Original Article - Prospective Study

Interpersonal Violence and Maxillofacial Fractures

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Abstract

Purpose: Accident Compensation Corporation statistics shows that maxillofacial fracture affects 11,000 people with an approximate $90 million annual cost in New Zealand dollars (NZD). Previous studies have demonstrated interpersonal violence (IPV), road traffic accidents (RTAs), sports injury, and falls being the common causes of maxillofacial fracture. This study investigated the causes and associated alcohol and/or drug use and fracture patterns in patients presenting with maxillofacial fractures in the Wellington region. **Subjects and Methods:** Demographic data of the patients, the cause of maxillofacial fracture and associated alcohol and/or drug use, and the fracture patterns were culled from our prospective maxillofacial fracture database at Hutt Hospital for a 5-year period from January 01, 2013, to December 31, 2017 and analyzed. **Results:** A total of 1535 patients were referred with maxillofacial fractures during the study. 38% of the maxillofacial fractures were caused by IPV, followed by sports injury (24%), falls (24%), and RTA (6%), with 33.4% associated with alcohol and/or drug use. Males were six times more likely to present with IPV-related maxillofacial fractures, compared to females. The 16–30-year age group was the most prevalent in the IPV group with NZ Maori attributing to significantly more maxillofacial fractures compared to NZ European, 54.6% vs. 32.0% ($P < 0.0001$). **Conclusions:** IPV, especially involving alcohol and/or drug use, is the most common cause of maxillofacial fractures in the Wellington region, especially in NZ Maori males aged 16–30 years. Public health strategies are needed to decrease IPV as a cause of maxillofacial fractures.

Keywords: Alcohol, facial, fractures, interpersonal violence, maxillofacial

Introduction

Accident Compensation Corporation statistics show the incidence of maxillofacial fractures and its costs have increased over the past 11 years from 2006, with an increase of 14.7% in new claims and 12.4% of total claims.[1] In 2017, the cost of maxillofacial fractures exceeded $90 million[1] – a substantial cost to the health system. Since 1979, interpersonal violence (IPV) has been the leading cause of maxillofacial trauma in New Zealand (NZ) with alcohol playing a major role.[1-5] This study investigated the causes, associated alcohol and/or drug use, fracture patterns, and management of maxillofacial fractures in the Wellington region of NZ.

Subjects and Methods

Consecutive patients referred to Hutt Hospital from January 01, 2013, to December 31, 2017, were culled from our prospective maxillofacial fracture registry, approved by the Central Health and Disability Ethics Committee (Ref. 16/CEN/173). Informed consent was obtained from the patients. Demographic data of the patients including age, gender and ethnicity, cause of maxillofacial fracture, alcohol and/or drug use, fracture patterns, and management were collated and analyzed.

Statistical analysis

The 5-year sample yielded 1535 patients but contained only three groups that were of large enough size to be compared meaningfully for the study period – NZ Europeans (834), NZ Maori (339), and Pacific people (74). Testing for significance of difference was not helpful for the first two groups due to their size, as almost all differences will be significant, and real differences would generally be self-evident. To illustrate

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Quick Response Code:

Website: www.amsjournal.com

DOI: 10.4103/ams.ams_175_19

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How to cite this article: York BS, Sent-Doux KN, Heo J, Barnett M, Marsh RW, Mackinnon CA, *et al*. Interpersonal violence and maxillofacial fractures. Ann Maxillofac Surg 2019;9:315-8.

this, testing between the ratios of IPV to total incidents for the NZ Maori and NZ European groups using χ^2 (GraphPad QuickCalcs) produces $P < 0.0001$ which is extremely significant but at 15.5% is also substantial.

Results

A total of 1535 patients aged 1–97 (mean: 35) years with 1951 maxillofacial fractures were identified. About 75.1% of the patients were male. IPV accounted for 38% of the maxillofacial fractures, followed by sports injury (24%), falls (24%), and road traffic accidents (RTAs) (6%) [Figure 1].

Demographics and causes of maxillofacial fractures

The breakdown of the age groups and fracture patterns is shown in Table 1. The mean age for NZ Europeans and NZ Maori at presentation was 38.5 (range: 12–85) years and 28.6 (range: 8–67) years, respectively. The 16–30-year age group was the most prevalent age group to sustain maxillofacial fractures caused by IPV (53.8%), sports injury (54.4%), and RTA (48.1%). Patients older than 60 years were the most prevalent age group to sustain maxillofacial fractures from falls (48.5%). IPV was responsible for 54.6% of Maori presentations in both males and females and was responsible for 32% of NZ European presentations [Table 2]. This difference reached statistical significance (χ^2, $P < 0.0001$). This showed that Maori are more likely to present with maxillofacial fractures at a younger age and from IPV, than NZ Europeans. Those older than 60 years were more likely to present with falls than other causes with 59% of maxillofacial fractures, resulting from falls occurring in patients over 60 years compared with 11% for those aged 60 or younger ($P < 0.0001$) [Table 2].

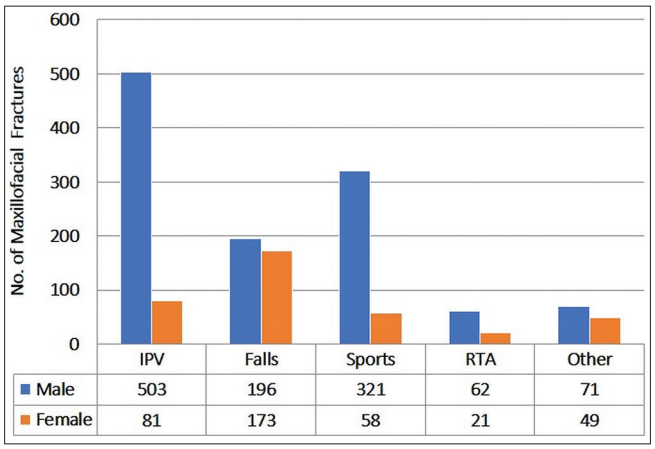

Figure 1: Gender and causes of maxillofacial fractures

Table 1: Age groups and causes of maxillofacial fractures

Age range (years)	IPV (%)	Falls	Sports	RTA	Other
<16	10 (1.7)	47 (12.7)	66 (16.6)	7 (8.4)	21 (17.5)
16-30	314 (53.8)	52 (14.1)	216 (54.4)	40 (48.1)	45 (37.5)
31-45	159 (27.2)	42 (11.4)	67 (16.9)	16 (19.2)	28 (23.3)
46-60	86 (14.7)	49 (13.3)	28 (7.1)	11 (13.3)	17 (14.2)
>60	13 (2.2)	179 (48.5)	2 (0.5)	9 (10.8)	9 (7.5)
Total	584	369	397	83	120

IPV=Interpersonal violence; RTA=Road traffic accident

Males are far more likely to sustain maxillofacial fractures from all causes except for falls where the difference is more modest [Figure 1]. Males were six times more likely to present with maxillofacial fractures resulting from IPV, five times more likely from sports injury, and 1.1 times more likely from falls, compared to females.

Ethnicity breakdown versus 2013 census

Figure 2 shows the ethnic representation of our regional population according to the 2013 census, the proportion of maxillofacial fractures affecting different ethnic groups from all causes, and those caused by IPV in our study. According to the 2013 census, NZ Maori represented 7% of our regional population. In our study, NZ Maori accounted for 22% of maxillofacial fractures from all causes and 31% of IPV-related maxillofacial fractures [Table 2]. This shows a greater than four-fold overrepresentation of NZ Maori in IPV. Pacific people were approximately two-fold overrepresented in our cohort than would have been expected from the census data. NZ European population was majorly underrepresented.

Alcohol and/or drug use

Alcohol, drugs, or both contributed to 37.3%, 14.6%, and 13.6% of maxillofacial fractures resulting from IPV, RTA, and falls, respectively. IPV-related maxillofacial fractures involving alcohol, drugs, and both affected ethnicities differentially. Of the total, IPV cohort affected by alcohol, drugs, or both were involved in 46.8%, 35.8%, and 9.2% of NZ Europeans, NZ Maori, and Pacific people, respectively. Alcohol alone was associated with maxillofacial fractures in 46.7%, 35.8%, and 9.2% in NZ European, NZ Maori, and Pacific people, respectively.

Table 2: Ethnicities and causes of maxillofacial fractures

Ethnicity	IPV (%)	Falls (%)	Sports (%)	RTA (%)	Other (%)	Total (%)
NZ European	275 (47.1)	264 (71.5)	222 (55.9)	52 (62.7)	84 (70.0)	897 (59.2)
NZ Maori	185 (31.7)	54 (14.6)	68 (17.1)	15 (18.1)	17 (14.2)	339 (22.4)
Pacific people	48 (8.2)	11 (3.0)	49 (12.3)	4 (4.8)	6 (0.1)	118 (7.8)
Asian	24 (4.1)	14 (3.8)	21 (5.3)	4 (4.8)	8 (6.7)	71 (4.7)
Other	31 (5.3)	26 (7.1)	19 (4.8)	8 (9.6)	5 (4.2)	89 (5.9)

IPV=Interpersonal violence; RTA=Road traffic accident; NZ=New Zealand

In males aged 16–30 years, alcohol, drugs, or both attributed to 50.6% of maxillofacial fractures resulting from IPV. Alcohol and/or drugs played a very small role in injuries occurring during sports (0.003%).

Causes, fracture patterns, and management

IPV contributed to the majority of maxillofacial fractures in our population and was the most common cause for all fracture patterns. Orbital fractures were the most common fracture pattern from IPV [Table 3]. More than half of the maxillofacial fractures resulting from IPV (56.6%), sports injury (57.9%), and other causes (58.9%) were managed operatively [Table 4]. Within the sports injury group, these were mainly manipulations as nasal fractures that represented 38.3% of all fractures [Table 3]. About 67.8% of the maxillofacial fractures resulting from falls were managed conservatively.

Analysis of New Zealand published data

There have been a number of NZ studies[2-5] on maxillofacial fractures and its causes dating to 1979. Over the past 40 years, maxillofacial fractures caused by RTA have dramatically decreased, to 6% in the past 5 years as demonstrated in our study, while IPV-related injuries have remained at 34%–55% [Table 5]. The ratio of IPV-related to RTA-related maxillofacial fractures over the past 5 years is 6:1, compared to 2:1, 20 years ago.[2] The contributions from falls and sports-related injuries have also relatively increased which could reflect the increasing number of computed tomography scans being performed in the emergency department.[6]

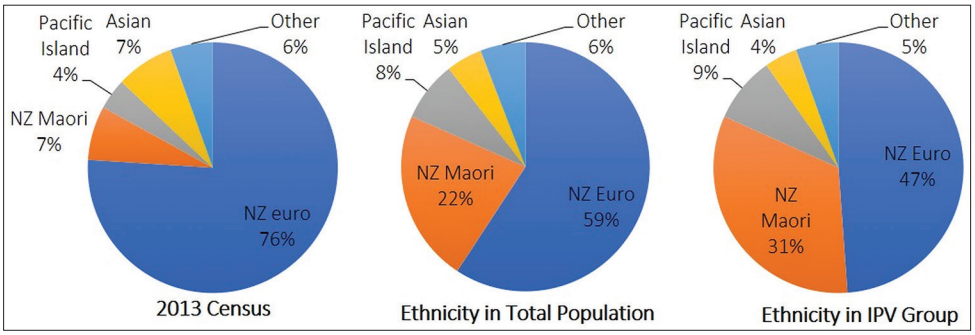

Figure 2: Ethnicities in 2013 census versus maxillofacial fractures in total population versus maxillofacial fractures in the interpersonal violence group

Table 3: Causes and fracture patterns

Causes	Fracture patterns					
	Orbital (%)	Maxillary (%)	Nasal (%)	Mandibular (%)	Cranial/skull base (%)	Total
IPV	215 (28.2)	179 (23.5)	176 (23.1)	168 (22.0)	24 (3.1)	762
Sports	110 (24.8)	92 (20.7)	170 (38.3)	58 (13.1)	14 (3.2)	444
Falls	120 (25.9)	112 (24.1)	158 (34.1)	44 (9.5)	30 (6.5)	464
RTA	38 (31.7)	29 (23.6)	29 (23.6)	12 (9.8)	15 (12.2)	123
Other	36 (22.9)	33 (21.0)	68 (43.3)	10 (6.4)	10 (6.4)	157

IPV=Interpersonal violence; RTA=Road traffic accident

Table 4: Management and etiology of maxillofacial fractures

Management	IPV (%)	Falls (%)	Sports (%)	RTA (%)	Other (%)
Conservative	331 (43.4)	312 (67.8)	187 (42.1)	71 (59.7)	66 (42.0)
Operative	431 (56.6)	148 (32.2)	257 (57.9)	48 (40.3)	91 (58.0)
Total	762	460	444	119	157

IPV=Interpersonal violence; RTA=Road traffic accident

Table 5: New Zealand publications on causes of maxillofacial fracture over the past 40 years

Publications	Populations	Period	Number of patients	IPV (%)	RTA (%)	Falls (%)	Sports (%)
Kieser *et al*.	NZ	1979-1998	27732	34.1	17.1	-	-
Lee *et al*.	Christchurch	1996-2006	2581	44.0	11.0	14.0	19.0
Moore *et al*.	Waikato	2004-2013	1975	54.5	14.5	11.6	11.9
York *et al*.	Wellington	2013-2018	1535	38.0	6.0	24.0	24.0

IPV=Interpersonal violence; RTA=Road traffic accident; NZ=New Zealand

Discussion

Analysis of data from our maxillofacial fracture registry for the Wellington region of NZ for the period 2013–2017 demonstrated IPV as the leading cause of maxillofacial fractures contributing 38% of all cases, 33.4% of which were associated with alcohol and/or drugs. Falls has emerged to be the major cause of maxillofacial fractures affecting those aged 60 years and over.

IPV has remained the leading cause of maxillofacial fractures in NZ for over the past 40 years with no effective intervention being implemented. RTA has dramatically decreased as a major cause of maxillofacial fractures over this period, reflecting the success of the implementation of public health campaigns and changes in legislation. Urgent measures are needed to address IPV.

The incidence of maxillofacial fracture is disproportionally higher in certain ethnic groups, especially in the context of IPV and alcohol and/or drug use. The situation is likely to be worse, as reporting the cause and alcohol and/or drug use in this study was voluntary. Comparison of our data with the 2013 census, Maori and Pacific populations are overrepresented in maxillofacial fractures, especially those caused by IPV, compared to NZ Europeans.

Our data also show that males aged 16–30 years in NZ contribute to over 50% of the IPV-related maxillofacial fractures, over 50% of which involved alcohol and/or drug use. NZ Maori suffering from maxillofacial fractures had a much lower mean age and are significantly more likely to be caused by IPV, when compared to NZ Europeans.

Orbital fractures were the most common fracture pattern from IPV. Operative management was needed in over 50% of the maxillofacial fractures resulting from IPV mostly mandibular and orbital fractures. Operative intervention was administered to 57.9% of maxillofacial fractures caused by sports injuries with a large proportion being manipulation of nasal fractures. Conversely, 67.8% of the maxillofacial fractures caused by falls were managed conservatively, mainly because of less severe displacement of the fractures and the presence of medical comorbidities in this cohort.

Concerted public health campaigns along with legislative changes over the past 40 years have decreased the incidence of RTA in NZ[7] which has resulted in a dramatic reduction of RTA-related maxillofacial fractures,[4,5] contributing to only 6% in our study. This underscores the effectiveness of concerted large-scale public health campaigns in concert with legislative changes to reduce the incidence of injuries. A similar campaign is urgently needed to deal with IPV as a leading cause of maxillofacial fractures that has significant personal, social, and economic implications.

Currently in NZ, campaigns against violence are mainly directed toward domestic violence targeting violence against women such as "White Ribbon Day" and "It's Not OK." Our data included injuries resulting mainly from street violence and demonstrate that the most affected group are NZ Maori aged 16–30 years. This emphasizes a need for a more targeted campaign toward this demographic group.

Conclusions

IPV has remained the leading cause of maxillofacial fracture in NZ over the past 40 years, while RTA now only contributes to 6%. Maxillofacial fracture caused by IPV is highly statistically significantly more prevalent in the 16–30-year age group and is disproportionally overrepresented by NZ Maori, and to a lesser extent, by Pacific population. Urgent concerted public health campaigns are needed to prevent this costly and unnecessary harm on NZ society.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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