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Full Length Article

The consequence of the closure of primary care dental services on secondary care during the COVID-19 pandemic – A national outlook

Constance Hardwick [a,*], Ellie Day [b], Edward Carlton [c], Tom Dudding [c]

[a] University of Bristol Dental School, UK
[b] NHS North Bristol Foundation Trust, UK
[c] University of Bristol Medical School, UK

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ABSTRACT

Background: After the global pandemic of COVID-19 in March 2020, restrictions were implemented on all aspects of routine dental-care with a primary focus to urgent care only.
Aim: To investigate the impact on secondary care medical facilities and Emergency Department (ED) admissions for the management of severe dental infections as a result of restricted access to routine primary dental-care during the period of COVID-19 restrictions.
Design: National level Hospital Episode Statistics was used to describe the number of inpatient admissions for the drainage of a dental abscess and the attendance for dental related to ED. Data was stratified across ethnicity, sex and deprivation.
Results: There was a decrease in admission to secondary care for dental infection and total admissions during the initial period of national lockdown due to COVID-19. Incidence of dental abscess drainage equalled 4.51 per100,000 person years from 2018 to 2021. There was a 209 % increase in admissions in patients with greatest deprivation. This was much more exaggerated compared to that of non-dental comparison conditions and total inpatient admissions. Using subsequent inpatient admission as a marker of severity, 4.2 % dentally related ED attendance required onward admission.
Conclusion: A large proportion of ED attendances with dental related conditions did not require inpatient admission, therefore a large proportion of ED attendances could be managed more appropriately in specific dental services. Dental infections requiring surgical admission disproportionality affects the most deprived communities of the population which is much more exaggerated compared to peri-anal and total inpatient admissions. This highlights the inequalities and links with deprivation that exist in oral and dental health in England, which is much greater than that of general health if total admissions are used as maker for this. This research highlights the need to improve access to primary dental-care services.

1. Introduction

COVID-19 was declared a global pandemic on March 11th, 2020 [1]. A nation-wide lockdown was enforced across the United Kingdom starting on March 24th, 2020 [2]. The Chief Dental Officer (CDO) published guidance prohibiting all routine and non-urgent dental-care, which started from 25th March 2020 in England [3]. The pandemic led to multiple challenges to both medicine and dentistry. Primary care dental practitioners were instructed to triage patients, issue advice and prescribe appropriately over the phone [4].

From 25th March 2020 to 7th June 2020, urgent care arrangements were put in place, identifying specific urgent dental care centers, personal protective equipment and expertise to provide emergency treatment [5]. This centralisation aimed at reducing the potential for dental practices becoming reservoirs for COVID-19 [6]. These measures however limited the number of patients who could receive face-to-face treatment. After the 8th June 2020, dental practices re-opened following updated guidance from the CDO, still with a priority for urgent care [7]. After April 2022 dental practices were able to resume pre-pandemic approaches to dental-care [8].

* Corresponding author. Bristol Dental School, 1 Trinity Walk, Bristol, BS2 0PT, UK.
E-mail addresses: c.hardwick@bristol.ac.uk (C. Hardwick), ellie.day@nbt.nhs.uk (E. Day), ed.carlton@bristol.ac.uk (E. Carlton), tom.dudding@bristol.ac.uk (T. Dudding).

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Suspending all but urgent dental procedures may have helped protect patients and the community from COVID-19, however potentially at the expense of prolonged dental pain and exacerbating infection [9]. Which may have led to increased attendance in secondary care health services.

Dental infections can become life-threatening conditions if left untreated [10,11]. Advanced dental infections require hospital admission for drainage and removal of the source of infection. In severe cases intensive care unit admissions may be required to maintain and secure airways. Studies have highlighted a link with increased rates of hospitalisation from serious dental infections and patients not attending primary dental-care regularly for treatment and prevention [12,13]. Poorer oral health is higher in areas of greater deprivation, and linked with serious dental infections [14]. Access to NHS dental-care is an area of concern for many patients, resulting in people seeking dental treatment from their general medical practitioner [15].

The reduction of primary dental-care services is a unique opportunity to analyse a 'natural' experiment. Which allows investigation of the role primary dental-care has in reducing dental infection development and severity. The aim of this study was to describe the national incidence of dental infection requiring surgical management in secondary care, comparing this to pre-pandemic rates.

2. Material and methods

Hospital Episode Statistics (HES) data from NHS Digital (NHSD), is a national database detailing all NHS hospital admissions in England. Data is collected at the time of patient attendance and processed [16]. HES data can also be analysed for research purposes and was used in this project to assess variation in serious dental infection across age, genders, ethnicity and deprivation. Ethical approval was approved from the University of Bristol Research Ethics Committee and a Data Access Request Service application made to NHSD. Data was collated from 1stApril 2018 to 31st March 2021 and separated into three phases depending on admission date. Phase 1, admissions prior to 25th March 2020, where no COVID-19 dental restrictions were enforced. Phase 2, admissions from 25th March 2020 to 7th June 2020, during the closure of all routine primary dental-care services. Phase 3, admissions from 8th June 2020 to 31st March 2021, when primary dental-care services re-opened, however with strict restrictions. Data beyond the 31st March 2021 was unavailable.

Inclusion criteria for inpatient data comprised of operation and procedures code (OPCS) including F16.1, 'drainage of abscess of alveolus of tooth' and primary diagnosis codes (ICD-10) for dental infections. This ensured all presentations for odontogenic infection were captured. OPCS codes were also requested for comparison procedures and diagnoses (H58.2, 'drainage of peri-anal abscess') as rate of presentation would not be affected by the restrictions in primary dental-care services. However, they would be affected by factors such as COVID-19 government advice. Total admission and procedure numbers were recorded to understand general hospital attendance.

Emergency Department (ED) data was also requested from NHSD. Accident and Emergency Diagnosis (AED) codes were used from 1st April 2018 to 1st April 2020 and Systemised Nomenclature of Medicine Clinical Terms (SNOMED) codes used from 1st April 2020 to 31st March 2021, due to changes in NHSD coding system on 1st April 2020. Admission codes of toothache, dental infection, dental trauma and total ED admissions were requested.

Summary data of attendance and procedure number for each code was received and stratified by age, ethnicity, sex and Index of Multiple Deprivation (IMD).

Incidence was calculated for each procedure per100,000 person-years to allow for direct comparisons across each phase and strata of age, sex, ethnicity and IMD. The numerator equated to the total number of hospital admissions in England and the denominator used Office of National Statistics (ONS) population totals of England [17–19]. During phase 1, an average ONS populations for the three years was used. To calculate person-years the number of days in each phase was calculated and converted to years (2.60 = phase 1, 0.20 = phase 2 and 0.81 = phase 3). Crude data was analysed, and comparisons made with dental and peri-anal abscess drainage. Indirect age standardisation (AS) was calculated and compared, to acknowledge differing age distributions across strata of ethnicity and IMD [20]. Percentage changes were calculated using phase 1, white ethnicity groups and IMD-10 (the least deprived 10 % of the population) as baseline values to assess percentage change. The number of inpatient admissions from ED was used as a marker for severity of dental abscess.

3. Results

A total of 47,133,392 patients were admitted into English hospitals from 2018 to 2021, of which 7616 were admitted for drainage of a dental abscess (Crude-incidence = 4.51 per100,000 person-years, Age-standardised-incidence = 13.60 per100,000 person-years). 33,415 patients were admitted for drainage of a peri-anal abscess (Crude-incidence = 19.78 per100,000 person-years, Age-standardised-incidence = 59.83 per100,000 person-years) (Table 1). Incidence was marginally higher in males (4.81 per100,000 person-years) compared to females (4.18 per100,000 person-years).

In Phase 1, prior to COVID-19 dental-care restrictions, age-standardised-incidence equaled 3.80 per100,000 person-years, which reduced to 0.59 per100,000 person-years in phase 2. Incidence subsequently increased to 3.04 per100,000 person-years in phase 3, almost resuming to pre COVID-19 levels. During these 3-years, 7616 admissions occurred for severe dental infections. Incidence was higher in males at each phase (Table 2).

Age-standardised dental abscess drainage fell by 85 % in phase 2 and 20 % in phase 3 compared to phase 1. Compared to peri-anal abscess drainage and total admissions which fell by 93 % and 95 % in phase 2 respectively and fell by 66 % and 67 % respectively in phase 3 (Fig. 3). Overall dental abscess admissions reduced from pre COVID-19 pandemic levels during the imposed restrictions, and more so than the other conditions compared.

Most dental abscess drainage procedures affected Black and White ethnicity groups, with an age-standardised-incidence of 10.20 and 9.68 per1000,000 person-years respectively (Fig. 1).

The most deprived 10 % of the population (IMD-1) had a higher

Table 1
Total procedure admissions, incidence per 100,000 and incidence per 100,000 person years.

OPCS Code 2018–2021	Inpatient admissions	Total incidence per 100,000 (n/total population) *100000	Total incidence per 100,000 person years ((n/total population) *100000)/3
F16.1 (Drainage of dental alveolar abscess)	7,616	13.52	4.51
H58.2(Drainage of peri-anal abscess)	33,415	59.34	19.78
Total Hospital Admissions	47,133,392	83,698.18	27,899.39
SNOMED Code 2020–2021	**ED Attendance**	**Total incidence per 100,000 (n/total population)*100000**	**Total incidence per 100,000 per person years ((n/total population) *100000)/0.99**
Dental Abscess	48,175	85.19	86.05
Dental Trauma	10,678	18.90	19.10
Toothache	847	1.50	1.51

Table 2
Incidence of procedure per 100,000 person years in each Phase of COVID-19 restrictions imposed on primary dental care services.

	Incidence per 100,000 person years (Age standardised incidence per 100,000 person years)		
	National Total	Female	Male
Phase 1			
F16.1 Drainage of dental alveolar abscess	3.81 (3.80)	3.59	4.03
H58.2 Drainage of peri-anal abscess	16.18	10.30	22.13
Phase 2			
F16.1 Drainage of dental alveolar abscess	2.94 (0.59)	2.48	3.40
H58.2 Drainage of peri-anal abscess	14.68	10.08	19.37
Dental Abscess	78.97	74.25	83.23
Dental Trauma	18.03	16.18	19.69
Toothache	0.79	0.62	0.93
Total ED Attendance	25,604.90	25,684.30	25,258.73
Phase 3			
F16.1 Drainage of dental alveolar abscess	3.74 (3.04)	3.45	4.04
H58.2 Drainage of peri-anal abscess	17.64	11.70	23.69
Dental Abscess	88.72	84.43	92.33
Dental Trauma	19.54	16.17	22.84
Toothache	1.70	1.51	1.88
Total ED Attendance	33,344.85	33,706.50	32,605.82
Total Phase1-3			
F16.1 Drainage of dental alveolar abscess	4.51	4.18	4.81
H58.2 Drainage of peri-anal abscess	19.78	12.68	26.8
Total Phase 2 and 3			
Dental Abscess	86.05	81.73	89.74
Dental Trauma	19.07	16.01	22.04
Toothache	1.51	1.33	1.69
Total ED Attendance	31,600.77	27,251.08	26,363.27

incidence of dental abscess drainage (14.27 per100,000 person-years) compared to the least deprived 10 % of the population (IMD-10) (1.63 per100,000 person-years). There was a spiked increase at IMD-5 equaling 8.69 per100,000 person-years (Fig. 2). There was a marked 209 % increase in admissions from IMD-10 to IMD-1 for dental abscess drainage compared to a 91 % increase for peri-anal abscess drainage and only a 25 % increase for total inpatient admissions. This shows the consequences of poor dental health disproportionately affects the most deprived communities more compared to other conditions (Fig. 2).

Age-standardised-incidence across deprivation showed similar patterns across the three phases with trends similar to those presented above (Fig. 3). The largest reduction was seen in the 'Asian' ethnicity group by a reduction of 49 % and least in the 'White' ethnicity group, a reduction of 9 % between phase 1 and 2. The ethnic group most affected from the closure of primary dental-care was 'Other'. This group includes Hispanic, Arabinan and Chinese ethnicities, and saw a 58 % increase in presentations from phase 1 to 3. Incidence in 'White' ethnicity increased by 5 % and 'Black' ethnicity increased by 3 %.

A total of 17,691,575 patients attended ED from 1st April 2020 to31st March 2021, of which 48,175 attended with a dental abscess (Crude-incidence = 86.05 per100,000 person-years, Age-standardised-incidence = 85.05), 10,678 attended with dental trauma (Crude-incidence = 19.10 per100,000 person-years, Age-standardised-incidence = 0.03 per100,000 person-years) and 847 for toothache (Crude-incidence = 1.51 per100,000 person-years, Age-standardised-incidence = 1.50 per100,000 person-years)(Table 1). Attendance to ED for dental conditions equated to 0.33 % of all ED admissions. The majority of dental abscess and toothache attendances were in the 15–44 age group. Dental trauma attendance was highest in 0–4-years.

Of the 48,175 patients attending ED with a dental abscess, only 4.24 % (n = 2045) resulted in inpatient admittance for dental abscess drainage, a marker for severity, which was similar across the three phases.

Dental abscess attendance affected 'Other' ethnicity groups the most (116.71 per100,000 person-years) and 'Asian' ethnicity groups the least (16.02 per100,000 person-years). Dental trauma attendance affected 'Other' ethnicity group the most (49.73 per100,000 person years) and the 'Mixed' ethnicity group the least (17.68 per100,000 person years).

The most deprived 10 % of the population (IMD-1) had a higher incidence of dental abscess attendance compared to the least deprived 10 % of the population (IMD-10), which increased by 264 % from IMD-10 to IMD-1. Dental trauma increased by 112 % and toothache attendance increased by 386 % from IMD-10. Compared to total ED attendance which increased by 89 % from IMD-10 to IMD-1 (Fig. 4).

4. Discussion

The general trend showed a decrease from phase 1 to 2 for inpatient admissions including peri-anal abscess and dental abscess drainage when the national government lockdown began due to COVID-19 restrictions. This, however, increased during phase 3, despite government restrictions still being in-place. This could potentially be due to members

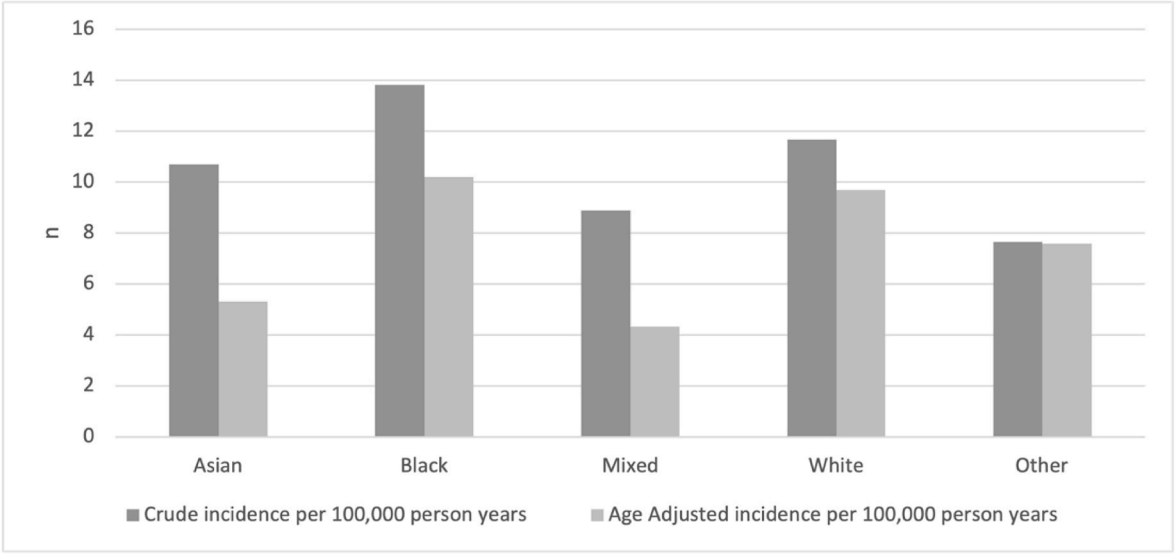

Fig. 1. Graph showing incidence and age standardised incidence per ethnicity groups for drainage of a dental abscess.

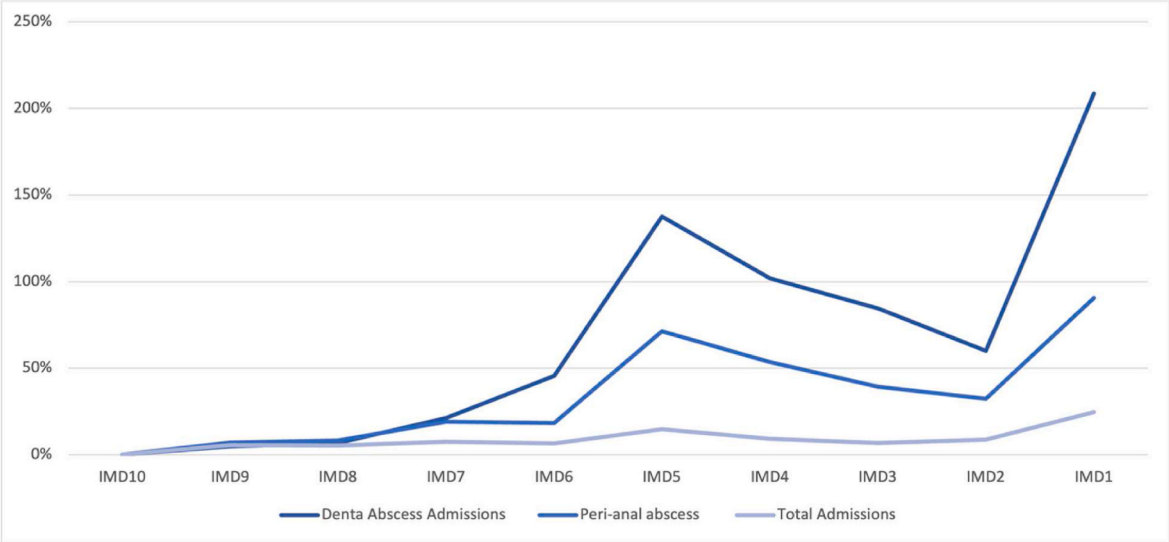

Fig. 2. Graph to show percentage change from IMD 10 to IMD 1 in admissions of each procedure per 100,000 person years.

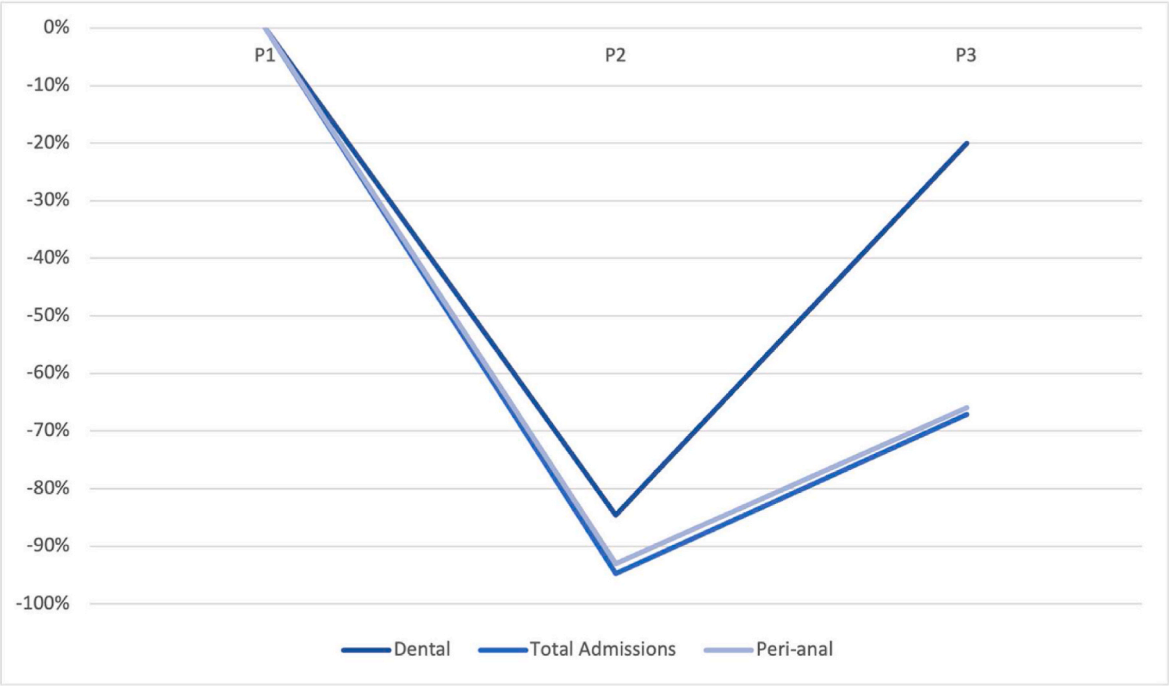

Fig. 3. Graph to show percentage change from phase 1 in admissions of procedure per 100,000 person years.

of the public following government messaging of staying at home and keeping away from hospitals in the initial stages however returning to healthcare systems when restrictions in some health settings reduced.

The closure of routine primary dental-care occurred in phase 2, therefore during this 74-day period it was hypothesised there would be an increase in inpatient admissions due to dental infection, however, an absolute increase was not seen. This may have been partly due to the 25 % increase in antibiotic prescribing in phase 2 [21] which may have suppressed the number of dental abscess inpatient admissions. However, when compared to inpatient admissions for peri-anal abscess and all hospitalisations, the reduction was 10 % less for dental abscesses suggesting there may have been some impact of dental practice closure.

95.8 % of dental attendances to ED for a dental abscess did not require inpatient admission for further treatment. This suggests a large proportion of patient expectations and need cannot be met in ED. Primary dental-care is the appropriate place for these patients. Not only is this taking valuable time, space and resources in already burdened EDs, but patients are not receiving care they require [22]. A potential reason could be related to the growing problems with access to NHS dental-care in England, or a lack of awareness regarding where to receive and access help for dental concerns [23,24].

As deprivation increases so does poorer oral health, which is represented by ED dental attendance and dental alveolar abscess drainage, a severe consequence of poor oral health [25,26]. This was represented by a 209 % increase from IMD-10 to IMD-1 for the 3-years. Phase 2, during the strictest restrictions to routine primary dental-care, saw the largest percentage change from IMD-10 to IMD-1, highlighting the most deprived communities were more adversely affected by primary

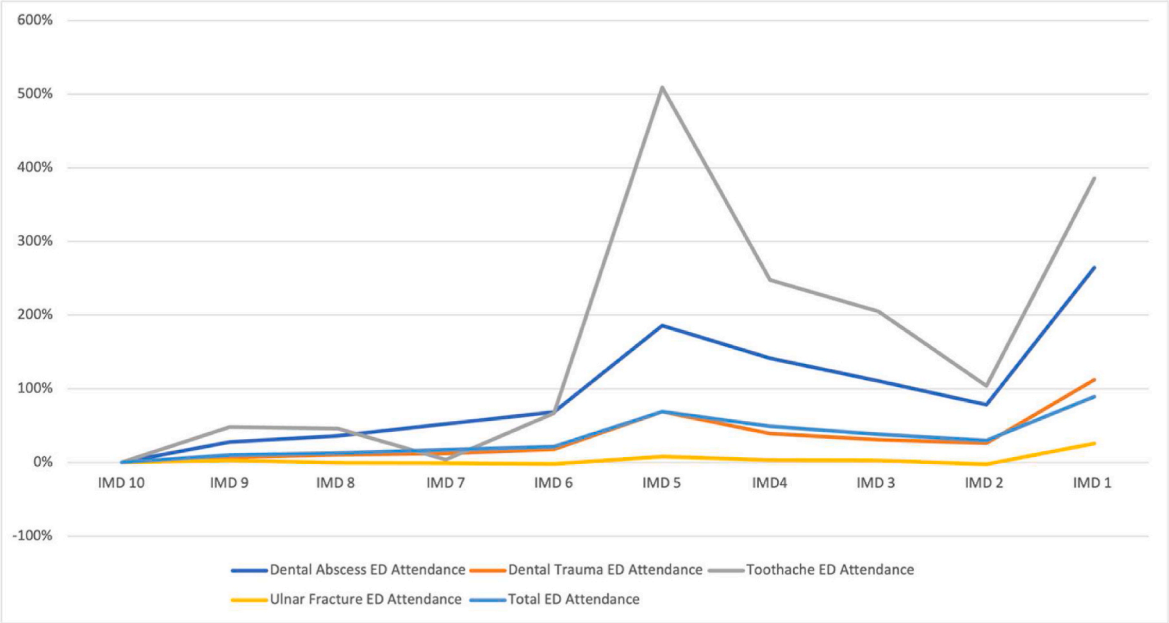

Fig. 4. Graph to show percentage change from IMD 10 to IMD 1 for dental related ED admissions, ulnar fractures and total ED attendance.

dental-care restrictions. These trends are also replicated in ED attendances with the greatest exaggeration seen in toothache attendance, shown by a 385 % increase.

Across all procedures there is a relative peak at IMD 5 and a trough at IMD 2. This could suggest populations in the middle of the deprivation scale fall between health services, resulting in higher levels of disease. Although seen for peri-anal abscess and total hospital admissions, it was more exaggerated for dental outcomes, indicating patterns of social deprivation and oral health are more exaggerated [27].

In most centers dental inpatient cases are admitted via ED rather than direct ward admissions. This is due to the admission process from primary care in addition to potential airway concerns, and patient-initiated attendance. Therefore, the need for inpatient admission from ED was used as an assumed marker for severity. If, however direct inpatients referrals were made our results are potentially an underestimation, resulting in more than 95.8 % of ED attendances not requiring inpatient admissions.

5. Limitations

NHSD changed from AED to SNOMED codes in the ED dataset from 1st April 2020, therefore accurate conclusions cannot be drawn comparing pre-and post-COVID-19 primary dental-care restrictions in ED presentations. HES Data is used for administrative coding purposes and not specifically designed for research, therefore this may limit the results as data relies on accurate coding from within NHS Trusts [28]. There is likely to be miss-classification of dental data which is unclear if over or under-represented, however our incidence rates are comparable with smaller regional data collections [29]. Regarding how this may affect our results we do not feel this will be different across COVID and deprivation.

6. Conclusions

Only 4.2 % of all ED attendance for dental conditions required inpatient admission and care highlighting a large proportion of attendances could be managed more appropriately in specific dental services, such as dental emergency clinic. Therefore, individual patient needs are not being met by attending ED. Dental infections requiring surgical admission disproportionality affect the most deprived communities of the population which is more exaggerated compared to peri-anal and total inpatient admissions. Highlighting the inequalities and links with deprivation that exist in oral health in England, which may be greater than that of general health. General population education in where to access appropriate care is required in addition to general improved access to NHS primary dental-care services.

Author contribution

Miss Constance Hardwick, Conception and design of study/review/case series, Acquisition of data: laboratory or clinical/literature search, Analysis and interpretation of data collected, Drafting of article and/or critical revision, Final approval and guarantor of manuscript. Dr Ellie Day, Conception and design of study/review/case series, Drafting of article and/or critical revision, Final approval and guarantor of manuscript. Dr Edward Carlton, Conception and design of study/review/case series, Drafting of article and/or critical revision, Final approval and guarantor of manuscript. Dr Tom Dudding, Conception and design of study/review/case series, Acquisition of data: laboratory or clinical/literature search, Analysis and interpretation of data collected, Drafting of article and/or critical revision, Final approval and guarantor of manuscript.

Conflict of Interest Statement

The authors declare no conflict of interest.

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