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Nutrition and periodontium: Review article

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Abstract

Periodontal health is influenced by a number of factors such as oral hygiene, genetic and epigenetic factors, systemic health, and nutrition. Moreover, bone formation and periodontal regeneration are also affected by numerous vitamins, minerals, and trace elements. The majority of opinions & research findings on the effects of nutrition on oral & periodontal tissues point the following: There are no nutritional deficiencies that by themselves can cause gingivitis/periodontitis. However, they affect the condition of periodontium & thereby may accentuate the deleterious effects of plaque-induced inflammation in susceptible individuals.

Keywords: Nutrition, periodontium

Introduction

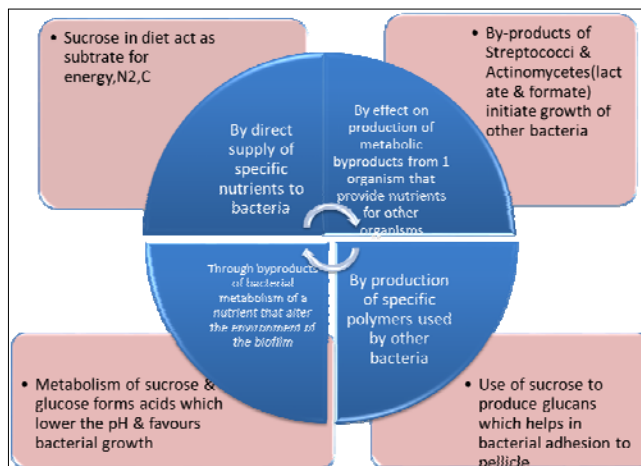
“Nutrition” is defined as the science of how the body utilises food to meet the requirements for the development, growth, repair and maintenance.

Relation of Oral Tissues with Nutrition

- The nutritional state of a person is often manifested in the oral tissues. Why???
- Because of the rapid turnover rate of cells in this area & the bacterial onslaught this area receives.
- A healthy oral epithelium, eg. experiences 3-day to 7-day cell turnover & acts as an effective barrier to toxins.
- Inadequate nutrition may cause the tissues to breakdown, become infected & develop lesions.
- The oral health care provider can aid pt.’s health & well being by providing nutritional information as it relates to conditions pertinent to oral health and general health & in doing so, improve the quality of life of the community in which they live! ^[1, 2].

Host Nutrition and Plaque Biofilm ^[3, 4, 5]

4 mechanisms by which nutrition impacts biofilm are:



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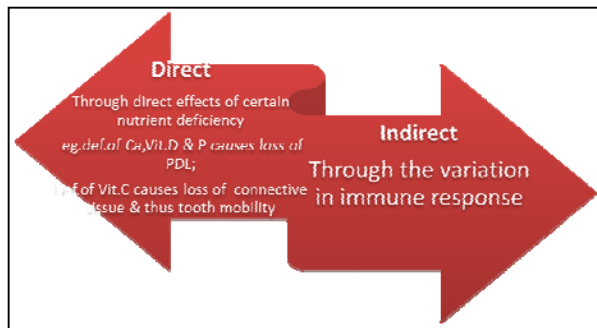
Role of Nutrition in Periodontal Diseases [4]

Although the primary etiology of periodontal disease is bacterial; host & environmental factors modulate the severity of disease.

- These factors are:

Genetics
 Chronic diseases
 Tobacco use
 Socio-economic level
 Education level
 Frequency of dental visits
 “Local & systemic nutrition”

- The last factor has 2 types of effects on the development of periodontal diseases-
- Direct effects of nutrient deficiencies have already been discussed in previous slides.
- It is important that dental professionals be able to identify pts. at risk for poor nutrition, which may compromise their immune response & place them at higher risk of infection.
- Deterioration of oral health is highly co-related with deterioration of general health; making it essential that the pt. be well nourished in order to respond to the challenge of infectious disease like periodontal disease! [5, 6]



Interaction of Immunity, Infection and Nutritional status

According to R.K Chandra; Nutrition is “critical determinant of immune response” due to the fact that “nutrients derived from food sources interact with immune cells in the blood stream, lymph nodes & specialised immune system of GIT.”

- Infections have adverse effect on nutritional status.
- Poor nutritional status makes a person prone to various infections.

In a periodontal disease; host immune system responds to a bacterial challenge with a well regulated response consisting of:

- Innate factors
- Adaptive factors [7]

Innate immunity

- By non-specific defences like-skin, mucosa, phagocytes, saliva, mucous.
- Oral mucosa acts as 1st line of defence as it prevents penetration of bacterial virulence factors.
- Nutritional deficiencies like that of vit.C, vit.B etc. cause deleterious effects on the integrity of oral mucous membrane, thus causing infection.
- Saliva is also protective agent against periodontal pathogens (by active lysozyme, lactoperoxidase &

antibodies)

- Leucocytes are next line of defense. The neutrophils phagocytose pathogens; monocytes communicate with lymphocytes and antigen presenting cells and; macrophages act by chemotaxis.
- Any nutritional deficiency lowers immunity; decreases efficiency of these cells and cause infection...

Adaptive immunity

- Lymphocytes (T & B cells) and mast cells mediate adaptive immunity.
- They are involved in the changes in the connective tissue associated with periodontal infection, repair & healing [8, 9, 10]

Effect of Nutritional Deficiencies on Infection [11, 12, 13]

Nutrient	Deficiency effect on immune response
Protein	Dec. salivary anti-microbial properties Dec. Immunoglobulin production Dec. lysozymes Dec. activation of lymphocytes Dec. antibody production Inc. bacterial adhesion
Vit.A	Dec. immune cell differentiation Dec. antigen response Dec. antibody production Dec. immunoglobulin production Dec. lymphocyte production Inc. bacterial adhesion
Vit.E	Dec. antibody response Dec. phagocytic function Dec. cytotoxic T-cell activity
Nutrient	Deficiency effect on immune response
Vit.C	Dec. antibody response Dec. phagocytic function Dec. cytotoxic T-cell activity
Vit.B complex	Dec. antibody synthesis Dec. cytotoxic T-cell activity Dec. lymphocyte response Dec. lymphocyte production Dec. phagocytic function
Zinc	Dec. antibody response Dec. phagocytic function Dec. B & T cell proliferation
Iron	Dec. antibody response Dec. phagocytic function Dec. B & T cell proliferation

Effect of Infection on Nutritional Status [14]

- Negative nitrogen balance
- Loss of lean body mass
- Anorexia
- GIT problems
- Hypermetabolism
- fever

Negative impact on nutritional state

Periodontal Defense Factors affected by Nutrition [15, 16, 17]

- Exact mechanism not known
- Alfano (1976) suggested that any of basic periodontal defense factors could be affected like:

- Saliva- in activity of lactoferrin
Lactoperoxidase
Lysozyme
Secretory IgA

- b) *Gingival crevicular fluid*-in activity of lysozyme
Complement
Antibodies
- c) *Gingival sulcular epithelium*-nutrients are required for rapid turnover rate of epithelium
- d) *d)Basement membrane*-by disruption in formation of basement collagen

Nutrition and Older Adults ^[18]

- Older adults have lesser intake of food.
- This causes deficiency of nutrients; predisposing them to infections.
- *Causes of nutritional deficiency in old age:*
 1. physical conditions (disability)
 2. medical conditions (oral disorders, GIT diseases, metabolic diseases)
 3. psychosocial conditions (living alone, bereavement, depression)

Immune senescence: term given to the process of decline of immune response with age.

Nutritional consideration in Surgical Patient ^[19]

- Nutrition affects a surgical patient through its effect on the healing of the surgical wound.
- Wound healing requires energy derived from various nutrients in following ways-
 1. Proteins: strength of fracture repair
 2. Vit.A: epithelialisation, collagen synthesis, cross linking, fibroblast differentiation
 3. Vit.C: co-factor in hydroxylation of lysine & proline in collagen synthesis
 4. Vit.D & Calcium : healing of hard tissues
 5. Vit.E: decreases damage from oxygen free radicals
 6. Vit.K: activation of clotting factors

Nutrition Strategies to enhance Immunity & Prevent Infection ^[20, 21, 22]

- The American Dental Association & American Dental Hygiene Association recommended the following nutrition recommendations such as the USDA food guide pyramid & the dietary guidelines for Americans as basic guidelines for educating & counselling the patient about the poor nutrition & oral health.

USDA pyramid

- The Food Guide Pyramid is one of the ways to make people understand how to eat healthy.
- It explains how much & what should be included for a balanced diet.

Dietary Guidelines

1. A nutritionally adequate diet should be consumed through a wise choice from a variety of foods.
2. Additional food & extra care be required during pregnancy & lactation.
3. Exclusive breast feeding should be practised for upto 6 months; & continued upto 2 years.
4. Food supplements should be introduced to infants after 6 months.
5. Adequate & appropriate diet should be taken by children & adolescents; both in health and disease.
6. Green leafy vegetables & fruits should be used in plenty.
7. Cooking oils & animal foods should be used in

moderation and vanaspati/ghee/butter should be used sparingly.

8. Over eating should be avoided to prevent over weight & obesity.
9. Salt should be used in moderation.
10. Water should be taken in adequate amounts ^[23, 24, 25].

Conclusion

- Some clinicians enthusiastically adhere to the theory in periodontal disease that assigns a key role to nutritional deficiencies & imbalances.
- The majority of opinions & research findings on the effects of nutrition on oral & periodontal tissues point the following:
 1. There are no nutritional deficiencies that by themselves can cause gingivitis/periodontitis. However, they affect the condition of periodontium & thereby may accentuate the deleterious effects of plaque-induced inflammation in susceptible individuals.
 2. There are nutritional deficiencies that produce changes in the oral cavity. These include- alterations of tissues of the lips, oral mucosa, gingiva & bone. These are considered to be periodontal & oral manifestations of nutritional diseases.

Thus, what we eat or don't eat has a lasting effect on the quality of dental as well as oral health, directly or indirectly.

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