

Evaluation of the acid-formation potential of the saliva for individual caries risk assessment

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Aim

To determine the acid-formation potential of the saliva and evaluate whether this is a valid method to detect the individual caries risk in patients with and without caries experience.

Materials and Methods

A clinical controlled cross-sectional study was carried out by means of two groups:

- (1) naturally healthy subjects without caries-experience (n=25;DMFT=0) and
- (2) subjects with at least one active carious lesion (n=25;DMFT>0).

A detailed intraoral examination, bleeding (BI) and plaque (PI) indices were obtained. The acid-formation potential was measured according to the pH-difference of the saliva samples in a nutrient solution after 1 hour. Number of *Streptococcus mutans*, *Lactobacilli* and the buffering capacity were assessed. Intergroup comparisons were performed by Mann-Whitney-U-Test. The diagnostic value of acid-formation potential was evaluated by "Receiver-Operating-Characteristic"-method (ROC) and calculation of the "Area Under the Curve" (AUC-value). The saliva microbiome was analyzed by 16S rDNA next generation sequencing.

Results

A significant difference was found between the groups for pH-difference, while the caries group showed a higher mean value after 1 hour (Healthy=1.07, Caries=1.42; p=0.035, please see Figure 1). The ROC method could show that the AUC-value for the acid-formation measurement was in a desirable range (0.67; 1=ideal, please see Figure 2). Furthermore, a significantly increased occurrence of *Streptococcus mutans* (p<0.001; AUC=0.83) and *Lactobacilli* (p<0.001; AUC=0.83) was found in the caries group (Figures 3 and 4). The oral hygiene indices showed a significantly higher BI (p=0.006) and PI (p=0.001) in the caries group. With regard to the buffering capacity no difference was shown between the two groups. The composition of the saliva microbiome of subjects with active caries indicates a higher α -diversity and richness (Figure 5). A significant increase was seen for *Alloprevotella*, *Prevotella*, *Campylobacter* and *Veillonella*, in the naturally healthy group. The genera *Fretibacterium*, *Lactobacillus*, *Spirochaetes*, *Synergistetes* and *Leptotrichia* were significantly increased in the caries group.

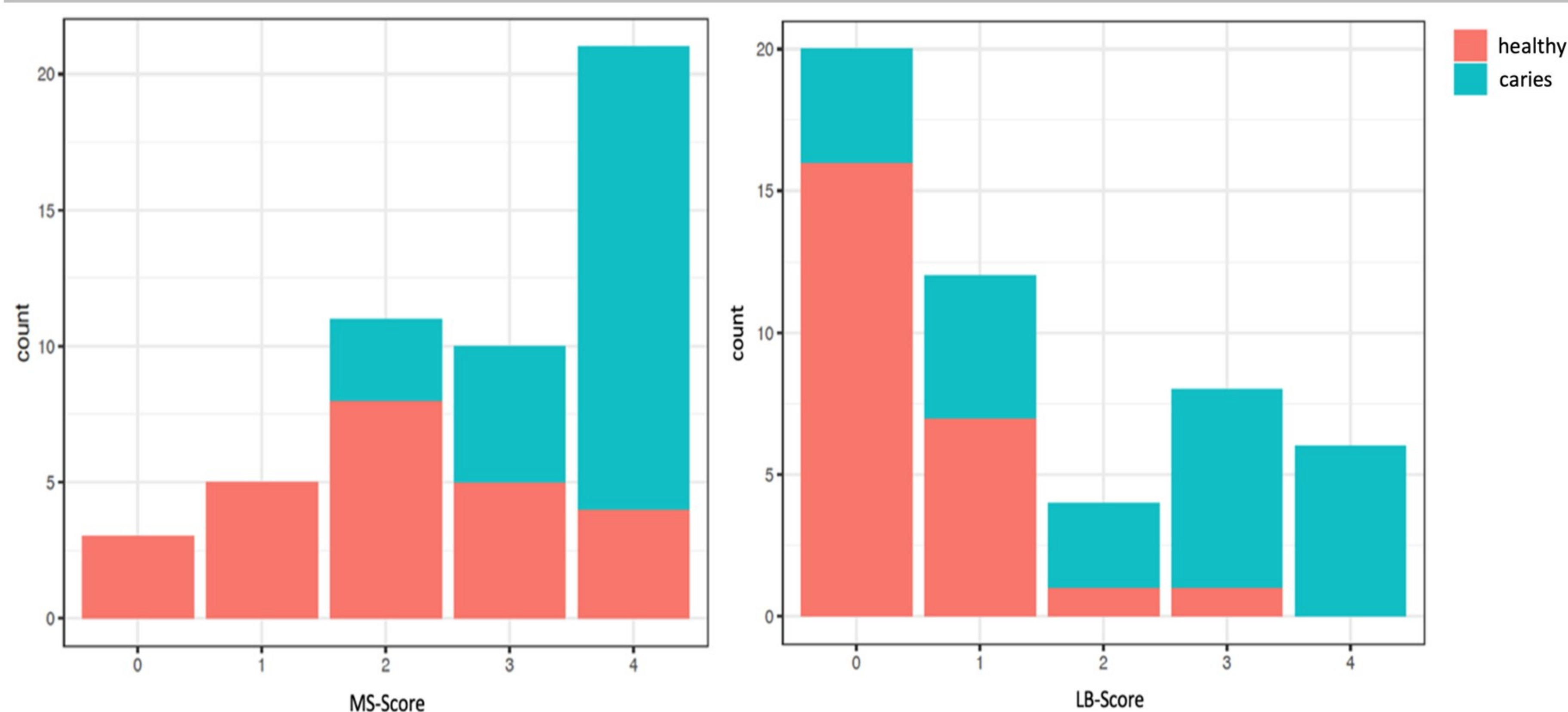


Figure 3: Barplot presenting the comparison of the mutans streptococci count (MS score) of the two subject groups

Figure 4: Barplot presenting the comparison of the lactobacilli count (LB score) of the two subject groups

Conclusion

The acid-formation potential of the saliva seems to be a valid method for individual caries risk screening and corresponds well to the number of mutans streptococci/lactobacilli as well as the saliva microbiome composition.

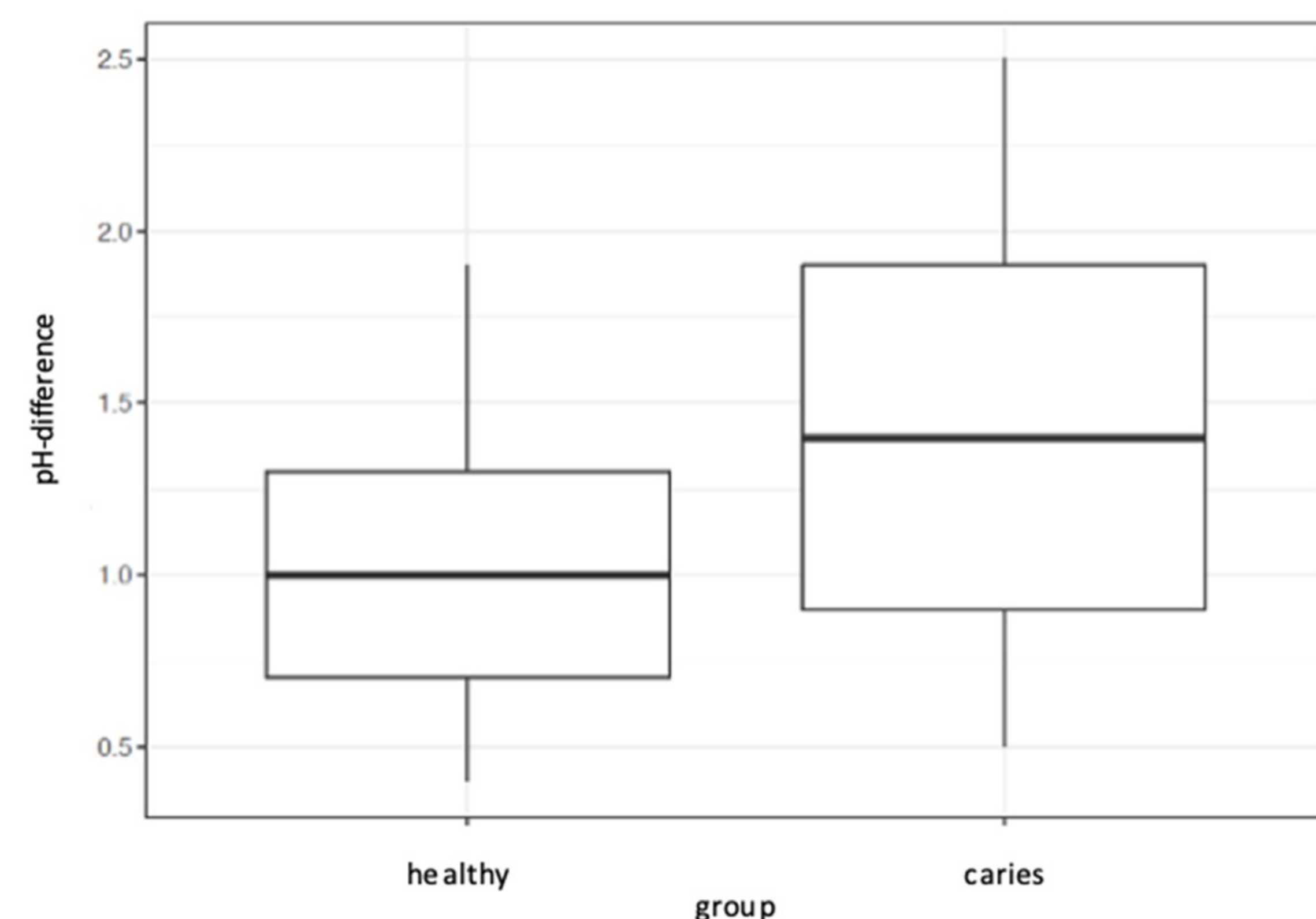


Figure 1: Box plots showing the comparison of the clinically determined pH value difference of the two subject groups

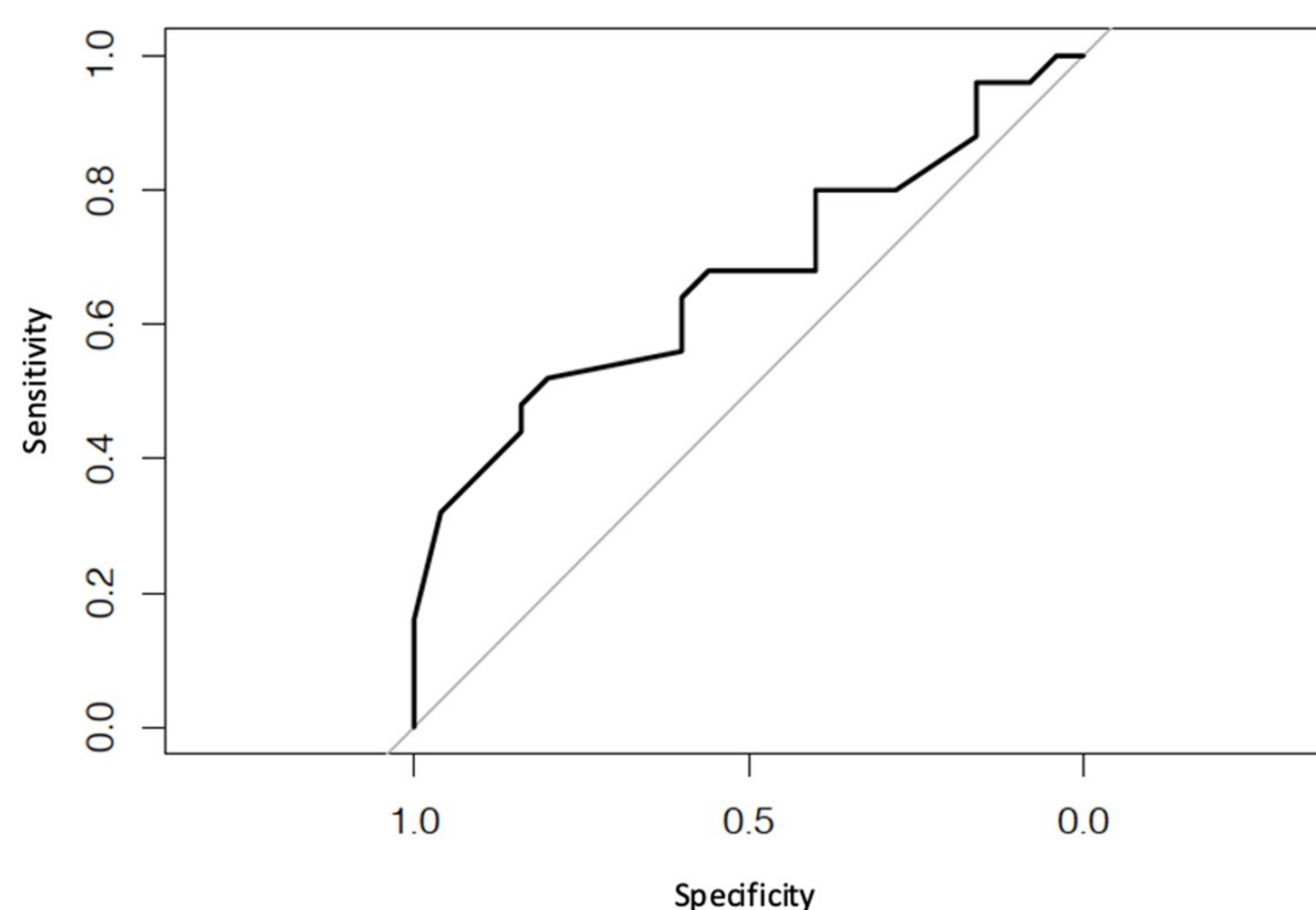


Figure 2: Plot of the ROC curve of the measured pH value differences of the two subject groups.

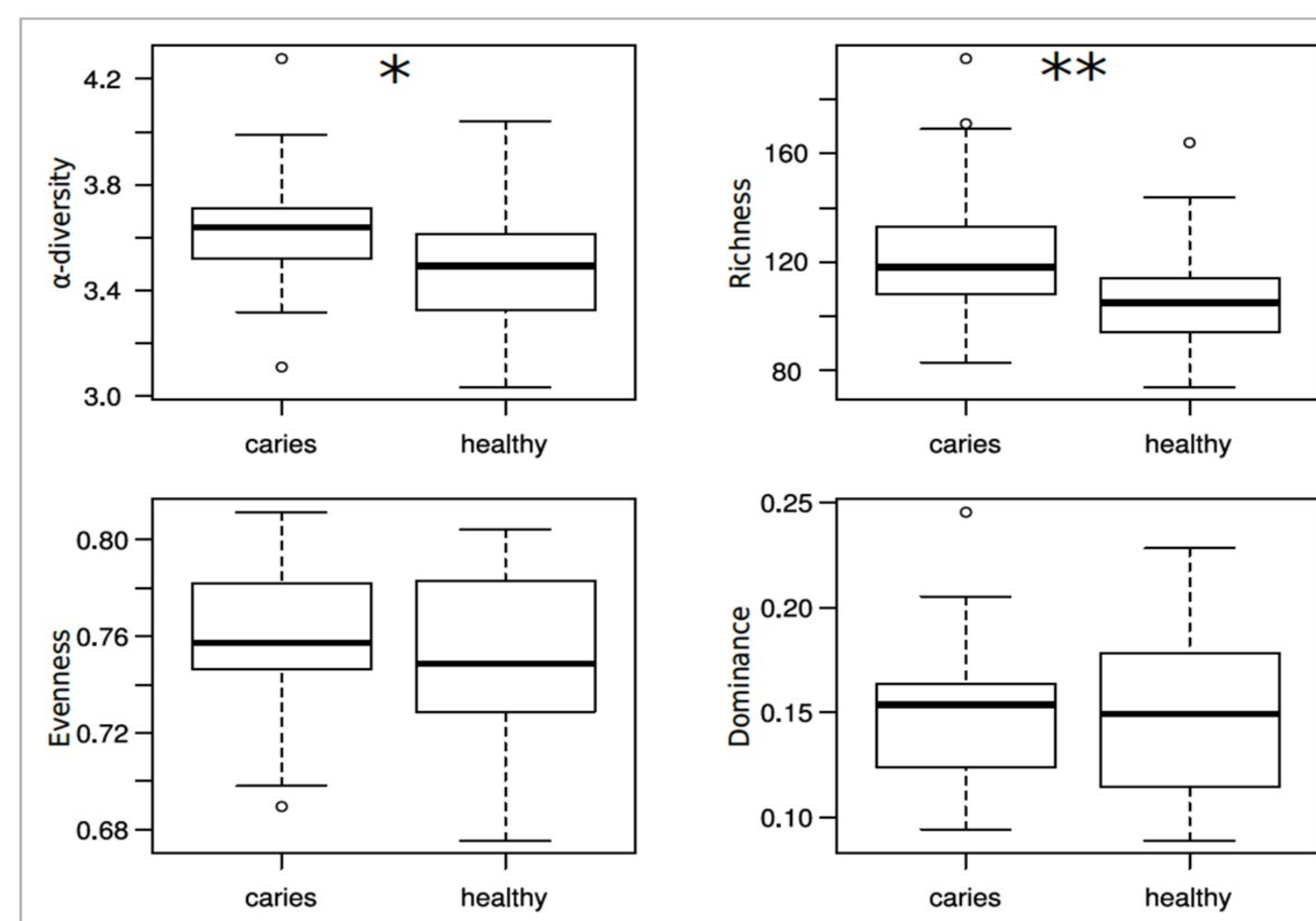


Figure 5: Comparison of the microbiome structure of the two subject groups, a. α -diversity based on Shannon index; b. richness calculated as the number of RSVs; c. evenness based on Pielou index; d. dominance based on Bergerparker index.

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