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"**ORAL MICROFLORA**"- Its importance in Prosthodontics- A Narrative Review

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ABSTRACT:

The microorganisms found in the human oral cavity have been referred to as the oral microflora, oral microbiota, or more recently as the oral microbiome. The resident oral microflora develops in an orderly manner via waves of microbial succession (both autogenic and allogenic). Oral microflora is the aggregate of microorganisms residing in the mouth, and more than 700 bacterial species have been detected that can be found intraorally. When oral bacterial species form a coating on teeth, dentists recognize this as dental plaque, or dental biofilm. The metabolism of these organisms modifies local environmental conditions, facilitating subsequent attachment and growth by later, and more fastidious, colonisers. Eventually, a stable biofilm community develops, that plays an active role in (a) the normal development of the physiology of the habitat. Thus, when considering treatment options, clinicians should be aware of the need to maintain the beneficial properties of the resident oral microflora.

INTRODUCTION:

The term microbiome was coined by Joshua Lederberg "to signify the ecological community of commensal, symbiotic, and pathogenic microorganisms that literally share our body space and have been all but ignored as determinants of health and disease".[1]

Human mouth contains a wide range of sites with different environmental characteristics; the oral flora consists of a complex mixture of microbial species, which include bacteria, mycoplasma, fungi, and protozoa. The mouth consists of a number of ecological niches that are colonized by a characteristic mixture of microorganisms. [2,3]

Many oral bacteria have been implicated in dental diseases resulting from a dysbiosis. Imbalance in the different types of bacteria Favors microorganisms that can be harmful by playing a lead role in the disease process. Two species of bacteria are major contributors to dental disease: Streptococcus mutans (S. mutans) and Porphyromonas gingivalis (P. gingivalis). In addition, lactobacilli are linked to root caries.[4]

An imbalance in the oral flora can occur for many reasons, for instance, due to a diet high in fermentable carbohydrates that changes the pH of the environment, or a thick biofilm buildup that protects the microorganisms Finally, the mouth can also be invaded by opportunistic pathogens. Oral microflora refers to the diverse community of microorganisms that naturally inhabit the human mouth. These microorganisms include bacteria, fungi, viruses, and other microbes. They are present on the teeth, gums, tongue, and other oral surfaces. Oral microflora play a crucial role in maintaining oral health by helping to digest food, protecting against harmful bacteria, and contributing to the immune system's function. However, an imbalance in oral microflora can lead to oral diseases such as dental caries (cavities) and periodontal diseases. [5]

Significance of oral microflora: [6-8]

Oral microbiome is crucial to health as it can cause both oral and systemic diseases. It rests within biofilms throughout the oral cavity and forms an ecosystem that maintains health in a state of equilibrium. However, certain imbalances in this state of equilibrium allow pathogens to manifest and cause disease.

Oral microflora, the diverse community of microorganisms in the mouth, holds significant importance in several aspects of oral health and overall well-being:

Digestion and Nutrient Cycling: Certain bacteria in the oral cavity help break down food particles and initiate the digestion process, aiding in nutrient absorption.

Protection Against Pathogens: Healthy oral microflora can outcompete harmful bacteria, preventing them from colonizing and causing infections. They create a barrier effect known as colonization resistance.

Immune System Regulation: The oral microbiota interacts with the immune system, influencing its development and response. This interaction is crucial for maintaining immune balance and responsiveness.

Oral Health Maintenance: Balanced microflorae contribute to maintaining oral pH balance, preventing acid erosion of teeth, and reducing the risk of dental caries (cavities) and periodontal diseases.

Systemic Health: Research suggests connections between oral health and systemic conditions such as cardiovascular disease, diabetes, and respiratory infections, implicating oral microflora in systemic health outcomes.

How microflora affects oral and general health?

Oral microflora profoundly influences both oral and general health through various mechanisms: [9-14]

1.Oral Health:

a).Dental Caries (Cavities): Certain bacteria, like Streptococcus mutans, metabolize sugars into acids, leading to enamel erosion and cavity formation.

b).Periodontal Diseases: Imbalances in oral microflora can trigger inflammation and gum disease. Porphyromonas gingivalis is associated with periodontitis, causing tissue destruction around teeth.

c).Halitosis (Bad Breath): Anaerobic bacteria produce volatile sulfur compounds, contributing to bad breath if they dominate the oral microbiome.

2.General Health:

a).Cardiovascular Disease: Chronic periodontitis is linked to increased risk of heart disease and stroke due to systemic inflammation and bacterial translocation.

b).Diabetes: Periodontal disease can worsen glycemic control in diabetes patients, potentially due to inflammatory cytokines and bacterial byproducts affecting insulin sensitivity.

c).Respiratory Infections: Aspiration of oral pathogens can cause pneumonia, especially in vulnerable populations such as the elderly or those with compromised immune systems.

How to maintain the balance of oral microflora: [15]

Maintaining a balanced oral microflora is crucial for oral health. Here are some practices supported by studies that help promote a healthy oral microbiome:

1.Good Oral Hygiene:

a).Brushing: Brush teeth twice a day with fluoride toothpaste to remove plaque and food particles.

b).Flossing: Clean between teeth daily to remove plaque and prevent gum disease.

Tongue Cleaning: Gently clean the tongue surface to remove bacteria that contribute to bad breath.

2.Dietary Considerations:

a).Limit Sugars: Reduce sugar intake, especially sugary drinks and snacks, to minimize acid production by bacteria.

b).Eat Balanced Meals: Consume a diet rich in fruits, vegetables, and whole grains, which support a healthy oral environment.

3.Regular Dental Visits:

a). Proffessional Cleaning: Visit the dentist regularly for professional cleanings and oral exams to detect and treat oral health issues early.

4.Avoid Tobacco Products:

Tobacco use contributes to gum disease and oral cancer, disrupting the oral microbiome's balance.

5.Probiotics and Prebiotics:

a).Probiotics: Certain probiotic strains, like Lactobacillus reuteri and Lactobacillus salivarius, can help restore oral microbial balance and reduce harmful bacteria.

b).Prebiotics: Foods rich in prebiotic fibers (e.g., onions, garlic, bananas) promote the growth of beneficial bacteria in the mouth.

6.Stress Management:

Chronic stress can affect oral health by weakening the immune system. Practice stress-reducing activities like meditation or yoga.

Effect of oral microflora environment changes: [16]

When the oral microflora environment undergoes significant changes, it can lead to various oral health issues and potentially affect systemic health. Here are some consequences:

a).Increased Risk of Dental Caries (Cavities):

Changes in oral microflora, such as an increase in acid-producing bacteria like Streptococcus mutans, can lead to demineralization of tooth enamel and the development of cavities.

b).Periodontal Diseases:

a).Dysbiosis (imbalance) in the oral microbiome can promote the growth of periodontal pathogens like Porphyromonas gingivalis, leading to inflammation of the gums (gingivitis) and, if untreated, progression to periodontitis.

b).Halitosis (Bad Breath):

Changes in the oral microflora, particularly an increase in anaerobic bacteria that produce volatile sulfur compounds, can contribute to persistent bad breath.

Systemic Health Implications:[12]

Oral dysbiosis has been linked to systemic conditions such as cardiovascular disease, diabetes, and respiratory infections, though the exact mechanisms are still under investigation.

Impact on Immune Function:

Changes in oral microflora can affect local immune responses in the mouth, potentially compromising the body's ability to defend against infections.

Overall, maintaining a balanced oral microflora through proper oral hygiene, diet, and regular dental care is essential for preventing dysbiosis and associated oral health problems. Monitoring and addressing changes in oral microbiota can help mitigate risks to both oral and systemic health.

The relation of oral microflora and prosthodontic treatments : [17]

The relationship between oral microflora and prosthodontic treatments, which involve the replacement or restoration of teeth and surrounding tissues, is significant. Here's how oral microflora can influence and be influenced by prosthodontic procedures:

A).Dental Implants and Microbiota:[18]

i.Biofilm Formation: Oral microflora can form biofilms on implant surfaces, potentially leading to peri-implantitis if not properly managed. This inflammatory condition can cause bone loss around the implant.

ii.Implant Success: The composition of the oral microbiota can impact the success of dental implants. A balanced microbiome may support better integration and long-term stability of implants.

B). Dentures and Microbial Colonization:

i.Biofilm Development: Dentures can harbor biofilms of microorganisms, contributing to oral infections such as denture stomatitis (inflammation of oral tissues beneath dentures).

ii.Hygiene Practices: Proper cleaning of dentures and oral hygiene maintenance are crucial to prevent microbial colonization and associated oral health issues.[19]

C).Surgery and Microbiota Changes:

i.Post-Surgical Healing: Prosthodontic surgeries can temporarily alter the oral microbiota due to tissue trauma and the introduction of foreign materials.

ii.Infection Risk: Disruption of the oral microbiota during surgeries may increase the risk of infections, emphasizing the importance of preoperative and postoperative oral care protocols.[20]

D).Periodontal Health and Prosthodontics:

i.Gum Health: Prosthodontic treatments can influence periodontal health and the balance of oral microflora, particularly around prosthetic margins.

ii.Maintenance: Regular professional maintenance and home care are essential to prevent microbial accumulation and maintain oral health.[21]

Role of microflora in systemic disease patients undergoing prosthodontic treatment with supportive literature

The role of oral microflora in patients with systemic diseases undergoing prosthodontic treatment is an important area of study, as systemic conditions can influence oral health and microbial balance. Here are some insights supported by literature:

I.Impact on Oral Health:

a)>Diabetes: Patients with diabetes are more susceptible to periodontal diseases due to impaired immune response and elevated glucose levels that can promote bacterial growth. Prosthodontic treatments, such as dental implants or dentures, can be affected by these conditions, influencing healing and long-term outcomes. [22]

b).Cardiovascular Diseases:

Chronic periodontitis, exacerbated by dysbiosis in the oral microbiota, has been linked to increased risks of cardiovascular diseases. Prosthodontic treatments that alter the oral environment can potentially influence microbial balance and systemic health outcomes in these patients.[23]

c).Respiratory Diseases:

Oral microflora can contribute to respiratory infections, particularly in patients with compromised immune systems or chronic respiratory conditions. Prosthodontic treatments, if not managed properly, may introduce or exacerbate microbial challenges in these patients.[24]

d).Systemic Inflammatory Conditions:

Conditions such as rheumatoid arthritis or inflammatory bowel diseases can influence oral health and the composition of oral microflora. Prosthodontic treatments may need to consider these systemic factors to optimize treatment outcomes and minimize exacerbation of oral and systemic inflammation.[25]

e).Immune Compromised Patients:

Patients undergoing immunosuppressive therapies or with immunodeficiency disorders are at heightened risk of oral infections and microbial complications following prosthodontic treatments. Careful management of oral hygiene and microbial balance is crucial in these cases.

Guidelines from organizations like the American Academy of Oral Medicine provide recommendations for managing oral health in immunocompromised patients undergoing dental procedures.

In summary, understanding the role of oral microflora in systemic disease patients undergoing prosthodontic treatment involves considering how systemic conditions influence oral health and microbial balance. Literature highlights the need for personalized approaches that integrate systemic health considerations to optimize treatment outcomes and reduce the risk of complications.[26]

CONCLUSION:

Understanding the relationships underscores the importance of integrating microbial considerations into prosthodontic treatment planning and maintenance protocols. Proper management of oral microflora supports the longevity and success of prosthodontic interventions while minimizing the risk of oral infections and complications.

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