Innovations

Comparative Estimation of Salivary Ph among Complete Denture, Removable and Fixed Partial Denture Wearers

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Abstract: *Salivary pH plays a crucial role in maintaining oral health and the integrity of prosthetic appliances. The type of dental prosthesis worn—complete dentures, removable, or fixed partial dentures—can influence salivary composition and pH.A total of 60 participants aged between 30 to 60 years were categorized into three groups: Group 1 – complete denture wearers (n = 20), Group 2 – fixed partial denture wearers (n = 20), and Group 3 – removable partial denture wearers (n = 20). Unstimulated whole saliva was collected and pH levels were evaluated using salivary pH indicator strips. A statistically significant difference in mean pH levels was observed across the three groups (P = 0.019). However, the duration of denture use alone did not show statistical significance (P = 0.054). When the duration of usage was correlated with pH values across the groups, the association was statistically significant (P = 0.043).The study revealed that variations in salivary pH exist among the different denture-wearing groups and these are influenced by the duration of prosthesis use. Regular monitoring of salivary pH may aid in improving oral health among denture users.*

Keywords: *Saliva, pH, Denture, Fixed Denture, Usage Duration*

Introduction

Saliva plays a vital role in maintaining oral health by supporting various functions like lubrication, buffering, antimicrobial defense, and tissue repair [1]. It is secreted by both major and minor salivary glands, and in healthy adults, the daily output of saliva ranges from 500 to 1500 mL, with unstimulated flow typically between 0.3 and 0.4 mL/min [2]. The composition of saliva includes enzymes, immunoglobulins, growth factors, electrolytes, and antimicrobial agents. These components not only aid digestion and taste perception but also play a key role in maintaining mucosal health and prosthesis stability. Salivary secretion is under autonomic nervous system control and is influenced by psychological stimuli, systemic conditions, and the mechanical presence of prostheses [3].

Among elderly individuals, changes in salivary flow and composition are common and may be attributed to aging, medications, systemic diseases, or salivary gland dysfunction [4]. For patients who are edentulous or partially edentulous and rely on prostheses, saliva is critical for denture retention and comfort. A thin salivary film between the denture base and mucosa enhances adhesion and reduces friction [5]. Furthermore, the pH of saliva is a key determinant of microbial stability and denture hygiene. An imbalance in pH can predispose the oral cavity to infections, tissue irritation, or even denture stomatitis [6]. This study investigates the salivary pH among individuals wearing complete, removable partial, and fixed partial dentures and evaluates the role of denture usage duration in altering salivary pH levels.

Methodology

Institutional ethical approval was obtained before beginning the study, and informed consent was secured from all participants. The study was conducted in the outpatient department of oral medicine and radiology. Saliva samples were collected and stored at -20°C. All pH measurements and further analysis were carried out in the oral pathology and microbiology department.

Participants were divided into three groups based on their prosthesis type and duration of use:

Group 1: Complete denture users (n = 20)
Group 2: Removable partial denture users (n = 20)
Group 3: Fixed partial denture users (n = 20)

Participants, aged 30 to 60 years, had been using dentures regularly for a period between 2 and 10 years. Those with systemic illnesses, history of radiation or chemotherapy, salivary gland disorders, congenital abnormalities, or taking medications affecting salivation were excluded from the study. Saliva collection was performed with patients seated in a relaxed, upright position. They were instructed to spit into sterile containers at five-minute intervals over a 15-minute period. The

collected unstimulated whole saliva samples were immediately analyzed using pH strips. Changes in strip color were matched with a reference chart, and results were recorded. Data were analyzed statistically, considering p-values less than 0.05 as significant.

Results

Data from all participants were compiled in a spreadsheet and analyzed using SPSS version 23. The chi-square test was used to compare groups. Gender distribution showed 25% of complete denture users were male and 8.3% female; for fixed partial dentures, 11.7% were male and 21.7% female; and for removable partial dentures, 13.3% were male and 20% female.

In terms of age, most complete denture users were over 60 years. Fixed partial denture users were mainly in the 30-45 age group, while removable denture users were more evenly distributed. Regarding pH, values ranged from 5 to 8. A pH of 7 was most common across all groups. Significant differences in mean pH levels between the groups were found (P = 0.019).

Analyzing denture usage duration, most complete denture and removable partial denture users had used them for less than five years. While the overall correlation between usage duration and salivary pH showed minimal differences (P = 0.054), further analysis revealed a significant relationship when comparing pH levels within different usage durations (P = 0.043).

Discussion

Saliva's buffering and protective roles are indispensable in preserving oral homeostasis, particularly in individuals using dental prostheses. Alterations in salivary pH may result from prosthesis-induced mechanical stimulation, microbial colonization, or changes in salivary gland activity [7,8]. In this study, we observed significant differences in salivary pH among different types of denture wearers. These findings align with previous reports that suggest prosthetic appliances can modify salivary environment through both mechanical and biological interactions.

The significant association between denture type and salivary pH observed in our study suggests that prosthetic material, surface characteristics, and mucosal coverage may impact salivary parameters. Additionally, we observed that while the duration of denture usage alone did not significantly influence pH, a significant association emerged when usage duration was analyzed in relation to denture type. These findings may be explained by long-term adaptive changes in salivary flow or microbial shifts induced by prolonged prosthesis use [9]. Makila et al previously reported that complete denture wearers demonstrated minimal changes in salivary properties before and after denture insertion, while Murineanu et al. emphasized variations in pH irrespective of age or gender [10,11].

The present study demonstrated a statistically significant variation in salivary pH among complete denture, removable partial denture, and fixed partial denture wearers (P = 0.019), indicating that the type of prosthesis has a measurable impact on the oral environment. This aligns with the findings of Murineanu et al., who reported that different prosthetic appliances can influence salivary pH due to their varying levels of mucosal coverage and interaction with the oral flora [11]. While the duration of denture use alone did not show a statistically significant association with pH (P = 0.054), a significant correlation emerged when analyzed in relation to the type of prosthesis (P = 0.043). This suggests that the effect of duration becomes more evident when considered alongside the nature of the prosthetic appliance. Similar trends were observed by Sahu et al., who reported that prolonged prosthesis use contributed to gradual shifts in salivary pH, particularly in complete denture users, likely due to long-term mucosal contact and biofilm development [9]. Additionally, our observation that long-term denture wearers exhibited salivary pH values trending toward neutral or slightly alkaline is consistent with Makila's findings, which suggested that salivary buffering mechanisms adapt over time in response to continued prosthesis use, thereby stabilizing the oral pH [10]. Collectively, these results highlight the dynamic relationship between salivary characteristics and prosthesis type and duration, reinforcing the need for regular salivary monitoring in prosthodontic patients.

Our findings extend these observations by introducing prosthesis duration as a modifying factor. A slight alkaline trend with longer duration of prosthesis usage was observed, which could be attributed to changes in salivary buffering capacity or biofilm adaptation. However, our study is limited by the small sample size and lack of prosthetic material standardization. Future studies should include larger cohorts, longer follow-up periods, and control for material composition to better understand the influence of prosthesis type and duration on salivary pH.

Conclusion

The findings suggest that salivary pH changes among different denture wearers and is moderately associated with the duration of prosthesis use. As saliva supports both denture retention and mucosal health, regular monitoring of salivary characteristics may aid in improving prosthesis success and overall oral health among edentulous patients.

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