

# Exploring the relationship between COVID-19 and oral health by radiographic examination

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## A commentary on

Sirin D A, Ozcelik F.

The relationship between COVID-19 and the dental damage stage determined by radiological examination. *Oral Radiol* 2021; DOI: 10.1007/s11282-020-00497-0.

## Abstract

**Design** Analytical retrospective study aimed at revealing the relationship between dental damage stage (DD Stg) and the severity of COVID-19 disease. This study was conducted over four months between 10 March 2020 and 15 July 2020 at the University of Health Sciences department at the Abdulhamid Han Training and Research Hospital Dental Services in Turkey.

**Sample selection** A total of 137 patients were included in this study taken from a cohort of 1,516 patients with a positive polymerase chain reaction (PCR) COVID-19 test. In order to meet the inclusion criteria, patients must have been referred to the dental outpatient department and have a dental panoramic tomogram available for examination.

**Data analysis** A new radiographic staging tool was developed by the authors, informed by previous tools. Following radiographic analysis, participants were allocated to a DD Stg (0–3). Multiple statistical analyses were conducted on the data including Pearson correlation analysis, Spearman correlation analysis and a multiple regression analysis.

**Results** Those participants in DD Stg 3 were significantly older than the other groups; those in DD Stg 2 and 3 had significantly higher presence of chronic disease and evidence of more carious teeth. Those in DD Stg 2 and 3 had a statistically higher number of hospitalisations due to COVID-19 when compared to those in DD Stg 0 and 1, with DD Stg 3 having the highest number overall as well as having a significantly higher mortality rate. Furthermore, those in DD Stg 0 had fewer symptoms associated with COVID-19 compared to the other groups.

**Conclusions** The results show there may be a remarkable association between severity of COVID-19 symptoms and oral health; however, care must be taken when interpreting these results as age is clearly a serious confounding factor and no clinical examination was undertaken.

## Commentary

The COVID-19 pandemic has claimed the lives of approximately 125,000 people in the United Kingdom.<sup>1</sup> Oral health has often been described as a gateway for general health, with symbiotic links between periodontal health and diabetes control already established.<sup>2</sup> However, the COVID-19 pandemic has given rise to

## Practice point

- There may be a link between oral health and COVID-19 outcomes but this cannot be concluded from this study. Clinical examination is invaluable to provide a comprehensive assessment of the patient's oral health and confounding factors must be considered



a new clinical question: is there a link between oral health and severity of coronavirus infection?

The primary aim of this analytical retrospective study is to ascertain if there is a relationship between dental damage stage (DD Stg) and severity of COVID-19. DD Stg is a staging tool developed by the authors, informed by pre-existing classifications including the apical periodontitis grading scale (APGS), radiographic bone loss and pathophysiological process of dental caries. Further contributing to the DD Stg are data on numbers of dental caries, dental implants, root canal treatments, tooth fillings, missing teeth and hospitalisations due to COVID-19, as well as the presence of chronic disease and symptoms associated with COVID-19.

Patients who had a positive COVID-19 PCR test (n = 1,516) with attendance at the dental outpatient clinic in the last six months with access to clinical records and dental panoramic tomogram (DPT) were included in this study (n = 137). The distribution of patients included were approximately equal for men (n = 71) and women (n = 66), with an age range of 20 to 65 years. A table of baseline characteristics including ethnicity, BMI and smoking status would have been valuable.

Radiographic examination was completed by an endodontist, not a dental radiologist. The study does not mention any blinding; however, radiographs were examined on two occasions, presumably to increase inter-examiner reliability. Presence of

**GRADE rating** ●●●○

periapical pathology was scored in accordance with the APGS scoring method; this method has also been developed by the authors and is derived from the Periapical Index. Larger periapical radiolucencies or multiple lesions placed the candidate in a higher DD Stg. Computer-aided diagnoses were used to measure radiographic bone loss (%) using the cemento-enamel junction as healthy levels.

The key findings of results are as follows: those in DD Stg 3 were significantly older than in DD Stg 0–2; with an ageing population, this is to be expected. Those in DD Stg 2 and 3 had significantly higher levels of chronic disease and numbers of carious teeth. Those in DD Stg 2 and 3 also had a significantly higher number of hospitalisations due to COVID-19 than those in DD Stg 0 and 1, with those in DD Stg 3 having the highest overall. With regards to severity of COVID-19, those in DD Stg 3 had significantly higher levels of mortality and those in DD Stg 0 had significantly lower levels of symptoms, though the specific symptoms are not clarified. Multiple regression analyses were completed on all nine independent variables; however, this was considered inappropriate ( $p = 0.1086$ ) and so it was recompleted with the following variables: number of dental caries, number of hospitalisations with COVID-19, symptoms associated with COVID-19 and presence of chronic disease. Following this adjustment, the model was considered as appropriate ( $p = 0.0060$ ).

DPTs are not ideal for assessment of the periapical status of teeth or bone levels due to the nature of their acquisition and resolution, although they do provide a general overview of the hard tissues and perhaps this is why the authors used this to base the study on. However, any radiograph is a static image of that patient's anatomy, and without clinical examination, it is difficult to contextualise this. Using solely radiographic examination, it is impossible to tell whether periapical radiolucencies associated

with endodontically treated teeth are a sign of disease or indeed a healing lesion. Assessment of bone levels does not differentiate between the legacy of periodontitis or active disease. Furthermore, the utilisation of computer-aided diagnosis has been acknowledged; however, its use has highlighted difficulty in differentiating pathology from physiology – further research would benefit from clinical correlation which would allow for context to be applied.

Confounding factors must be appropriately identified to allow for their effect to be controlled within the study design. The argument of cause and effect needs to be further explored with regards to shared risk factors between COVID-19 and radiographically determined oral diseases, most importantly age.

Although this study acknowledges previous limited literature regarding links of oral health to severity of COVID-19 disease, care must be taken when interpreting results due to the nature of utilising radiographs as the sole tool with which to assess oral health and the lack of control for analysis of potential confounding factors.

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