Dysbiosis of the subgingival microbiome and relation to periodontal disease in association with obesity and overweight

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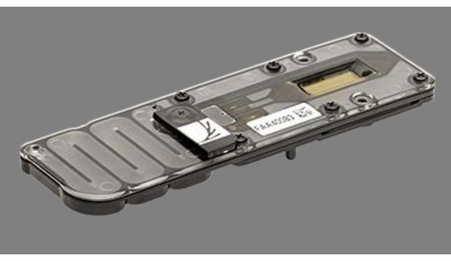

Introduction & significance

- Obesity is a global public health issue, that can cause various diseases in different organs and systems in the body such as type 2 diabetes, cardiovascular diseases, and some types of cancer.
- Obesity is also recognizable as a cause of diseases in the oral cavity.
- The oral cavity hosts one of the most diverse microbial communities within the human body.
- The oral microbiome is nowadays considered as a key determinant of oral and systemic health.
- Microbiota can influence the host's metabolic functions either directly by affecting energy and nutrient availability or indirectly via modulation of signaling pathways through bacterial by-products as short chain fatty acids.
- Obesity causes gut dysbiosis; nevertheless, little is known on the oral microbiome.
- Thus, it is important to analyze microbiota alteration in the obese and overweight populations to understand the changes in the microbiome, and relation to various diseases, including those affecting the oral cavity.

Aim of the Study

This study aimed to identify the differences in the subgingival microbiota influenced by body weight and periodontal status using Oxford nanopore technology.

Methodology

- Samples were collected at the University Dental Hospital Sharjah, United Arab Emirates
- Methods are summarized in figure 1.

Methodology

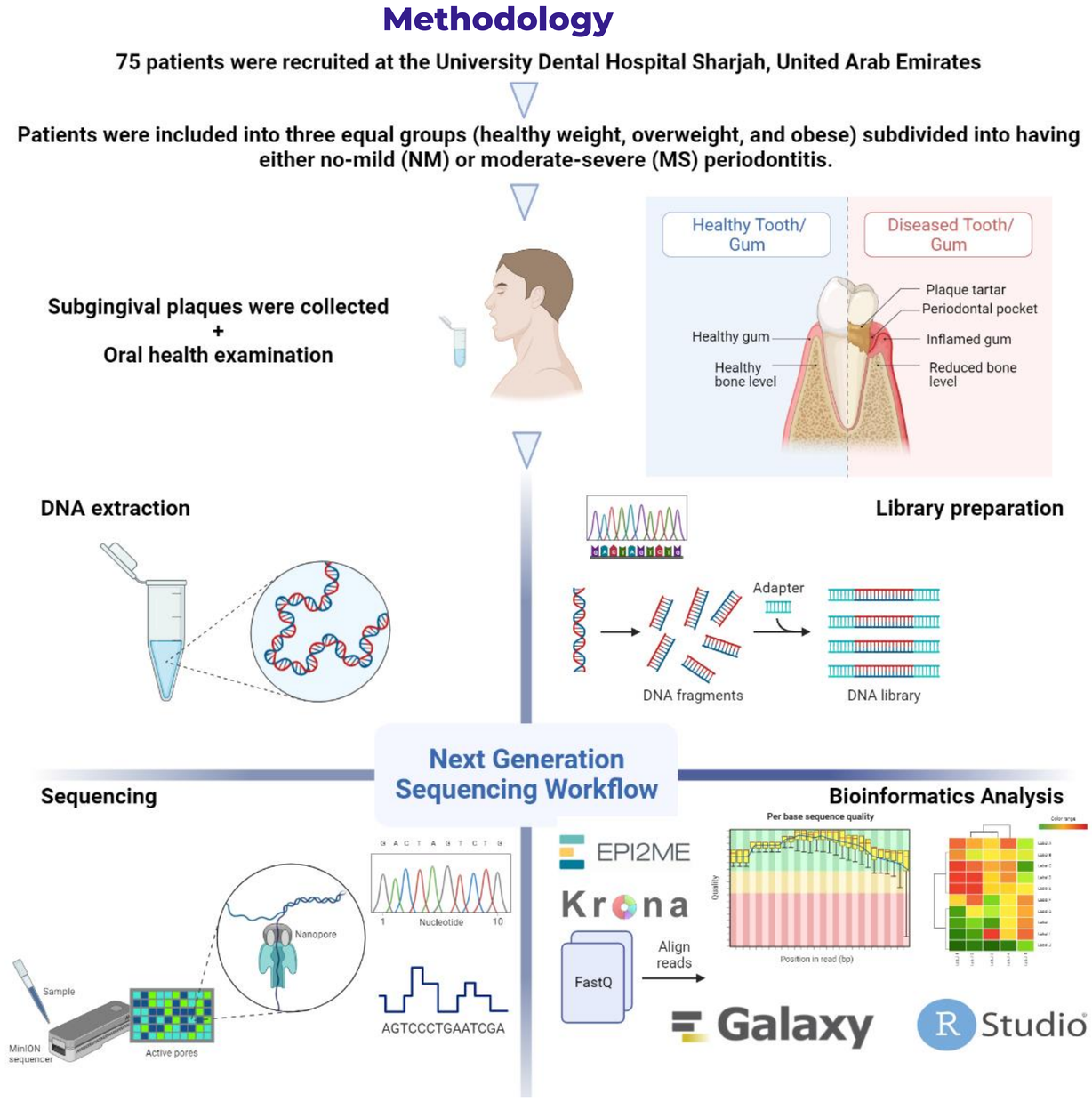

Figure 1 : Methods

Results

- Linear discriminant analysis demonstrated significant bacterial biomarkers for body weight and periodontal health.
- Unique microbiota signatures were identified (figure 2), with enrichment of periopathogens (*Aggregatibacter actinomycetemcomitans* in obese, *Tannerella forsythia* and *Treponema denticola* in overweight, *Porphyromonas gingivalis* and *Fusobacterium nucleatum* in healthy weight) in patients with MS periodontitis.
- Other pathogenic bacteria such as *Salmonella enterica*, and *Klebsiella pneumoniae*, were enriched in overweight subjects with NM periodontitis.
- Alpha (figure 3) and beta (figure 4) diversities were significantly different among the groups.

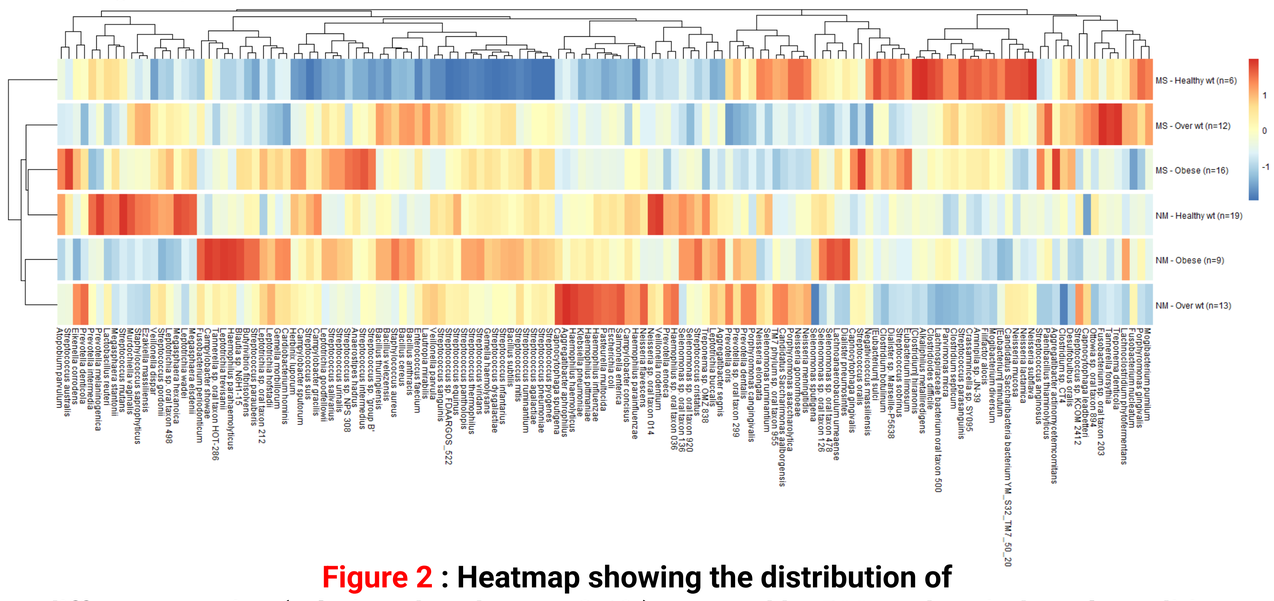

Figure 2 : Heatmap showing the distribution of different species (relative abundance > 0.1%) grouped by BMI and periodontal condition.

Discussion

- Dysbiosis of the subgingival microbiota in obese and overweight individuals was associated with increased prevalence and severity of periodontal diseases correlated with the body mass index.
- There was a significant correlation between measures of adiposity and predictors of periodontal disease, suggesting that higher body weight increases the risk for more severe periodontal diseases.
- This is alarming as these diseases can cause local complications such as tooth loss, as well as systemic complications in other body sites related to the overgrowth of harmful bacteria in the oral cavity which can be translocated to distant body sites.
- Furthermore, oral dysbiosis can lead to gut dysbiosis which also predisposes to serious health issues and numerous diseases.

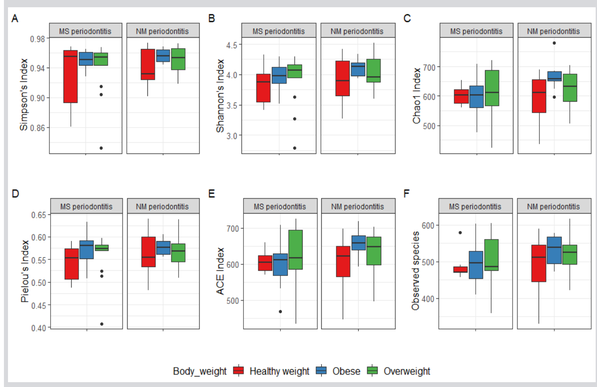

Figure 3 : Alpha diversity in the 75 subgingival plaque samples

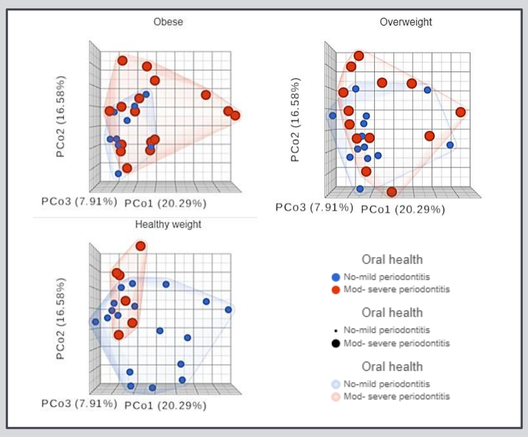

Figure 4 : Principal coordinates (PCo) analysis plots of beta diversity. Participants were grouped based BMI, then sub-grouped based on periodontal heath status

Conclusions

- Identification of key pathogens altered in obesity and periodontal disease can help in the discovery of potential bacterial biomarkers, that can be targeted during therapy or used to monitor the response to therapy.
- With the use of the portable sequencer (MinION), as done in this study, it is possible to incorporate microbiota screening as part of the investigations for assessment of oral and systemic health.
- This study highlights the immense importance of oral microbiome, and the need for lifestyle and dental interventions to resolve oral dysbiosis and restore normal homeostasis.