater cranial mass-to-body ratio and also quite frequent than fractures in children who have encountered facial trauma, specifically in younger children whose bones have the distinct ability to resist fracture [5]. The force of impact and the injury type is directly related to the severity of the injury sustained [5].

Classifications of soft tissue injuries, in general, are abrasions, lacerations, contusions, and avulsions.

1) Abrasions refer to injuries that remove the epithelial and papillary layers of the dermis, leaving the reticular layer exposed. It usually happens when there is friction between an object and the surface of the soft tissue [6].

2) A tear that involves the epithelial and subepithelial tissue layers is termed a laceration. They can have sharp, contused, ragged, or stellate margins [6] [7].

3) An avulsion occurs when there is forcible tearing away or separation of a bodily structure or part either as a result of injuries or an intentional surgical procedure. Such injuries are often due to gunshots, missile and war injuries, road traffic crashes, and human or animal bites [7].

4) Contusions form as a result of blunt trauma that leads to edema and hematoma formation in the subcutaneous tissues without a break in the soft tissue surface. The associated soft tissue swelling and ecchymosis can be extensive [6] [8].

The orofacial region is made up of the face, eyes, nose, and this region of the human body is usually not protected, making it prone to several injuries including assault, falls, road traffic crashes, and animal and human bites [2] [9].

Most children are excited to play with family pets or other pets they encounter, so they should be supervised and watched when they are with these animals for a long time. The prominent cranial head-to-body ratio makes the face an easy target. Management requires an urgent confirmation of rabies status, identification, and isolation of the animal involved [8].

In the management of soft tissue injury, a detailed history is gathered (from the parent or caregiver). The time of injury and the mechanism of injury is essential information as well as the loss of consciousness, and this highlights the type and severity of the injury. The history also provides adequate information on the progress of wound care, especially in previously contaminated wounds. Determining the tetanus status of the child in open wounds is an essential part of the care [10].

Children who suffer facial trauma usually present with associated injuries that may require multi-specialty involvement, this may include a Pediatric Oral & Maxillofacial surgeon, Pediatric dentist, Orthodontist, Pediatrician, Dietician and a Pediatric Physiotherapist [11]. Early management of soft tissue injuries gives a better outcome than when delayed. Thorough cleaning and exploration of the wound followed by rinsing with a copious amount of normal saline should be done to ensure the wound is devoid of foreign objects and underlying bony fractures are identified as early as possible [12].

Suturing material must be appropriate and should be done in layers with the wound margins everted. An adequate wound dressing to avoid subsequent injury is vital [12]. This study sought to analyze the etiological factors, prevalence, and management of oral and maxillofacial soft tissue injuries seen at the Komfo Anokye Teaching Hospital in Kumasi, Ghana.

## 2. Materials & Methods

This was a prospective study that involved children presenting with oral and maxillofacial injuries at the Accident and Emergency Department and the Oral and Maxillofacial Surgery unit of the Komfo Anokye Teaching Hospital in Kumasi between the period of April to October 2020 (6 months). Patient selection was by convenience sampling targeting all children with injuries who met the inclusion criteria. Inclusion criteria were children below the age of 18 years whose parents/caregiver's consent to participation. Children with maxillofacial injuries as a result of burns were excluded from the study. Detailed information was recorded on the cause of injury, type of soft tissue injury, site of injury, treatment given, and follow-up review period of at least 3 months for each patient to evaluate the outcome.

Based on the Advanced Trauma Life Support (ATLS) protocol for the management of patients with life-threatening injuries, securing the airway and controlling the cervical spine were the mainstay focus in the evaluation and man-

agement.

Airway loss is likely to be fatal as compared to the other emergency parameters like difficulty in breathing and circulatory challenges and hence this was key in the life-saving intervention, especially in cases where fractures caused airway obstruction. After the initial trauma assessment was done at the emergency department, stable patients (with Glasgow Coma Scale score of 15/15) were moved to the ward for definitive care.

The definitive diagnosis of both soft and hard tissue injuries was based on good history and clinical examination, followed by the necessary radiographic investigations. As part of the management protocol for the accident and emergency, most patients with severe injuries to the craniomaxillofacial region were made to take computerized tomography scans (CT scans) of the head and the neck to rule out traumatic brain injury (TBI) and injury to the cervical spine. Initially, patients who had both traumatic brain injuries and cervical spine injuries were treated by the Neurosurgery team. Once they became stable, they were referred for further treatment of their maxillofacial injuries.

Soft tissue injuries both intra-oral and extra-oral were examined thoroughly to remove foreign bodies and detect any underlying bony fractures. Wounds were initially cleansed thoroughly with a copious amount of normal saline for irrigation. Most of the soft tissue injuries were managed within the first 24 hours of presentation even though in some cases there were challenges with personal protective equipment (PPE) because of the pandemic (COVID-19) at the time of this study. Appropriate suturing techniques were used in all cases to reduce post-operative complications like wound dehiscence and scarring. Some avulsion injuries required the use of flaps for closure and skin grafting done in case of scalp avulsion. Sutures were removed postoperative between 7 - 10 days under local anesthesia or sedation in some of the cases.

Patients with extensive deformities as a result of injuries were managed together with other surgeons like the Ophthalmologist, Otolaryngologist, Neurosurgeons, and Plastic and Reconstructive surgeons.

### 3. Results

Over the 6 months, 134 children were reviewed with oral and maxillofacial injuries at KATH. Of these, 107 (78.9%) were recorded cases of oral and maxillofacial soft tissue injuries. There were 63 (58.9%) males and 44 (41.1%) females and the male-to-female ratio was 1.5:1. The age range of patients studied was 8 months - 17 years, with mean age  $\pm$  SD being  $9.5 \pm 5.3$  years and modal age of 17.

The patients were organized into three main age groups to facilitate easy capturing and comparison of available data.

- The first age group included preschool-aged children with an age range of 0 - 5 years.
- The second group included school-aged children with an age range of 6 - 12 years.

- The third group was the adolescent-aged children with an age range of 13 - 17 years.

The majority of the children reviewed in this study were within the school-aged group (42.9%), as shown in **Table 1**. However, most soft tissue injuries were seen among the adolescent-aged group (42.6%) and the adolescent male had the most injuries (**Table 2**).

Laceration (45.7%) was the most frequent soft tissue injury recorded, followed by abrasions (35.8%). Road Traffic crashes (MVC, PK, MCC, and BC) represented 50.5% of all the causes of injury and were the commonest; this was followed by falls (42.1%). Motorcycle crashes (24.3%) and Pedestrian knockdowns (19.6%) were the main etiological factors in most road traffic crashes recorded (**Table 3**).

The lips (19.8%) and the forehead (18.5%) were the most frequently injured sites on the face while the tongue (3.3%) had the most injuries intraorally (**Table 4**).

According to **Figure 1**, 85 (56.3%) of soft tissue injuries underwent primary closure. There were 12 (8.0%) injuries that required flaps, and 28 (18.5%) had only dressing of the wound done. Five (3.3%) of the injuries needed secondary closure done and 2 (1.3%) required split-thickness skin grafting.

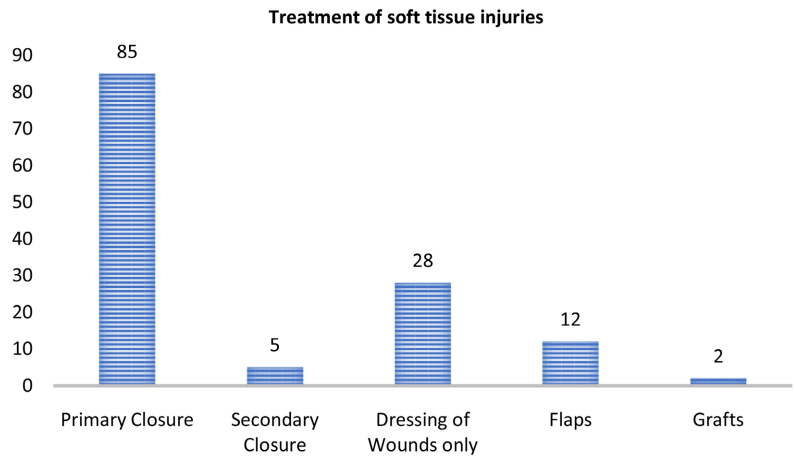
A complication rate of 21.2% was recorded in this study and hypertrophic scarring was the most frequent (11.3%), followed by wound infections (6.0%). There were various forms of deformities seen including avulsed ears and nose and ruptured globes (**Figure 2**).

**Table 1.** Age distribution for soft tissue injuries.

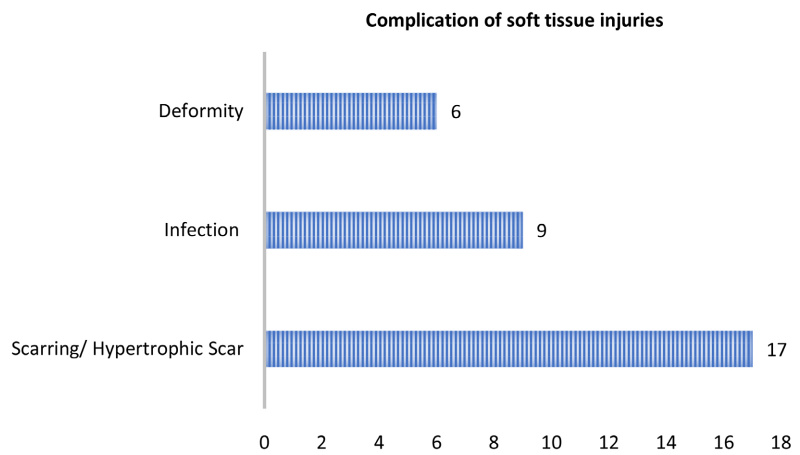
<i>Age Distribution</i>	<i>Gender</i>		<i>Total</i>	<i>Percentage</i>
	<i>Male</i>	<i>Female</i>		
0 - 5	14	12	26	24.2
6 - 12	21	25	46	42.9
13 - 17	28	7	35	32.7
<i>Total</i>	<b>63</b>	<b>44</b>	<b>107</b>	<b>100</b>

**Table 2.** Distribution of soft tissue injury among the various age groups.

<i>AGE DISTRIBUTION</i>	<i>0 - 5</i>		<i>6 - 12</i>		<i>13 - 17</i>		<i>TOTAL</i>	<i>Percentage (%)</i>
	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>		
<i>Contusion</i>	1	0	2	2	7	1	13	8.6
<i>Abrasion</i>	3	6	12	8	21	4	54	35.8
<i>Avulsion</i>	2	2	3	4	3	1	15	9.9
<i>Laceration</i>	11	5	12	14	20	7	69	45.7
<i>Total</i>	17	13	29	28	51	13	151	100



**Figure 1.** Treatment of soft tissue injuries.



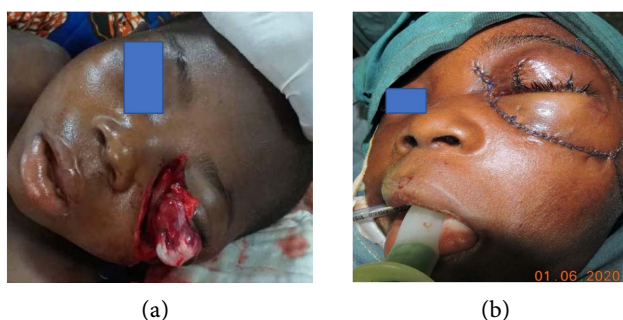
**Figure 2.** Complication of soft tissue injuries.

**Table 3.** Etiology of soft tissue injury according to gender and age.

Cause of Injury	0 - 5		6 - 12		13 - 17		Total
	M	F	M	F	M	F	
Motor Vehicle Crash (MCV)	2	0	0	2	0	2	6
Pedestrian Knockdown (PK)	2	2	6	10	0	1	21
Motor Cycle Crash (MCC)	0	0	2	0	22	2	26
Bicycle Crash (BC)	0	0	0	1	0	0	1
Gunshot	0	0	0	2	0	0	2
Fall	9	10	12	10	3	1	45
Assault	0	0	0	0	2	1	3
Bite	1	0	0	0	0	0	1
Contact Sports	0	0	1	0	1	0	2
<b>Total</b>	<b>14</b>	<b>12</b>	<b>21</b>	<b>25</b>	<b>28</b>	<b>7</b>	<b>63</b>
	<b>26</b>		<b>46</b>		<b>35</b>		<b>107</b>

**Figure 3(a)** shows a 6-year old girl who fell from a height at the playing ground and hit her face against a metal bar, sustaining an extensive laceration over the left infraorbital region and a ruptured left globe. **Figure 3(b)** shows wound closed in layers and the overlying skin was well apposed after enucleation of the ruptured left globe was done by the ophthalmologist.

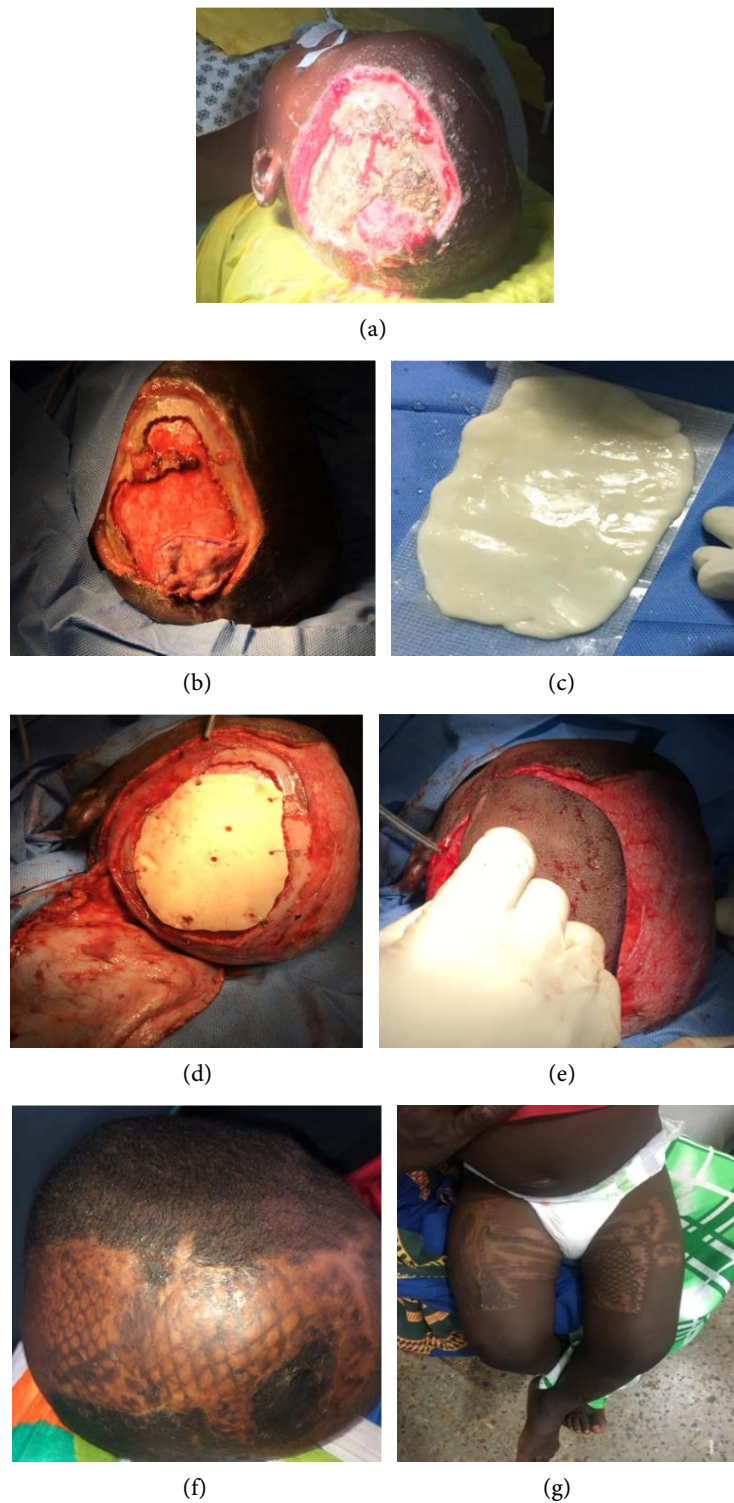
**Figure 4(a)** shows an extensive left temporo-parietal avulsion of the scalp as a result of pedestrian knockdown in a 5-year old boy. **Figure 4(b)**—After thorough debridement of the wound, the underlying parietal bone fracture with exposed dura was identified and covered with a pericranial flap. **Figure 4(c)**—Bone cement, Polymethyl methacrylate (PMMA) was prepared to cover the bony defect. **Figure 4(d)**—Bone cement was trimmed and secured in place using stainless steel wires. **Figure 4(e)**—A scalp flap was raised from the right parietal region to cover the bone cement. **Figure 4(f)**—Healed split-thickness skin graft that was placed over where the scalp flap was raised. **Figure 4(g)**—Healed donor sites where the graft was taken.



**Figure 3.** Extensive orbital blow-out injury in a 6-year old.

**Table 4.** Anatomical distribution of soft tissue injuries.

<i>Site of soft tissue injury</i>	<i>Frequency (%)</i>
<b><i>Extra-oral</i></b>	<b>137 (90.7)</b>
Lip	30 (19.8)
Forehead	28 (18.5)
Scalp	18 (11.9)
Cheek	17 (11.3)
Nose	14 (9.3)
Ear	11 (7.3)
Chin	10 (6.6)
Eye	9 (6.0)
<b><i>Intra-oral</i></b>	<b>14 (9.3)</b>
Tongue	5 (3.3)
Labial mucosa	4 (2.7)
Buccal mucosa	3 (2.0)
Gingiva	2 (1.3)
<b>Total</b>	<b>151 (100)</b>



**Figure 4.** Temporo-parietal avulsion of the scalp due to knockdown.

**Figure 5(a)** above shows a 17-year-old girl who had the right lip commissure bitten off by a friend during a fight. The wound was thoroughly debrided and reconstruction of the right commissure was done under local anesthesia. **Figure 5(b)**—One-month post-op showing a healed wound with scarring.





**Figure 5.** Avulsion of the right lip commissure.

#### 4. Discussion

In this study, a total of 134 children with oral and maxillofacial injuries were reviewed at the Accident and Emergency and the Oral and Maxillofacial unit of KATH over the six months period (From April 2020 to October 2020). Of these, 107 (78.9%) children reported oral and maxillofacial soft tissue injuries and these were either isolated or in combination with other injuries. This gave a prevalence of 78.9% which was higher and is consistent with studies by Hussaini *et al.* [13] and Bernard *et al.* [14] which recorded a prevalence of 94.2% and 81.7% respectively.

There were 63 (58.9%) males and 44 (41.1%) females and the male-to-female ratio was 1.5:1. The male predominance in this study lends credence to existing literature. [15] [16] [17] [18] and this is because boys are more prone to injury as a result of riskier behaviour and increased outdoor activities [16] [19] [20].

The average age was 9 years 5 months with a modal age of 17 years. Categorizing the sample into three different groups highlighted which oral and maxillofacial soft tissue injury was suffered the most by the various groups of children. The adolescent age group (13 - 17 years) reported the most soft tissue injuries 64 (42.4%). This result was also similar to the study done at the Korle-bu Teaching Hospital in Accra by Blankson *et al.* [21] which showed that adolescent-aged children within 13 - 17 sustained the most injuries, followed by the School-aged children.

**Table 3** showed a higher occurrence of pedestrian knockdown and fall within the 6 - 12 year age group indicating that this was the most active age group that spent most of the time out of school engaging in riskier activities at home or they were out there on the streets. Unlike the adolescent-aged group which does not require much supervision from parents, the school-aged group does and probably the lack of supervision from parents or guardians may have contributed to the higher frequency of injuries seen [22] [23].

The adolescent-aged group mostly the males, was involved in motorcycle crashes the most and this result is consistent with other studies [13] [24] [25]. This observation may be as a result of the illegal use of motorcycles for commercial purposes and the motorcycles are usually ridden by school drop-out who have little or no regard for road traffic regulations [25] [26] [27].

Purely soft tissue injuries were seen in 38 (28.4%) of patients, other soft tissue injuries were in combination with either a dental injury, bony fracture, or other associated injuries. The majority of the soft tissue injuries were extra-oral 137 (90.7%) with the lips 30 (19.8%) being the most frequent site followed by the forehead 28 (18.5%). Lacerations 69 (45.7%) were the most common soft tissue injury observed followed by abrasions 54 (35.8%). Oginni *et al.* concluded in a study done to determine the pattern of soft tissue injury in a teaching hospital in Nigeria that the majority of the soft tissue injuries (82.2%) were located extra-orally. Of the 174 injuries recorded, 145 (83.3%) were purely soft tissue injuries and lacerations were the most common forms of injury recorded followed by abrasions. The forehead was the most frequently injured site followed by the cheek. [28] The current study was partly consistent with the above results, however, the most frequently injured site varied. The reason why the lip was the most frequent was due to the increased numbers of falls in both the preschool and school-aged groups which presented with dentoalveolar injuries in both the mandible and maxilla in this study.

Most of the soft tissue injuries received primary closure of wounds (53.6%) with only 3.3% requiring secondary closure. This result is quite different from what Akinbami *et al.* [29] observed in a study in Nigeria, where (96.0%) received primary closure of the wounds while 5 (4.0%) received delayed closure. The difference may be due to the varying pattern of soft tissue injuries that were seen in this study however both studies agreed that only a few cases required secondary/delayed closure.

The reported complication rate in maxillofacial injuries ranges from 10.0% to 14.0% [30] [31]. This was contrary to this study which reported a 21.2% rate and hypertrophic scarring was the commonest complication seen in 17 (11.3%). Even though scars are an inevitable result of soft tissue trauma and most surgical interventions, darker skins tend to form post-inflammatory hyperpigmentation and are more likely to form keloids or hypertrophic scars. [32] Secondly, the delay in managing some of the injuries as well as the inadequate period of review may also have contributed to this.

## 5. Conclusion

In Kumasi and its environs adolescent males are at a higher risk of sustaining maxillofacial injuries from motorcycle crashes while children who are 12 years and below may suffer maxillofacial injuries as a result of pedestrian knockdown and falls. The prevalence of oral and maxillofacial soft tissue injuries was 78.9%, laceration was the most frequent injury sustained and the commonest anatomical site was the lips. Hypertrophic scarring was the most common complication observed.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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