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THE IMPORTANCE OF **'IMMUNITY'** AND **'PROSTHODONTIC TREATMENTS'**- A NARRATIVE REVIEW

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INTRODUCTION:

The immune system has evolved to protect the host from an ever-growing world of pathogenic microbes. The immune system also helps the host eliminate toxic or allergenic substances that enter the body. The host uses internal and adaptive mechanisms to recognize and eliminate pathogens. Pathogens have a variety of mechanisms by which they multiply, spread, and threaten the normal functioning of the host. At the same time, the immune system destroys pathological microbes and toxic or allergenic proteins. [1] The immune system is a complex network of cells, tissues and organs that work together to protect the body from harmful pathogens such as bacteria, viruses, fungi and parasites. So far, the dental fraternity not given much importance to the immune related dental diseases and their treatment. As such very less prosthodontic literature is available on this important topic, hence this narrative review aimed to focus on the importance of immune and its effect on different prosthodontic treatment modalities.

Immunity refers to the body's ability to resist and fight off infection or disease. It involves a complex network of cells, tissues, and organs that work together to defend the body against harmful pathogens such as bacteria, viruses, fungi, and parasites. Different immunity systems are given below. (Fig-1) [2]

1. Innate immunity: [3]

Innate immunity is the body's first line of defence and provides continuous and independent protection against pathogens. These include physical barriers (eg skin), chemical barriers (eg stomach acid) and immune cells such as macrophages and natural killer cells.

2. Adaptive (acquired) immunity: [4] Adaptive immunity throughout life in response to pathogens. It contains immune cells called lymphocytes (B cells and T cells) that produce antibodies and target specific antigens on pathogens. Adaptive immunity also provides immunological memory, which allows for a faster and stronger response when exposed to that pathogen.

2A. Passive Immunity: It is a temporary disease that is passed from one person to another. This happens naturally, for example through maternal antibodies that are given to the fetus during pregnancy or breastfeeding. Immunization can also be acquired using antibodies, which provide permanent but temporary protection.[2]

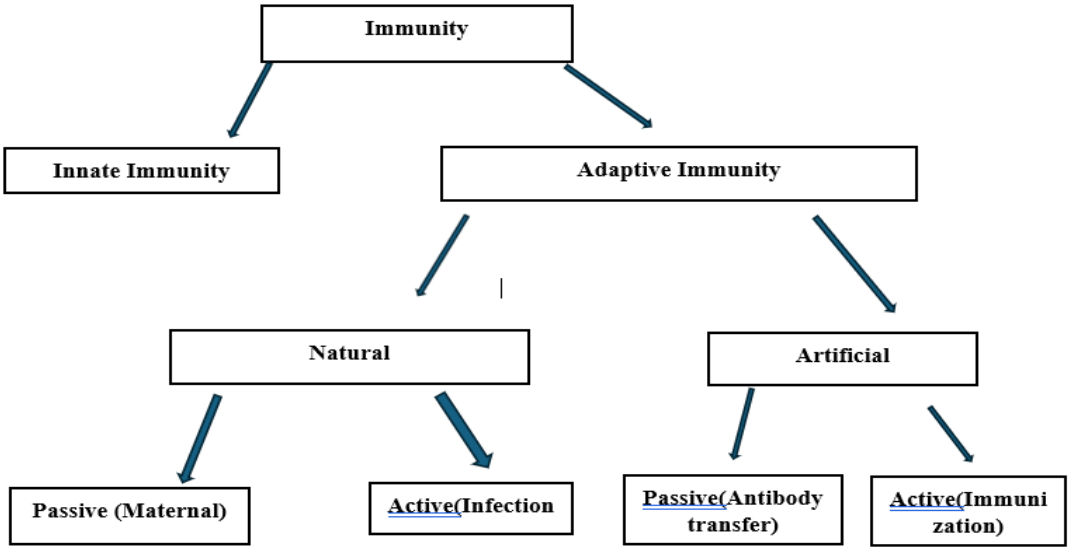

Fig-1:Flow Chart depicting different Immune systems

2B. Vaccine-Induced Immunity: Immunization is a form of adaptive immunity caused by vaccines containing weakened or inactivated pathogens or their antigens. Vaccines strengthen the immune system to recognize and respond quickly to specific pathogens, preventing disease or reducing the burden of subsequent exposure. [4]

2C. Mucosal Immunity: Mucosal immunity protects mucous membranes lining various body cavities exposed to the external environment, such as the respiratory, gastrointestinal, and urogenital tracts. It involves specialized immune cells and antibodies that prevent pathogens from entering the body through these surfaces.[5]

These various forms of immunity work together to provide comprehensive protection against a wide range of pathogens, contributing to overall health and disease resistance in individuals.

IMMUNITY AND ORAL TISSUES:

Immunity in oral tissues plays a crucial role in maintaining oral health and protecting against pathogens that constantly interact with the mouth's external environment. Key aspects of immunity as it relates to oral tissues:

a). Innate immunity in Oral tissues: Innate immunity is the body's first line of defence and provides continuous and independent protection from pathogens. These include physical barriers (eg skin), chemical barriers (eg stomach acid) and immune cells such as macrophages and natural killer cells. Innate immunity in the oral cavity, it can lead to increased susceptibility to dental caries, periodontal disease, and oral candidiasis. Systemically, it can result in higher rates of infections, chronic inflammatory diseases, increased cancer risk, and cardiovascular diseases.

Understanding the interplay between innate immunity and health is crucial for developing strategies to enhance immune function and prevent related health issues.[6]

b). Adaptive immunity in the oral tissues: These immune cells are located in the oral mucosa lymphoid tissue (MALT), such as the tonsils and adenoids, where they sense and react to specific pathogens. B cells in the oral lymph tissue produce antibodies (IgA, IgG) that destroy pathogens and prevent adhesion to oral surfaces. [7]

c). Mucosal infection: Secretory IgA is abundant in saliva and plays an important role in eliminating pathogens before they are present in the mouth. Mucosal-Associated Lymphoid Tissue (MALT) are specialized immune structures in the oral cavity, like Waldeyer's tonsillar ring, contribute to local immune responses against infections. [8]

d). Microbiota and Oral Immunity: The oral microbiota interacts dynamically with the immune system, influencing immune responses and maintaining microbial balance (eubiosis). Dysbiosis in the oral microbiota can trigger inflammatory responses and contribute to oral diseases like periodontitis and dental caries.[9]

SYSTEMIC DISEASES IN PATIENTS WITH REDUCED BODY IMMUNITY:

Several systemic diseases and conditions can lead to a decrease in overall body immunity, making individuals more susceptible to infections such as:

HIV/AIDS: HIV (Human Immunodeficiency Virus) attacks the immune system's CD4 cells, weakening the body's ability to fight infections and diseases. This can progress to AIDS (Acquired Immuno Deficiency Syndrome), where the immune system is severely compromised.[10]

Cancer: Cancer, especially leukemia and lymphoma, can impair the function of the immune system. Chemotherapy and radiation therapy to treat cancer can also suppress immune responses and make patients more vulnerable to disease.[11]

Autoimmune Diseases: Autoimmune diseases, like rheumatoid arthritis, lupus, and multiple sclerosis, occur when the immune system mistakenly attacks healthy tissues. This can lead to chronic inflammation and compromise immune function.[12]

Chronic Diseases: Chronic diseases such as diabetes mellitus, chronic kidney disease, and chronic obstructive pulmonary disease (COPD) can weaken the immune system, increasing susceptibility to infections and impairing immune responses.

Malnutrition: Inadequate nutrition, including deficiencies in key nutrients like vitamins (e.g., vitamin D) and minerals (e.g., zinc), can compromise immune function, impairing the body's ability to mount an effective immune response. Generalized signs and symptoms of decreased immunity in the Oral cavity:[13]

GENERALIZED SIGNS AND SYMPTOMS OF DECREASED IMMUNITY IN THE ORAL CAVITY:[13]

Decreased immunity can manifest in various signs and symptoms in the oral cavity, often indicating compromised immune function and increased susceptibility to infections.

Oral Ulcers and Lesions: Persistent or recurrent oral ulcers, such as aphthous ulcers (canker sores), may indicate reduced immune function. These wounds can be painful and slow to heal.

Gingivitis and periodontal disease: Increased susceptibility to gingivitis (inflammation of the gums) and periodontal disease, characterized by bleeding, tissue swelling and constipation, which may indicate a lower immune response.

Oral Thrush (Candidiasis): Candidiasis, characterized by white patches on the tongue and inner cheeks that can be wiped away, is common in individuals with weakened immune systems, such as those with HIV/AIDS or undergoing chemotherapy.

Recurrent Oral Infections: Frequent or recurrent oral infections, such as bacterial infections (e.g., recurrent abscesses) or viral infections (e.g., recurrent herpes simplex outbreaks), may indicate impaired immune surveillance and response.

Delayed Wound Healing: Delayed healing of oral wounds following dental procedures or trauma can be a sign of compromised immune function, affecting the regeneration of oral tissues.

HOW TO MANAGE PROSTHODONTIC TREATMENT FOR EDENTULOUS PATIENTS WITH REDUCED IMMUNITY POWER :

Managing prosthodontic treatment in edentulous patients with reduced immunity involves careful planning and execution to minimize the risk of complications. Here are key considerations: [14]

Conduct a thorough medical history review to assess the patient's immune status, underlying conditions (e.g., diabetes, cancer), and medications (e.g., immunosuppressants). Obtain medical authorization from the physician or specialist managing the patient's condition. Adhere to infection control procedures, including sterilization of instruments and disinfection of dental surgical surfaces. Use personal protective equipment (PPE) to minimize exposure.

Choose bio-compatible materials to reduce the risk of allergic reactions and infections. If available, consider antimicrobial properties and coatings for prosthetic components. Choose minimally invasive procedures to reduce pain and stress on the immune system. Close counters or temporary counters should be considered to reduce treatment time and patient exposure. Depending on the patient's condition and medical history, consider prophylactic antibiotic treatment before or after invasive procedures. Follow evidence-based guidelines for antibiotic resistance in allergic patients.[15].

PROSTHODONTIC TREATMENT IN IMMUNO COMPROMISED PATIENTS:

In immunocompromised patients, certain prosthodontic treatments may be contraindicated or require special considerations due to the increased risk of complications.[16]

Dental Implants: Dental implant placement involves a surgical procedure that can pose a risk of infection, especially in immunocompromised patients who may have reduced ability to fight off bacterial challenges. Careful patient selection and management are crucial to minimize the risk of peri-implantitis and implant failure in immunocompromised individuals.

Invasive Full Mouth Rehabilitation: Extensive prosthodontic treatments, such as full mouth rehabilitation involving multiple surgeries and extensive dental procedures, can increase the risk of postoperative infections and

delayed healing in immunocompromised patients. Importance of assessing immune status and considering alternative, less invasive treatment options when managing edentulous patients with compromised immunity.[17].

Complex Prosthetic Reconstructions:

Complex prosthodontic procedures, such as fixed or removable prosthodontics requiring extensive adjustments or multiple adjustments, may increase the risk of mucosal trauma. **Orthognathic Surgery**: Orthognathic surgery, which involves surgical repositioning of the jaws to correct bite abnormalities, can pose risks of postoperative infection and delayed healing in immunocompromised patients.

Immediate Dentures: Immediate dentures, which are placed immediately after tooth extraction, may increase the risk of postoperative infections and complications in immunocompromised patients due to reduced healing capacity.

Anti immune drugs can be suggested before or after prosthodontic treatment. The use of immunosuppressive medications before or after prosthodontic treatment in immunocompromised patients requires careful consideration and should be managed in consultation with the patient's healthcare team. Prophylactic antibiotic therapy may be recommended in immunocompromised patients before invasive prosthodontic procedures to prevent infections. The American Heart Association (AHA) and American Dental Association (ADA) guidelines recommend antibiotic prophylaxis in patients at risk for infective endocarditis and other systemic diseases.

Adjunctive Anti-Inflammatory Medications:

Non-steroidal anti-inflammatory drugs (NSAIDs) or corticosteroids may be prescribed to manage inflammation and pain following prosthodontic surgery or extensive procedures in immunocompromised patients. Antifungal medications may be indicated before or after prosthodontic treatment in immunocompromised patients to prevent or treat oral candidiasis (thrush). Clinical guidelines and reviews in Journal of Antimicrobial Chemotherapy and Clinical Infectious Diseases provide recommendations for antifungal therapy in immunocompromised patients with oral candidiasis. Antiviral medications may be prescribed to manage herpes simplex virus (HSV) infections before or after prosthodontic procedures in immunocompromised patients prone to recurrent outbreaks.

Immune Modulators: Depending on the specific immune condition and its management, immune modulating drugs such as monoclonal antibodies (e.g., TNF inhibitors) may be used to control inflammation and disease activity before or after prosthodontic treatment. Intrinsic immunity plays an important role in protecting the body against dental diseases. It is the first line of defence with physical, chemical and cellular defences that quickly respond to pathogens.

EFFECT OF DECREASED INNATE IMMUNITY ON DENTAL AND SYSTEMIC HEALTH OF THE PATIENTS:

Decreased innate immunity can significantly impact both dental and systemic health, leading to increased susceptibility to infections and other health complications.

Effects on Dental Health:

Decreased saliva flow or impaired activity of antimicrobial peptides increases the risk of tooth decay. Saliva plays an important role in neutralizing acids produced by bacteria, and without bacteria, the oral microbiota becomes unbalanced. [18] Impaired innate immune response may lead to impaired neutrophil function and ineffective removal of periodontal pathogens. This can lead to chronic inflammation and destruction of the periodontal tissues. [19] Individuals with weakened immune systems are more susceptible to oral candidiasis, especially when salivary antimicrobial protein levels are reduced or phagocytic cell function is impaired. [20].

Effects on Systemic Health:

A weakened immune system increases the risk of infection. When the body's first line is compromised, pathogens can multiply and cause disease.[21] Chronic inflammation from congenital malformations can lead to a variety of inflammatory conditions, including rheumatoid arthritis and inflammatory bowel disease. [22] Persistent inflammation and reduced ability to control inflammation caused by pathogens increases the risk of certain cancers. Chronic diseases and inflammation lead to cell damage and tumor growth. [23] There is a positive correlation between periodontal disease and cardiovascular disease. Systemic inflammation caused by periodontal pathogens may contribute to atherosclerosis and other cardiovascular diseases. [24].

EFFECT OF DECREASED ADAPTIVE IMMUNITY ON DENTAL AND SYSTEMIC HEALTH OF THE PATIENTS :

Decreased adaptive immunity can have significant repercussions on both dental and systemic health. The adaptive immune system, characterized by its specificity and memory, is crucial for long-term immunity and effective pathogen eradication.

Effects on Dental Health:

Reducing gum disease can have significant benefits for dental health and systemic health. The adaptive immune system, characterized by specificity and memory, is important for long-term immunity and elimination of pathogens. Effects on dental health.Increased susceptibility to periodontal disease. The immune response, particularly the activation of T cells and B cells, plays an important role in controlling periodontal pathogens. Disruption of these cells leads to inappropriate disease control and chronic inflammation, which can lead to tissue death.[25] People with weakened immune systems are more prone to oral infections, such as herpes simplex virus (HSV) reactivation and oral candidiasis. The ability of the adaptive immune system to recognize and respond to these pathogens is critical to preventing chronic disease. [26] Adaptive immunity involves wound healing through the action of cytokines and growth factors produced by T cells and other immune cells. Reduced adaptive immunity can interfere with the healing process in the oral cavity, leading to longer healing times and complications after dental procedures.[27].

Effects on Systemic Health:

The adaptive immune system is important for protection against specific pathogens through the action of antibodies and cytotoxic T cells. Reduced immunity increases susceptibility to bacterial, viral and fungal infections. [28] Disruption of the adaptive immune system leads to loss of tolerance to self-antigens, resulting in autoimmune diseases such as systemic lupus erythematosus (SLE) and rheumatoid arthritis (RA). These conditions mean that the immune system attacks the body's own tissue. [29] Reduced adaptive immunity may contribute to the development and worsening of chronic inflammatory diseases, such as inflammatory bowel disease (IBD). The immune response of T cells is important in these diseases. [30] The adaptive immune system plays a role in monitoring and eliminating harmful cells. Decreased immunity impairs this screening process and increases the risk of cancer and its progression. [31].

Decreased adaptive immunity can reduce the effectiveness of vaccinations, as the immune system's ability to generate a memory response and produce specific antibodies is compromised.[32]

It has significant effects on dental health and physical health. In the oral cavity, there is a greater susceptibility to periodontal disease, more oral diseases and less healing. Systemically, it increases susceptibility to disease, increasing the risk of autoimmune diseases, chronic inflammatory diseases, cancer and decreased immunity. Understanding the

role of the immune system in health is important in developing strategies to improve immune function and prevent health-related problems.

CONCLUSION:

A multifaceted approach is needed to provide safe and effective dental treatment for patients with dementia. Individualized treatment planning and adherence to best practices will ensure optimal results and minimize the risk associated with disease progression. It involves the interaction of various components and mechanisms that work together to protect against pathogens. Understanding the role of the immune system in dental health can better develop preventive and therapeutic strategies for dental diseases.

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