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# Journal Pre-proof

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PII: S0266-4356(20)30515-5

DOI: <https://doi.org/10.1016/j.bjoms.2020.09.006>

Reference: YBJOM 6279

To appear in: *British Journal of Oral & Maxillofacial Surgery*

Accepted Date: 4 September 2020

Please cite this article as: { doi: <https://doi.org/>

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# COVID-19 Social distancing measures altered the epidemiology of facial injury - A UK-Australia comparative study

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## Abstract

The purpose of this study was to undertake a retrospective cross-sectional analysis that compared the frequency and characteristics of facial injury presentations at a UK and an Australian tertiary referral hospital during COVID-19 social distancing.

The primary predictor variables were a heterogeneous set of factors grouped into logical categories: demographics, injury mechanisms and site, and management. The primary outcome variable was the presentation of a hard or soft tissue facial injury. A descriptive statistical analysis was undertaken on the assembled data.

The study found a clinical and statistically significant reduction in the frequency (absolute numbers) and prevalence (number per 1000 population) of facial injuries at each study site. In addition, the striking similarity common in both countries was an increase in facial injury due to falls and a decrease in facial injury due to interpersonal violence. Conservative (non-operative) management of facial injury increased at both sites. The implementation of COVID-19 social distancing public health measures, aimed at limiting the community transmission of coronavirus, had a secondary serendipitous effect in reducing the frequency of facial injury presentations and altering its epidemiological characteristics at both a UK and Australian tertiary referral hospital.

**Keywords:** COVID-19, social distancing, epidemiology, facial injury, public health

## INTRODUCTION

There are substantive epidemiological similarities in the circumstances that surround the presentation of facial trauma in the United Kingdom and Australia<sup>1</sup>.

It is widely acknowledged that such injuries typically present in young adult males, and are most often associated with occasions of interpersonal violence (especially in the context of substance abuse) as well as incidents of motor vehicle, sport and workplace misadventure<sup>1</sup>.

A number of public health approaches have been adopted to either prevent or reduce the incidence of injury or mitigate its severity<sup>2</sup>.

Many studies have investigated the role that legislation can play in this regard and, in particular, the resultant beneficial behavioural change that can occur in injury susceptible and specific groups.

Of significance to us was that the implementation of COVID-19 pandemic social distancing laws (primarily to reduce the effective rate of virus transmission within the community) seemingly had a secondary, serendipitous public health effect, by altering the frequency and characteristics of facial injury.

### **COVID-19 Synopsis**

A novel coronavirus (SARS-COV-2) was the pathogenic agent that was identified as being responsible for the December 2019 outbreak of a highly infectious and virulent pneumonia in Wuhan City, China. On March 12<sup>th</sup> 2020, the nominal disease (COVID-19) was declared a pandemic by the World Health Organization (WHO)<sup>3</sup>.

In response to a rapidly rising COVID-19 morbidity and mortality, multiple national governments imposed a range of community public health measures to reduce the effective rate of community viral transmission.

### **Australian Response**

On the 15<sup>th</sup> March 2020, the Prime Minister of Australia introduced a series of legislative changes in order to reduce community virus transmission and in turn, “flatten the curve (reduction in the rate of infection)”.

In addition to international border surveillance, health checks and quarantine, a range of additional measures were progressively introduced in a staged manner as follows<sup>4</sup>:

Stage 1: March 16<sup>th</sup> – social distancing and numerical limitations of attendance at public gatherings

Stage 2: March 22<sup>nd</sup> – discontinuation of all non-essential gatherings

Stage 3: March 30<sup>th</sup> – home isolation – “stay at home”

### **United Kingdom Response**

On the 3<sup>rd</sup> March 2020, the Prime Minister of the United Kingdom announced his nations’ “coronavirus action plan”<sup>5</sup>.

This was a four pronged approach to “contain, delay, research and mitigate” the impact that the virus had on the welfare of the nation. The overriding priority was to “keep the country safe” and the overarching catch cry was “to wash your hands”.

As the pandemic was declared, subsequent statements were released by the Prime Minister on the 12<sup>th</sup>, 16<sup>th</sup> and 23<sup>rd</sup> March<sup>5</sup>. Symptomatic residents were to critically self isolate for seven days, which was subsequently extended to fourteen days.

On March 16<sup>th</sup> decreed a ban on all mass gatherings which included the cessation of a range of non-essential contact activities (travel, work, social, sport, ceremonial and religious) and which, by March 23<sup>rd</sup>, also decreed that everyone should “stay at home”.

### **Devolution of Restrictions**

These restrictions effectively remained in place in each country for an eight week period (16<sup>th</sup> March to 11<sup>th</sup> May), though perhaps slightly extended (by approximately one week) in the United Kingdom. At that time, in Australia, the national cabinet convened on the 8<sup>th</sup>, 15<sup>th</sup> and 29<sup>th</sup> of May to discuss the nation's response to COVID-19.

This was to outline, enact and monitor (as a national surveillance plan) a three step program to devolve social distancing in order to facilitate a return of the nation to its pre-COVID socio-economic level of activity<sup>6</sup>.

On the 22<sup>nd</sup> May the UK government announced its initial plan to rebuild the country in the form of a recovery strategy as a road map for lifting restrictions<sup>7</sup>.

In discussions between the senior authors (GRH, GMW), it became apparent that the respective tertiary referral maxillofacial departments located in each city (Newcastle, AU and Coventry, UK) noted similar changes in the epidemiology of facial injury.

The purpose of our study was to undertake a cross sectional analysis at two comparable hospitals (UK and Australia) during the COVID-19 social distancing, 16<sup>th</sup> March - 11<sup>th</sup> May. The hypothesis of the study was that social distancing caused a difference in the frequency and characteristics of facial injury at both sites.

## **MATERIALS AND METHODS**

### **Study design, sample and setting**

To address the research purpose, the authors designed and implemented a retrospective cross sectional, comparative study (conducted over an eight week period in 2019 and 2020, commencing on 16<sup>th</sup> March and ending on the 11<sup>th</sup> May at two comparable sites) of the clinical records of a cohort of patients who sustained a facial injury.

The study population was derived from facial injured patients who were assessed or managed by the Department of Maxillofacial Surgery at each study site.

Exclusion criteria were applied to patients who had insufficient clinical data to fulfil that which was required for the study.

Local Health district population numbers were comparable at each site for the study years 2019 and 2020 and were used to calculate prevalence (n=950 000). Each study site acts as a hub and spoke tertiary referral surgical service. The population demographics are comparable at each site and reveal equal gender representation as well as ethno-religious, language, employment and student mix.

### **Variables**

The primary predictor variables that were selected for the study compromised a heterogenous set of factors grouped into logical categories: demographic (age, gender, week), injury specific (mechanism and site) and treatment characteristics (management, complications, discharge).

The primary outcome variable was the sustaining of a hard or soft tissue facial injury.

### **Data Collection**

The relevant data that was required to undertake the study was retrieved from the respective unit log books and cross checked against the hospital's digital medical record system (DMR)..

### **Censorship**

Censorship was within a matched eight week period in each study year at each study site.

### **Statistical Methods**

Descriptive statistics were presented as count percentages and compared between 2019 and 2020 using the Pearson Chi-squared test (or Fisher's exact test if small cell counts). The change in count of

admissions per week over the eight week period for 2019-2020 were analysed using the Poisson regression (count outcome), modelling included week (continuous), year and the interaction term. Estimates presented include the estimated change per week for each year with 95% confidence interval (CI), and the incidence rate ratio (IRR) for 2020 and 2019 with 95% CI and p-value. Statistical analyses were programmed using Statistical Product and Service Solutions (SPSS) v. 20, International Business Machines (IBM). A  $p < 0.05$  (two tailed test) was used to indicate statistical significance.

### **Ethics**

The study was designated as a retrospective review of patient records and was therefore granted an exemption in writing by the local institutional review board (IRB) authorised as negligible risk (AU: 20205-07). The authors adhered to the privacy and confidentiality of all clinical information as espoused by the World Medical Associations (WMA) Declaration of Helsinki.

### **RESULTS**

In Australia, in the 2020 eight week COVID period of study (matched to a comparable 2019 eight week non COVID period), the absolute number of facial injury presentations decreased from 103 to 73 (decreased prevalence of 30%). The UK comparative was numerically more substantial, decreasing from 149 to 37 (decreased prevalence of 72.5%).

Clinically meaningful demographic trends occurred at both sites. In general, injury presentations in 11-30 year olds decreased while those in the 71-90 year olds increased. In Australia, female injury presentations increased as a proportion by 11% , while in the UK female injury presentations also increased as a proportion, but by 6%.

There were strikingly similar changes to the mechanism of injury recorded. In both countries, there was an increased presentation in facial injuries that resulted from falls: 17% in Australia and 24% in the UK. There was a concomitant decrease in presentation of facial injuries due to instances of interpersonal violence as noted at both sites (12% in Australia and 23% in UK), with smaller reductions in the presentations of injury resulting from motor vehicle accidents and sporting injuries across both sites.



The presentation of mandibular fractures increased in Australia while the presentation of dentoalveolar fractures increased in the UK. The UK had a marked reduction in the presentation of isolated soft tissue trauma (n = 88 to n = 6).

Not unexpectedly, conservative non operative management of trauma in the COVID-19 period increased at each site (10% in Australia and 22% in UK) with concomitant decreases in operative management respectively noted at each study site. (Table 1, 2, 3)

## **DISCUSSION**

COVID-19 social distancing measures were introduced on a global basis to reduce the rate of infection and spread of the coronavirus through populations. However, these arguably draconian measures serendipitously were seen to have had a secondary effect in changing the frequency and characteristics of facial injury.

The results of an unpublished study (Wang, May 2020) that was conducted over the same eight week periods revealed a 30% decrease in the prevalence when comparing facial injury presentation in 2019 with 2020.

In addition, an increased proportion of injuries sustained from falls and a decrease proportion from interpersonal violence (with smaller, but none the less demonstrable reductions in motor vehicle, sports and work accidents).

This current study was to extend the application of the earlier study to compare facial injury presentation to two maxillofacial units (one United Kingdom/one Australia), which have known demographic and epidemiological similarities.

We noted with almost immediate effect a change in the frequency, demographics and aetiology of facial injury presumably as a direct result of the social distancing, and perhaps as an indirect result of the healthcare seeking culture of the population as a whole.

The association between facial trauma and alcohol related interpersonal violence (IPV) has been well established in the literature with early lockouts and strict liquor licensing laws leading to a decrease in facial trauma presentations. Not surprisingly, the closure of licenced pubs, clubs, bars and hotels during the COVID social distancing period similarly reduced the sale and consumption of alcohol, which we believe directly lead to a reduction in IPV<sup>8,9,10</sup>.

The prevalence of falls increased in both Australia and the UK during the COVID-19 social distancing period. We believe the cause of this increase is multifactorial. Falls can be defined as either medical or mechanical in nature. There was an impetus in rationalisation of medical services during the COVID-19 period with a conversion of traditional face-face consultations to telehealth. There also seemed to be a reluctance of medical attendance within the elderly age groups due to their being considered high risk patients for transmission of coronavirus during community engagements or activity. This may have lead to an increase in medical falls due to lack of timely medical reviews, as well as a proportion of home bound mechanical falls. In addition, there were increases in the presentation of mechanical falls seen at home in young adults. This may have been due to increases in home do-it-yourself enterprises during isolation. Presumably the cancellation of competitive sporting activities likely lead to a reduction in sporting injuries (4% reduction in Australia, 8.7% in UK).

There were some concerns held that episodes of domestic violence may have been affected by COVID-19 social distancing. The NSW Bureau of Crime, Statistics and Research (BOCSAR), released a report that concluded that episodes of domestic violence did not change in either March or April 2020 when compared to the same time period in 2019. This was in spite of a considerable proportion of the community being house-bound combined with the stressors of social isolation and financial hardship. The apparent low numbers of domestic violence could be explained by an inability or unwillingness of victims to contemporaneously report occasions of such violence or that the perpetrated violence did not reach a threshold of serious enough physical injury that warranted a hospital attendance. The Australian team only identified three episodes of domestic violence in the 8 week study while the UK team recorded zero episodes.

The delivery of general anaesthesia and the undertaking of some specific surgeries (e.g. Oral and Maxillofacial surgery, Otolaryngology, Upper Gastrointestinal surgery, Procedural Gastroenterology, Dentistry) put those clinicians at high risk for coronavirus droplet exposure or aerosolization. This lead to significant changes in the delivery of those surgical services and when combined with an effective rationing of operating time and resources (to maximise the ability to treat a potential avalanche of COVID positive patients while conserving personal protective equipment), perhaps lead clinicians to be more circumspect about committing patients to operative management of their facial injuries. Our study identified a 10% (Australia) and 22% (UK) increase in conservative (non-operative) case management.

There has been little published in relation to the impact that COVID-19 had on the epidemiology of facial injury.

The first published facial trauma study to emerge during COVID-19 was authored by Guo et al<sup>13</sup> from China. They analysed 25 emergency attendances from 23<sup>rd</sup> January and 20<sup>th</sup> February. The study identified 11 cases of soft tissue contusion/laceration and 10 cases of mandibular fracture. There were n=12 children (48%) and n=15 females (60%) in the cohort under investigation and falls were the predominant cause of injury.

Barca et al<sup>14</sup> undertook a study 29<sup>th</sup> February – 16<sup>th</sup> April, presumably as the rate of COVID-19 community infection began to rise in Italy. Their study of 20 patients identified domestic accidents as the main cause of trauma. However, such conclusions are limited by the smaller number (n=20) of patients under investigation.

Blackall and co-workers<sup>15</sup> conducted a collaborative study from 26<sup>th</sup> March – 7<sup>th</sup> May. The majority of their 225 trauma presentations were sustained in the home. The mechanism of injury for 158 (70%) of injuries was as a result of a slip, trip or fall. The study also identified 17 cases of domestic violence, 11 animal bites and 3 instances of self-harm, which were all rationalised on the basis of the

social and financial stressors that resulted from social distancing, or for example the greater periods of time being housebound with family pets.

There was no comparative data presented in their study to make any statistically valid conclusions, in addition the study started and concluded midweek). Unfortunately it was evident that on numbers alone that COVID-19 imposed home isolation was reflective of a greater proportion of facial injuries that occurred in the home.

The strength of our study was the readily comparable trauma populations, matched time spans and similar legislative restrictions at each site.

The weakness of the study was an eight week “snap-shot” period of time (it is noted that this time also included lag times for onset and offset). However, the study in effect could only be conducted for eight weeks, as social distancing restrictions began to be lifted by the respective national governments. Interestingly this might see a return to pre-COVID trends, and, as such, we will continue the study.

In conclusion, this study has shown by investigating two comparable international sites that the implementation of COVID-19 social distancing measures changed the frequency and characteristics of facial injury. This was a serendipitous, secondary outcome, to its intended reason.

In addition, the study serves to reinforce the role that the impost of public health measures has in promoting behavioural change which can reduce the incidence of facial injury.

Authors agreement: all authors contributed to the study and agreed to its submission

#### **Ethics Statement/confirmation of patient permission**

This study was granted an exemption in writing by the local institutional review board. Patient permission not required.

Ethical approval: IRB: AU: 20205-07.

#### **Conflict of Interest**

None

Conflict of interest:           there were no financial or personal relationships to disclose

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**Table 1:** Comparison of Demographics, Injury type, Mechanisms and Management

		Australia			UK		
		2019	2020		2019	2020	
Characteristic		(n=103)	(n=73)	P-value*	(n=149)	(n=37)	P-value*
Age	0-10	10 (9.7%)	8 (11%)	0.4039	8 (5.4%)	10 (27%)	0.002
	11-20	17 (17%)	8 (11%)		18 (12%)	1 (2.7%)	
	21-30	27 (26%)	13 (18%)		26 (17%)	7 (19%)	
	31-40	10 (9.7%)	11 (15%)		34 (23%)	5 (14%)	
	41-50	11 (11%)	8 (11%)		14 (9.4%)	3 (8.1%)	
	51-60	12 (12%)	6 (8.2%)		23 (15%)	3 (8.1%)	
	61-70	7 (6.8%)	5 (6.8%)		13 (8.7%)	1 (2.7%)	
	71-80	4 (3.9%)	9 (12%)		7 (4.7%)	3 (8.1%)	
	81-90	5 (4.9%)	4 (5.5%)		4 (2.7%)	4 (11%)	
	91-100	0	1 (1.4%)		2 (1.3%)	0	
Gender	Male	84 (82%)	52 (71%)	0.1075	45 (30%)	9 (24%)	0.481
	Female	19 (18%)	21 (29%)		104 (70%)	28 (76%)	
Mechanism	Animal injuries	6 (5.8%)	4 (5.5%)	0.1099	6 (4.0%)	2 (5.4%)	0.006
	Domestic Violence	0	3 (4.1%)		0	0	
	Falls	22 (21%)	28 (38%)		44 (30%)	20 (54%)	
	Interpersonal violence	39 (38%)	19 (26%)		67 (45%)	8 (22%)	
	MVA	11 (11%)	6 (8.2%)		8 (5.4%)	1 (2.7%)	
	Sports	19 (18%)	10 (14%)		13 (8.7%)	0	
	Work	3 (2.9%)	1 (1.4%)		0	0	
	Unknown/Other	3 (2.9%)	2 (2.7%)		11 (7.4%)	5 (14%)	



Injury	Isolated Maxillofacial	54 (52%)	43 (60%)	0.6236	49 (33%)	16 (43%)	0.005
	Bony injury						
	Isolated Soft tissue	26 (25%)	16 (22%)		88 (59%)	6 (16%)	
	Polytrauma	23 (22%)	13 (18%)		5 (3.4%)	15 (41%)	
	Unknown	0	0		7 (4.7%)	0	
Type of bony injury	Dentoalveolar	1 (1.0%)	0	0.1186	0	5 (14%)	0.001
	Frontal bone	4 (3.9%)	4 (5.5%)		0	0	
	Mandible	7 (6.8%)	11 (15%)		28 (19%)	6 (16%)	
	Maxilla/Midface	0	3 (4.1%)		1 (0.7%)	0	
	Nasal bone/ NOE	11 (11%)	4 (5.5%)		0	0	
	Orbit	15 (15%)	14 (19%)		14 (9.4%)	3 (8.1%)	
	Pan-facial	13 (13%)	9 (12%)		2 (1.3%)	2 (5.4%)	
	Zygomatic-maxillary	22 (21%)	8 (11%)		7 (4.7%)	5 (14%)	
	Complex						
	N/A	30 (29%)	20 (27%)		97 (65%)	16 (43%)	
Management	Non-operative	47 (46%)	41 (56%)	0.1685	24 (16%)	14 (38%)	0.009
	Operative	56 (54%)	32 (44%)		120 (80%)	23 (62%)	
	Unknown	0	0		5 (3.4%)	0	

\* Significance set at  $p < 0.05$

**Table 2:** Admissions and Prevalence (per 1000 persons) by site and year

	Australia				UK			
	2019		2020		2019		2020	
Week	Admissions	Prevalence per 1000	Admissions	Prevalence per 1000	Admissions	Prevalence per 1000	Admissions	Prevalence per 1000

		1000		1000		1000		1000	
		Persons		Persons		Persons		Persons	
1	5	0.0053	14	0.0147	25	0.0263	8	0.0084	
2	15	0.0159	10	0.0105	27	0.0284	5	0.0053	
3	7	0.0074	9	0.0094	20	0.0211	5	0.0053	
4	10	0.0106	6	0.0063	13	0.0137	2	0.0021	
5	19	0.0202	7	0.0073	13	0.0137	5	0.0053	
6	14	0.0149	13	0.0136	20	0.0211	4	0.0042	
7	13	0.0138	6	0.0063	11	0.0116	5	0.0053	
8	20	0.0212	8	0.0084	20	0.0211	3	0.0032	
<b>Tota</b>	103	0.1093	73	0.0766	149	0.1568	37	0.0389	

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**Table 3:** Comparison of Prevalence between 2019 and 2020

		<i>Incidence Rate Ratio 2020 vs 2019</i>		<i>p-value</i>
Australia		0.70 (0.52, 0.95)		0.020
UK		0.25 (0.17, 0.36)		0.000