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Relation between facial fractures and socioeconomic deprivation in the north east of England

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Abstract

Patients with a low socioeconomic status suffer disproportionately from trauma, and have a high incidence of mandibular fractures. To explore how deprivation affects the incidence of facial fractures in the north east of England, we reviewed 1096 patients who were admitted to the oral and maxillofacial surgical (OMFS) unit at Sunderland Royal Hospital for treatment of a facial fracture between December 2013 and December 2017. Levels of socioeconomic deprivation, which were obtained from postcodes and the UK Government Open Data Communities database, were compared with a random sample of deprivation data from the catchment area of our hospital. Patients with nasal and mandibular fractures were more likely to be socioeconomically deprived than those in the catchment area of our hospital ($p = 0.006$ and $p < 0.001$, respectively), but this was not the case in those with malar/maxillary or orbital floor fractures ($p = 0.184$ and $p = 0.641$, respectively). The incidence of fractures that were caused by assault was not associated with increased socioeconomic deprivation ($p = 0.241$). Patients of low socioeconomic status were more likely to have been under the influence of a substance when the injury occurred ($p = 0.014$). There is a strong association between socioeconomic deprivation and facial fractures. OMFS departments should therefore be as accessible as possible to patients from more disadvantaged backgrounds, given their greater risk of injury.

Keywords: Facial fracture; Maxillofacial trauma; Socioeconomic status; Deprivation; Substance abuse

Introduction

Socioeconomic deprivation is associated with many chronic diseases such as type 2 diabetes, heart disease, and chronic obstructive pulmonary disease (COPD),[1–3] and has a strong association with trauma.[3,4] In a study to identify a relation between social deprivation and mandibular fractures in Bristol, data on neighbourhood socioeconomic deprivation from Open Data (the official source for statistics and data from the UK Government Ministry of Housing, Communities & Local Government)[5] showed that patients with a more deprived background had a higher incidence of mandibular fractures.[6]

To implement effective preventative measures, the epidemiology of facial fractures must be studied and understood.[7] Assault, which is the most common cause of facial trauma, has been identified in several major urban centres,[8–10] and is often associated with factors such as drug and alcohol abuse.[11,12] Alcohol contributes considerably to maxillofacial trauma, and patients in deprived neighbourhoods are more likely to drink to excess than those in less deprived areas.[11,13] Victims of assault are more likely to be unemployed and also to come from more socioeconomically deprived neighbourhoods.[14]

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The aim of this study was to identify the socioeconomic status of the patients who presented to the department of oral and maxillofacial surgery (OMFS) with facial fractures. We could then work out whether the cause of the fracture and the incidence of substance abuse were influenced by the degree of socioeconomic deprivation. To our knowledge, this is the first paper to report the relation between socioeconomic deprivation and mandibular, nasal, orbital floor, and malar/maxillary fractures.

Table 1
Patients' details.

Fracture	Mean (range) age (years)	Total No.	Men	Women
All facial fractures	34 (2–93)	974	761	213
Mandibular	31 (4–88)	414	362	52
Nasal	31 (2–93)	307	202	105
Malar/maxillary	44 (3–91)	174	141	33
Orbital floor	46 (3–93)	79	56	23

Method

All the patients included in this study were referred to the OMFS department for treatment of a facial fracture between December 2013 and December 2017. Information regarding demographics, injuries sustained, aetiology, and whether the patient was under the influence of alcohol or illicit substances at the time of injury, was obtained retrospectively from electronic medical records and discharge summaries from the accident and emergency (A&E) department. Facial fractures were broadly grouped into four categories: nasal, mandibular, orbital floor, and malar/maxillary. To assign patients definitively to a group, and to avoid them being registered in more than one, those with multiple facial fractures were excluded, as were those who lived in an area that was not served by the OMFS department.

This retrospective study was registered with, and approved by, the clinical governance team at our hospital. All data were handled according to Caldicott principles.

Information about levels of socioeconomic deprivation were obtained from the English Indices of Multiple Deprivation 2015 database using patients' postcodes. The index is based on seven domains of deprivation: income; employment; education, skills, and training; health and disability; crime; barriers to housing and services; and living environment. Deprivation is a measure of the material deprivation of areas across England that include approximately 1500 residents. Each area is ranked from the most (1) to the least deprived (32 844), and these are sorted into deciles from the most (1) to the least deprived (10).

The control groups were compiled from a random selection of the postcodes served by our OMFS department. We entered them into the English Indices of Multiple Deprivation 2015 database to obtain four lists of deprivation deciles, each representing the overall level of deprivation of the catchment area, with sample sizes equivalent to those of each fracture group. These lists allowed us to compare the socioeconomic status of the patients with the deprivation deciles of the area served by our hospital.

Statistical analysis was done with the help of IBM SPSS Statistics for Windows version 24 (IBM Corp). We used descriptive statistics and Pearson's chi squared test to assess the significance of differences between groups. Probabilities of less than 0.05 were deemed significant.

Results

In total, 1096 cases of facial fracture were referred to our OMFS department between December 2013 and December 2017. Of these, 88 patients had more than one, 21 had none, and 13 lived outside of the area served by the department. We therefore had a total population of 974 patients (761 (78%) male and 213 (23%) female, mean (range) age at admission 34 (2–93) years). Their details are shown in Table 1.

In both the facial fracture group and the control group, the highest number of patients lived in the most socioeconomi-

Table 2
Incidence of facial fractures by decile of socioeconomic deprivation. A control group of equal size was created for each category by random sampling from all the postcodes (and their associated deprivation data) served by our OMFS department.

Groups	Deprivation decile										Total
	1	2	3	4	5	6	7	8	9	10	
All facial fractures	255	198	133	107	87	44	57	42	32	19	974
Control	195	133	143	93	82	59	64	75	91	39	974
Mandible	115	83	67	44	38	19	17	16	10	5	414
Control	83	56	61	40	35	25	27	31	39	17	414
Nasal	75	73	30	33	26	11	20	19	14	6	307
Control	61	42	45	29	26	19	20	24	29	12	307
Malar/maxillary	48	28	24	18	15	9	16	4	7	5	174
Control	34	24	26	17	15	11	11	13	16	7	174
Orbital floor	17	14	12	12	8	5	4	3	1	3	79
Control	15	11	12	8	7	5	5	6	7	3	79

Table 3
Fracture aetiology by socioeconomic deprivation.

Aetiology	Deprivation decile										Total
	1	2	3	4	5	6	7	8	9	10	
Interpersonal violence	133	99	68	49	45	20	23	11	13	4	465
Fall	54	34	32	27	15	11	13	11	4	4	205
Sport	15	16	6	8	9	3	7	7	5	3	79
Other	9	10	4	0	3	1	1	0	2	0	30
No interpersonal violence	78	60	42	35	27	15	21	18	11	7	314
Total	211	159	110	84	72	35	44	29	24	11	779

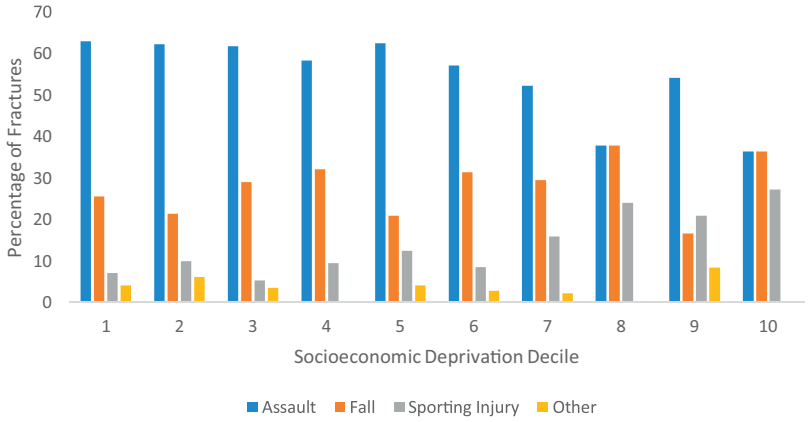

Fig. 1. Causes of facial fracture in each decile as a percentage of the total fractures/decile.

cally deprived decile (decile 1) (26% and 20%, respectively) (Table 2). Across the study population, most patients with facial fractures (80%) lived in deciles one to five. Mandibular fractures were the most common (43%), followed by nasal (32%), malar/maxillary (18%), and finally, orbital floor fractures (8%) (Table 1).

Socioeconomic deprivation and incidence of fracture (Table 2)

Overall, compared with the control group, patients with facial fractures were significantly more deprived ($p < 0.001$). Those with mandibular and nasal fractures were also significantly more deprived than their control groups ($p < 0.001$ and $p = 0.006$, respectively). Differences, however, were not significant between the controls and those with malar/maxillary, and orbital floor fractures ($p = 0.184$ and $p = 0.641$, respectively).

Socioeconomic deprivation and fracture aetiology

Of the study population, 779 patients had information regarding the cause of the fracture and substance misuse. Causes were broadly classified as interpersonal violence, falls, sport, and other. Interpersonal violence was the most common cause (60%), followed by falls (26%), sport (10%), and finally, other (4%) (Table 3).

Across the different socioeconomic deciles (Table 3, Fig. 1), interpersonal violence was the most common cause in all but deciles eight and ten, in which it equalled that of falls. The general trend also seemed to suggest that fractures sustained during sporting activities were more common in less socioeconomically deprived patients. Despite the high number of fractures caused by interpersonal violence in those from more socioeconomically deprived areas, there was no significant association between interpersonal violence and socioeconomic deprivation ($p = 0.241$) (Table 3).

Socioeconomic deprivation and substance abuse

Of the 779 patients with information regarding substances involved, 374 (48%) were under the influence of a substance when they were injured, the most common being alcohol, which was recorded in 348 incidents (93%). Abuse of multiple substances was recorded in 19 patients (5%) and these mixtures varied from cannabis and alcohol to cocktails of cocaine, diazepam, and heroin. Other substances ingested included methadone, amphetamines, lysergic acid diethylamide (LSD), MDMA (ecstasy), and solvents.

Patients with mandibular fractures were more likely to have been under the influence of a substance at the time of fracture (60%), but the rates of substance abuse were reported at lower levels across those with nasal (37%), orbital floor (35%), and malar/maxillary (36%) fractures (Table 4).

Substance abuse was much less prevalent in those from higher socioeconomic deciles (Table 5). There was a significant association between socioeconomic deprivation and substance misuse at the time of injury ($p = 0.014$).

Table 4
Fractures associated with substance abuse.

Type of fracture	Substance involved		Total
	Yes	No	
All facial fractures	374	405	779
Mandible	231	155	386
Nasal	73	125	198
Malar/maxillary	48	84	132
Orbital floor	22	41	63

Discussion

Socioeconomic deprivation has been associated with higher incidences of both chronic diseases and trauma,[4,6] and we must understand why this is the case if we are to implement effective preventative measures that will assist an already vulnerable population.

Our study has shown that the incidence of facial fractures increased with socioeconomic deprivation, and that socioeconomic deprivation was significantly associated with the incidences of nasal and mandibular fractures. This corroborates previous work from Bristol that also showed an association between socioeconomic deprivation and incidence of mandibular fractures.[6]

It has widely been reported that most facial fractures are caused by violence and assault. Our data support this, with 60% being caused by interpersonal violence, but we did not find an association between interpersonal violence and socioeconomic deprivation. The Bristol study did show such an association in patients with mandibular fractures, and the authors stated that patients whose fractures were caused by interpersonal violence were more likely to be socioeconomically deprived. This, however, is because patients who present with a fracture are more likely to be socioeconomically deprived anyway. We showed that in each socioeconomic decile, the percentage of facial fractures that resulted from interpersonal violence remained fairly consistent, and there was no significant association between socioeconomic deprivation and interpersonal violence.

Although it is widely reported that the incidence of homicide is much higher in deprived areas, the association between socioeconomic deprivation and non-fatal injuries that result from violence is more difficult to ascertain.[15] People with a low socioeconomic status are more likely to be admitted to hospital as a result of interpersonal violence, but the presence of an association between deprivation and the injuries caused by assault varies according to the measures of deprivation used, and the type and mechanism of injury.[16] A larger study population, particularly one that included more facial fractures in patients of higher socioeconomic status, may show more significant results.

The association between socioeconomic deprivation and abuse of alcohol and drugs has been well documented. Although people with a higher socioeconomic status drink more often and consume more alcohol, those with a lower socioeconomic status are more likely to become addicted and to die as a result.[17] This is further corroborated by our data, which showed that substance abuse was less likely to have been associated with the injuries of patients from higher socioeconomic groups.

Most patients with mandibular fractures were under the influence of a substance at the time of injury so this could explain why the incidence of these fractures is associated with socioeconomic deprivation. However, the rate of substance abuse in nasal fractures was similar to that in orbital floor and malar/maxillary fractures, so it cannot entirely explain why the incidence of certain fractures is higher in patients of lower socioeconomic status.

Although this study highlights the association between facial fractures and socioeconomic deprivation, it is important to address its limitations. First, this is a retrospective analysis and as such, the exact mechanism of fracture and the role of substance misuse were not always documented clearly. Patients may have concealed information about the cause of their fracture, particularly if it was the result of an assault or abuse. We also realise that we have studied the deprivation of an area rather than of an individual. Although the English Indices of Multiple Deprivation 2015 database assigns a deprivation score to a relatively small group of 1500 people, the score may not be representative of all the residents in that area. It would have been more accurate to use personal measures of deprivation such as income and education, but this was beyond the scope of this retrospective analysis.

The control group was composed of a random sample of the postcodes served by our OMFS department. Although this shows that patients who present with facial fractures are more socioeconomically deprived than the catchment area of our hospital, we cannot say that these patients are more deprived than those who present to our A&E department for other emergencies.

Table 5
Number of facial fractures associated with substance abuse by decile of socioeconomic deprivation.

	Deprivation decile										Total
	1	2	3	4	5	6	7	8	9	10	
Substance abuse	119	73	55	37	37	16	19	6	10	2	374
No substance abuse	92	86	55	47	35	19	25	23	14	9	405
Total	211	159	110	84	72	35	44	29	24	11	779

Disclosures and funding sources

None of the authors have any conflicts of interest to declare. No grant or financial support was required for this study.

Ethics statement/confirmation of patients' permission

This project was a retrospective study and was registered with and approved by the clinical governance team at Sunderland Royal Hospital. All data were handled in accordance with the Caldicott principles. Patients' permission was not required.

Conflicts of interest

Michael Goodfellow received the Professor John Lowry Congress Scholarship from the European Association of Cranio Maxillo Facial Surgery (EACMFS) to present this work as a poster presentation at the September 2018 EACMFS Congress.

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