

RAPPORTEURS

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study

# At least three phenotypes exist among periodontitis patients

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## RELEVANT BACKGROUND

Periodontitis has been classified several times and divided into different patterns according to clinical, microbiological, and radiographic features. In older publications, clusters of patients have been identified. Clustering involves creating groups of patients who share similar characteristics but, unlike in classification procedures, the groups are not defined *a priori*.

The hypothesis is that several phenotypes can be detected among periodontitis patients, based on radiographic alveolar bone loss and microbiological profiles of the subgingival biofilm.

## AIMS

To cluster periodontitis patients based on pre-treatment radiographic alveolar bone loss and microbiological data in order to discover various periodontitis phenotypes and subsequently define their characteristics.

## MATERIALS AND METHODS

This retrospective study included data from 392 untreated periodontitis patients. At the diagnostic appointment, full-mouth periapical radiographs were taken and at the first appointment for periodontal therapy, the deepest non-furcated site in each quadrant was selected for microbiological sampling.

Anaerobic bacterial culturing and identification was performed for seven periodontal pathogens: *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Tannerella forsythia*, *Parvimonas micra*, *Fusobacterium nucleatum*, and *Campylobacter rectus*. For the radiographic evaluation, 21 dentists and periodontists evaluated missing teeth and scored the alveolar bone level and the presence of angular bony defects.

A co-regularised clustering algorithm was used to form clusters based on microbiological data – seven periodontal pathogens and total colony-forming units (CFU)/ml – and radiographic data – number of teeth present, number of teeth without bone loss, number of teeth with bone loss ( $\leq 30\%$ ,  $>30\% - \leq 50\%$ ,  $>50\%$ ), and number of teeth with angular defects).

Descriptive and analytic statistical analyses were performed to describe and compare the clusters.

# results

Out of 800 consecutive newly referred periodontitis patients, a cohort of 392 individuals was subsequently analysed.

Based on a probability threshold of  $\geq 0.65$ , patients were clustered into three distinct groups. However, 10% of the patients did not reach that threshold, and were interspersed between the clusters.

The characteristics of the three clusters were the following:

#### Cluster A

- Dominated by young individuals (mean age:  $24.4 \pm 9.2$  years).
- High percentage (mean 35.4%) and prevalence (frequency of detection 89%) of *A. actinomycetemcomitans*.
- Trend for a more localised pattern of the disease:  $16.2 \pm 9.1$  teeth without bone loss and highest ( $29.6 \pm 2.8$ ) number of teeth present.
- The lowest percentage of current smokers (11%).

#### Cluster B

- Highest number of teeth with bone loss  $\leq 30\%$  ( $16.1 \pm 4.6$ ), which indicates the moderate disease severity.
- High prevalence (62%) and proportions ( $20.3\% \pm 23.4\%$ ) of *P. gingivalis* and low prevalence and proportions for *A. actinomycetemcomitans*. In general, similar microbiological profile to cluster C.

#### Cluster C

- The highest percentage of current smokers (54%) and self-reported diabetes (7%).
- The most severe periodontal destruction ( $8.1 \pm 4.5$  teeth with bone loss  $> 50\%$  and  $6.1 \pm 3.3$  teeth with angular defects).
- Similar to cluster B, high prevalence (65%) and proportions ( $26.7 \pm 27.3\%$ ) of *P. gingivalis*, and low prevalence and proportions of *A. actinomycetemcomitans*.



### LIMITATIONS

- No longitudinal radiographic examination was performed to analyse the rate of progression.
- The radiographic examination was performed by 21 dentists and periodontists.
- The cohort of patients investigated included only patients from the Netherlands. Thus, it is questionable whether the results can be extrapolated to other populations.



### CONCLUSIONS

- Based on radiographic alveolar bone loss patterns and microbiological information, periodontitis patients can be clustered into at least three groups with distinct phenotypic characteristics.
- Group A presented high percentage and prevalence of *A. actinomycetemcomitans*, a trend for a more localised pattern of the disease, and younger individuals.
- Groups B and C were mainly differentiated with respect to disease severity and smoking habits.



### IMPACT

- Three distinct phenotypes are identified among periodontitis patients, which are based on the radiographic bone loss and microbiological data.
- Clustering patients into three distinct groups may help the clinician tailor treatment according to the individual profile of each group and bring new perspectives to periodontal-disease classification.



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