

## Review

# Aetiology of maxillofacial fractures: a review of published studies during the last 30 years

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## Abstract

The epidemiology of facial trauma may vary widely across countries (and even within the same country), and is dependent on several cultural and socioeconomic factors. We know of few reviews of published reports that have considered the sex distribution and aetiology of maxillofacial trauma throughout the world. The aim of this review was to discuss these aspects as they have been presented in papers published during the last 30 years. We made a systematic review of papers about the epidemiology of maxillofacial trauma that were published between January 1980 and December 2013 and identified 69 studies from Africa (n=9), North America and Brazil (n=6), Asia (n=36), Europe (n=16), and Oceania (n=2). In all the studies men outnumbered women, the ratio usually being more than 2:1. In American, African, and Asian studies road traffic crashes were the predominant cause. In European studies the aetiology varied, with assaults and road traffic crashes being the most important factors. In Oceania assaults were the most important. A comparison of the incidence of maxillofacial trauma of different countries together with a knowledge of different laws (seat belts for drivers, helmets for motocyclists, speed limits, and protection worn during sports and at work) is crucial to allow for improvement in several countries. To our knowledge this paper is the first attempt to study and compare the aetiologies of maxillofacial trauma.

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## Introduction

Maxillofacial injuries are a serious public health and economic problem, as their treatment, and time spent in hospital and off work, is expensive. They are also often associated with severe morbidity, disfigurement, and psychological problems.<sup>1–69</sup> Their epidemiology may vary widely from country to country (and even within the same country), and it is dependent on several factors, including culture, socioeconomic background, and population density.<sup>9,28,30,33,38,46</sup>

First, the populations in urban and rural environments differ in density and infrastructure. The incidence of road traffic crashes may depend on: increases in the volume of traffic, a substantial rural to urban drift of the productive segment of the population, deteriorating infrastructure such as roads, road building programmes, widespread use of second-hand vehicles, young people driving illegally, young children travelling as front seat passengers without restraint, driving under the influence of alcohol, and non-compliance with legislation about seatbelts and crash helmets.<sup>6,12,25–27,30,38</sup>

However, enforcement of legislation about seat belts and crash helmets, measures for speed control, restrictions about driving under the influence of alcohol, the use of surveillance cameras in the streets, the development of subways, and the control of heavy wagons, can reduce the number of road traffic crashes.<sup>6,12,25–27,30,38</sup>

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Since the implementation of programmes to reduce road traffic crashes and apply restraints in some countries, the ease of acquiring weapons and increasingly aggressive behaviour in urban centres have led to a rise in the number of assaults, and replaced road crashes as the leading cause of maxillofacial injuries.<sup>12</sup> The change in assault weapons, with fists or heavy articles being replaced by knives or other sharp weapons, may affect the number of facial injuries.<sup>25</sup> The discrepancy in assault-related facial injury may also depend on differences in social customs and alcohol intake, and some specific religious practices or social habits may limit or forbid the drinking of alcohol.<sup>20</sup> Excessive consumption is strongly associated with assaults, as it impairs judgement, encourages aggression, and often leads to interpersonal violence.<sup>9</sup> The strictness of laws governing the sale and consumption of alcohol in some countries may have effectively prevented alcohol-related injuries in some countries.<sup>9</sup>

Finally, it is important to remember that turbulent political transition in a country may generate a certain insubordination by part of the population and increase the rate of assaults.<sup>60</sup>

Social and cultural factors are crucial in sports injuries, as the popularity of contact sports such as rugby or boxing can dramatically increase the rate of sport-related maxillofacial injuries.<sup>38</sup>

The rate of accidents at work also differs from country to country and even within the same country, as specific categories of worker are at higher risk of facial injury (such as construction and forestry workers).<sup>38</sup> In these cases, enforcement of work protection legislation is fundamental.

In some countries men usually work outdoors and women are mainly confined to the house or work as teachers, nurses, and doctors, and only few of them drive cars.<sup>26,38</sup> This has resulted in an increase in the male:female ratio in several countries.<sup>26,38</sup> In countries where women participate directly in social activities and consequently are more susceptible to traffic crashes and urban violence, the ratio of men:women with maxillofacial injuries can be much lower.<sup>12</sup> The more active lifestyles, increased life expectancy, and a general increase in the number of elderly people also play a part in the increase in the age of people with such injuries.<sup>25</sup>

Thorough knowledge and understanding of the aetiology and epidemiology of facial injuries is fundamental for the development of health services, the training of maxillofacial surgeons, and the adoption of new methods of preventing injuries. The aim of this paper, therefore, was to review and discuss papers that were published during the past 30 years about the distribution and aetiology of facial injuries throughout the world.

## Material and methods

We systematically reviewed all papers that were published in English between January 1980 and December 2013 using MEDLINE and the MeSH term “facial fractures” together

with the terms “review”, “epidemiology”, and “aetiology”. Twelve papers in other languages were excluded.

Papers that presented complete data about the sex distribution and aetiology of the groups studied were identified and included. Those that gave epidemiological data only about specific groups or specific conditions (such as children, old people, and military exercises) were excluded, as well as those that recorded only specific maxillofacial trauma such as injuries to the mandible alone. Data were collected on sex distribution and aetiology, and summarised in tables according to continents.

Papers were classified according to the size of the sample, for which they were rated A (n=1000 or more), B (n=200–999), or C (n=<200), and the design, for which they were rated 1 (prospective) or 2 (retrospective).

## Results

A total of 69 studies were identified from Africa (n=9), from North America and Brazil (n=6), from Asia (n=36), from Europe (n=16), and from Oceania (n=2) (Tables 1–5).

Only 6 papers<sup>1,11,12,40,56,59</sup> were rated A1 according to our classification. The others were classified as A2 (n=18), B1 (n=4), B2 (n=29), C1 (n=5), and C2 (n=7).

In all studies men outnumbered women, the male:female ratio usually being more than 2:1.

In African studies most showed a male:female ratio of 4:1 or more (Table 1), but the trend during the last 30 years has shown a slight decrease with an adjustment towards 4/5:1. With few exceptions African studies showed that in most cases road traffic crashes have remained the most important aetiological factor, with a progressive reduction during the last 20 years. Assault was the second most common cause of maxillofacial injury in several papers, whereas falls and sport accidents were more sporadic.

In North America and Brazil (Table 2), male:female ratios were between 2:1 and 4.3:1 and tended to stabilise during the last 3 decades. Road traffic crashes were the most important cause in almost all studies and the number remained stable, followed by assaults, the incidence of which progressively increased.

Papers from Asia included most of the epidemiological studies (Table 3). Male:female ratios were extremely variable, and ranged from 2.1:1 to 20:1, but no solid trend was apparent across the last 30 years, partly because of the great social and economic differences among the countries. However, there was a predominance of road traffic crashes in nearly all studies, with percentages of over 45%–50% even during recent years. Only two studies presented assaults as the most important aetiological factor.<sup>22,29</sup> Falls remained a common cause in all countries, with percentages often higher than 20%.

In Europe the male:female ratios ranged between 1.8:1 and 6.6:1 and remained stable across the last 3 decades (Table 4).

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