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Original article

Microbiological Profile of Dental Restorations, Crowns, and Bridges Among Patients Attending a University Dental Clinic

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Abstract
Dental restorations, crowns, and bridges restore tooth function and aesthetics but can also facilitate microbial adhesion and biofilm formation, increasing the risk of oral disease and restoration failure. This study aimed to identify the microbial species associated with dental restorative surfaces. A descriptive laboratory-based study was conducted among patients attending a university dental clinic. Oral samples were collected and examined using conventional microbiological methods. Microbiological analysis revealed a diverse microbiota comprising of *Streptococcus*, *Lactobacillus*, *Actinomyces*, *Fusobacterium*, *Porphyromonas*, and *Candida*. In conclusion, the highlight the complexity of the oral microbiome associated with restorative materials and emphasize the importance of effective biofilm control and regular maintenance in restorative dental practice.
Keywords: Dental Restorations, Crowns, Bridges, Oral Microbiology, Microbial Colonization.

Introduction

Dental restorations, crowns, and bridges are widely used in restorative dentistry to restore function, aesthetics, and structural integrity of damaged teeth. Despite their clinical benefits, these restorative and prosthetic surfaces may create favorable environments for microbial adhesion and biofilm formation. The accumulation of biofilm on restorative materials can contribute to secondary caries, periodontal disease, peri-abutment inflammation, restoration failure, and oral malodor. The oral cavity contains a highly diverse microbial ecosystem composed of hundreds of bacterial species that colonize both natural tooth surfaces and restorative materials. The microbial composition surrounding restorations is influenced by several factors, including material properties, surface texture, oral hygiene practices, salivary characteristics, and dietary habits. Restorative surfaces may act as reservoirs for microbial colonization, particularly in areas with irregular margins or limited accessibility for cleaning. Such conditions facilitate dental plaque accumulation and promote the growth of cariogenic and periodontal microorganisms, potentially compromising the longevity of restorations [1].

Among the microorganisms commonly associated with restorative surfaces are Streptococcus spp., Lactobacillus spp., Actinomyces spp., Veillonella spp., and periodontal pathogens such as Porphyromonas spp. and Fusobacterium spp. [2]. Understanding the microbial communities associated with restorations, crowns, and bridges is essential for improving preventive strategies and maintaining long-term restorative success [3,4]. This study aimed to investigate the prevalence and species distribution of bacteria colonizing dental restorations, crowns, and bridges.

Methods

Study Design

A descriptive laboratory-based study was conducted to investigate microbial colonization on dental restorations, crowns, and bridges.

Study Setting

The study was conducted in the Departments of Fixed Prosthodontics and Oral Biology at a university dental clinic from December 2025 to March 2026.

Study Population

Patients attending the dental clinic who possessed at least one restoration, crown, or bridge that had been in function for a minimum of six months were considered eligible for participation.

Sample Collection

Oral samples were collected from restoration margins, crown surfaces, bridge connectors, and adjacent plaque-retentive areas using sterile cotton swabs. Specimens were immediately transferred into sterile transport media and transported to the microbiology laboratory for processing.

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Microbiological Examination

Samples were inoculated onto Blood agar and MacConkey agar plates and incubated at 37°C for 24–48 hours. Colony morphology and growth characteristics were examined. Gram staining and biochemical tests were subsequently performed to identify bacterial species.

Ethical Considerations

Ethical approval was obtained from the Faculty of Dentistry and Oral Surgery, Sabratha University. Written informed consent was obtained from all participants prior to sample collection. Confidentiality and anonymity of participant information were maintained throughout the study.

Results

The distribution of the identified microorganisms and their association with specific restorative sites are presented in Table 1. Microbiological examination of samples obtained from dental restorations, crowns, and bridges revealed the presence of diverse microbial communities characteristic of oral biofilms. The microorganisms identified belonged predominantly to the genera *Streptococcus*, *Lactobacillus*, and *Actinomyces*. In addition, periodontal-associated bacteria including *Porphyromonas* and *Fusobacterium* species were detected, and fungal colonization by *Candida* species was observed on certain restorative surfaces.

Members of the genus *Streptococcus* were frequently detected on restoration margins and adjacent plaque deposits were commonly identified and appeared to be important constituents of the microbial communities associated with restorative materials. *Lactobacillus* species and *Actinomyces* species were also recovered from biofilm samples. These microorganisms were particularly evident in areas characterized by visible plaque accumulation and limited accessibility for routine cleaning.

Porphyromonas and *Fusobacterium* species were identified mainly in association with crowns and bridges, suggesting the presence of mature biofilm communities on these restorative surfaces. Their occurrence was more apparent in regions that favored plaque retention and reduced accessibility to oral hygiene measures. Bridges appeared to harbor a broader range of microbial species than individual fillings and crowns. The subpontic areas and connector regions provided protected environments that favored microbial retention and biofilm development.

Table 1. Distribution of microorganisms identified on dental restorations, crowns, and bridges.

Microorganism	Associated Restoration Site
Streptococcus spp.	Restorative surfaces
Lactobacillus spp.	Plaque-retentive areas
Actinomyces spp.	Plaque-retentive areas
Porphyromonas spp.	Crowns and bridges
Fusobacterium spp.	Crowns and bridges
Candida spp.	Restorative surfaces, crowns and bridges

Discussion

The present study demonstrated that dental restorations, crowns, and bridges harbor diverse microbial communities, confirming that restorative surfaces can serve as sites for biofilm accumulation and microbial persistence. The predominance of Streptococcus species observed in the current investigation is consistent with their established role as primary colonizers of oral biofilms and important contributors to cariogenic processes [5,6]. Previous studies have shown that Streptococcus spp. are commonly associated with both natural tooth surfaces and restorative materials, where they facilitate the attachment and succession of other microorganisms within the developing biofilm [7].

The isolation of Lactobacillus and Actinomyces species further supports the presence of cariogenic microbial communities on restorative surfaces. These microorganisms are frequently associated with plaque accumulation and caries progression because of their ability to metabolize carbohydrates and thrive in acidic environments [3,8]. According to Marsh and Zaura [1], ecological changes within dental biofilms favor the growth of acidogenic and aciduric microorganisms, contributing to the development and persistence of carious lesions.

Periodontal-associated microorganisms, including Porphyromonas and Fusobacterium species, were also identified in the present study. These bacteria are recognized components of mature oral biofilms and have been implicated in periodontal inflammation and tissue destruction [2]. Their presence on crowns and bridges suggests that restorative and prosthetic surfaces may provide protected niches that facilitate the retention of periodontal pathogens, particularly when oral hygiene is inadequate.

The greater microbial diversity observed around bridge restorations is consistent with previous reports indicating increased microbial colonization around fixed prostheses. Ruzimbetov [9] reported that crowns and bridges promote microbial accumulation in areas that are difficult to clean, especially around pontics and connector regions. Similarly, Fastovets et al. [10] demonstrated that restorative materials and prosthetic

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designs can influence the composition of gingival microbiota and affect periodontal tissue health. Supporting these findings, Vohra et al. [11] observed alterations in salivary microbial profiles associated with fixed partial dentures and reported increased microbial accumulation around prosthetic restorations, highlighting the potential impact of fixed prostheses on oral microbial ecology and gingival health.

The detection of Candida species on some restorative surfaces highlights that oral biofilms are not exclusively bacterial but may also include fungal microorganisms. The oral microbiome is a complex ecosystem in which bacteria and fungi interact to influence biofilm development, pathogenicity, and oral health status [4,12].

Conclusion

Dental restorations, crowns, and bridges are frequently colonized by a diverse range of microorganisms. *Streptococcus* spp, *Lactobacillus* spp., and *Actinomyces* spp. were among the most prevalent microorganisms identified. Bridges demonstrated the greatest microbial diversity, whereas fillings showed a predominance of cariogenic microorganisms. These findings underscore the importance of appropriate restoration design, regular professional maintenance, and effective oral hygiene practices in minimizing microbial accumulation and reducing restoration-related complications.

Conflicts of Interest

Nil

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