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NUTRITION AND DISEASE: IMPLICATIONS FOR ORAL HEALTH*

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This review is about a strong link between oral health and body health. Years ago, physician who had a patient with heart disease would not consider referring the patients to a gum specialist (periodontist). Recently many different data has shown impact of abnormal oral cavity conditions in development heart disease, as well as pregnancy, diabetes, malnutrition etc. The oral cavity serves as the main portal to a healthy body. The type of nutrition will either enhance or prevent the health of our teeth, gums, tongue, mucosa and help in the proper development and well being of other bodily structures. Early, proper dietary habits and hygiene are crucial in laying down the foundation for future bodily health. Proper nutrients (vitamins, microelements, bioflavonoids etc) and their regularity and amount, and most effective ways of their actions are discussed too. However, if the teeth and oral mucosa are compromised this can lead to augmenting the preexisting medical conditions, creating new diseases and leading to many health complications. Physicians and dentist need to work hand in hand in treating and educating their patients. No one particular strategy will solve every problem. Nor will one person be the solution to treatments. Cooperation with other professionals, recent scientific and popular data, openness and flexible in communication will help in health and wellbeing.

Key words: oral health, nutrition, oral hygiene, cytoprotection, malnutrition

ХАРЧУВАННЯ І ХВОРОБИ: НАСЛІДКИ ДЛЯ ЗДОРОВ'Я РОТОВОЇ ПОРОЖНИНИ

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Представлений огляд літератури та власних спостережень стосується тісного зв'язку між станом здоров'я ротової порожнини та здоров'ям людини загалом. Багато років тому лікар, який мав пацієнта з серцево-судинними захворюваннями, не розглядав питання про скерування пацієнта до лікаря-пародонтолога або стоматолога. Останнім часом багато різних літературних даних показали значення розладів функціонування та патологій структур порожнини рота для розвитку кардіологічних хвороб, а також для вагітності, діабету, порушень харчування тощо. Ротова порожнина служить основним порталом для здорового тіла. Тип харчування людини буде або покращувати, або запобігати порушенню здоров'я наших зубів, ясен, язика, слизової оболонки ротової порожнини та сприяти належному розвитку та функціонуванню решти усіх вісцеральних органів. Ранні правильні харчові звички та гігієна ротової порожнини мають вирішальне значення для встановлення основ майбутнього здоров'я організму. Правильні поживні речовини (вітаміни, мікроелементи, біофлавоноїди тощо) та їх регулярність споживання, оптимальна кількість, а також їхні найбільш ефективні способи дій обговорюються у статті. Проте, якщо зуби та слизові оболонки порожнини рота будуть скомпрометовані, це може призвести до посилення наявних захворювань, розвитку нових захворювань і багатьох медичних ускладнень.

Лікарі та стоматологи повинні співпрацювати разом під час лікування та навчання своїх пацієнтів основам профілактики захворювань. Ні одна конкретна стратегія не вирішить кожну проблему. Також не можливо одним фахівцем вирішувати усі питання, пов'язані з лікуванням. Співпраця з іншими фахівцями, здобування знань з наукової та науково-популярної літератури, відкритість та гнучкість у спілкуванні, дозволить підтримувати здоров'я та добре самопочуття.

Ключові слова: здоров'я, харчування, гігієна порожнини рота, цитопротекція, недоїдання

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NUTRITION AND DISEASE: IMPLICATIONS FOR ORAL HEALTH

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The oral cavity contains the strongest structures in the human body: teeth. Teeth function in our body just as any organ, yet they are often neglected and not respected for their worth. Since early childhood teeth and the oral cavity function twenty four hours a day seven days a week while being taken for granted during eating, drinking, sleeping, talking, breathing, swallowing, singing, playing musical instruments and even crying. Nutrition has significant implication on oral health.

TOOTH DEVELOPMENT

Primary teeth start develop in utero. Children have 20 baby (primary, deciduous) teeth. These teeth eventually are replaced by 32 permanent teeth. By age 6-10 months most infants cut their first tooth. At 10 months-3 years they start developing their permanent teeth. The lower (mandibular) teeth develop first, followed by the upper (maxillary) teeth. Teeth erupt in pairs. Girls develop their teeth earlier than boys. By age 3 years, most primary teeth are in. By age 5-6 years children begin to shed their deciduous teeth. By age 12-13 years most primary teeth have been shed and are replaced by permanent teeth.

ANATOMY OF THE TOOTH

Teeth are divided into three categories:

- (1) INCISORS: are used to cut food we eat, aid in speech and are important in aesthetics.
- (2) CUSPIDS: (canines) are used in ripping and tearing food and guiding the jaw in lateral movements (as a protection of other teeth from wearing down).
- (3) MOLARS: are flat surfaced teeth located in the back of the oral cavity and are used for grinding-mashing of food.

MASTICATION

If any one of these teeth are missing (single tooth or a combination of teeth) the process of mastication is affected and therefore it affects the types of food one can eat.

Certain foods serve certain age groups and once there are any disruptions in the oral cavity the process of mastication and digestion is affected.

“COMMON DENTAL MISCONCEPTIONS”

There are innumerable fallacies concerning teeth and mastication. Patients may develop or allow

problems to occur as a result of misinformation and this affects the proper caring of their dentition. Some of these fallacies are:

1. Loss of teeth as one gets older is a natural process and one's should not worry about this. Tooth loss is not related to age. One can live to an old age and maintain ones teeth
2. Primary teeth are a temporality and thus we do not need to take care of them.

Good hygiene habits start at an early age. If you neglect your teeth at an early age you can expect to neglect your permanent teeth later in life. Primary teeth also serve as spacers for the permanent dentition, If you loose primary teeth prematurely you can expect to have problems latter with proper alignment of the permanent teeth.

3. The health and strength of teeth is hereditary, thus we cannot improve on their condition.

Health and strength of teeth is not altogether hereditary but more important determinant of health are good oral hygiene habits.

4. You need to change your tooth paste often. There is no need to change toothpaste at all. There is no expiration date or loss of activity with the long-term use of a tube of tooth paste.

5. The more foam is created by your toothpaste, the better the quality of the product. Foam of a toothpaste has no effect on the quality of the product.

6. Once you finish brushing it is important to rinse very well to get rid of all the toothpaste from the oral cavity.

On the contrary. one rinse is sufficient and some leftover paste in the saliva is good for fluoridating the teeth.

7. The best tooth brushes are hard.
The best toothbrushes are soft to medium bristled. Hard bristles cause abrasion to the gingiva and can even erode enamel and cementum causing cervical abrasions.

8. When gums bleed it is an indication of a serious problem and "only then" you should visit your dentist.

One should visit a dentist regularly (twice/year). If your gums bleed this could just be an indication that you are not brushing often or properly.

9. Cigarette smoke is favorable because it kills bacteria in the mouth.

Cigarette smoke is harmful to the mucosa of the oral tissue and can lead to various cancers of the oral cavity.

10. When you have a toothache, the tooth has to be removed.

When one has a toothache, one should see a dentist to establish a diagnosis on the basis of the symptoms and the x-ray evaluation and then a treatment plan is established.

11. A sick tooth has no connection to the general health of the human.

The tooth/oral mucosa can both be a manifestation of systemic disease and can be a cause of disease processes in the human body.

Hygiene is important and it should start from the moment the first tooth appears in the oral cavity. Once a tooth has emerged, one may clean off the plaque off of the baby tooth and massage the gum with a soft cloth or gauze. Similarly, a physically and mentally challenged child, a debilitated individual, and the elderly, should all have regular dental care as described above. Tooth paste should not be used for children under 2 years of age.

Children should be taught to brush their own teeth by age 4-5 years. They should brush after every meal and if they are in school they

should be encouraged to rinse with water if it is not possible to brush.

The time needed for an adequate brushing is 3 minutes.

Most people do not spend even a minute brushing their teeth and for this reason the pathologic film called plaque remains on the tooth surface.

What is Plaque?

Plaque is the white film that can be scrapped off of the tooth surface. It is a sticky substance that houses multiple bacteria, inorganic compounds (such as calcium and phosphorous), leukocytes, macrophages, and an extracellular matrix of protein, polysaccharides and lipids.

In this milieu, when sugar is introduced into the oral cavity, it readily adheres to the tooth surface. If it is not removed physically by a brush or wiped off with gauze or cloth bacteria have an opportunity to adhere to the tooth and produce acid. The acid then begins to demineralize the tooth and destroys the enamel. Demineralization can be seen as white spots on the teeth and crescent like formations close to the gingiva. This is the start of dental caries. Poor nutrition can cause gum disease to progress and become more severe in children whose diet does not supply the necessary nutrients. Poor nutrition affects the entire immune system leaving one at higher risk for gum disease and many other diseases.

If plaque is not removed it will become mineralized (hard) and is then called calculus or tartar (Fig.1). Calculus cannot be removed by just mere brushing or wiping; it has to be physically scraped away with special dental instruments. It is formed by the presence of saliva, debris and minerals. Its rough surface provides an ideal attraction for the growth of bacteria.



Figure 1. Calculus formation in a child

Saliva cannot penetrate plaque or calculus to neutralize the acids. This then leads to the start of gingivitis, periodontal disease and even in extreme cases, tooth loss (Fig.2).



Figure 2. Demineralized enamel, caries and tooth loss

ROLE OF SALIVA

Saliva is necessary to maintain the health of the oral cavity. Food mastication reduces the production of saliva and causes "dry mouth". Some of the medications that can cause dry mouth side effects are antihistamines, decongestants, antihypertensives and antidepressants. One of the unfortunate side effects of radiation therapy for cancers of the head and neck area is severe xerostomia (dry mouth). The salivary glands are destroyed by radiation, leading to severe dental decay, dry mucosa and difficulty in eating and swallowing.

THE IMPORTANCE OF SALIVA

Saliva supports good health in three ways:

1. Saliva contains enzymes and antibodies that can directly attack the bacteria of the dental plaque.
2. Saliva neutralizes acids released by decay-causing bacteria
3. Saliva contains minerals (including calcium, phosphate and fluoride) needed to replace lost minerals from tooth surfaces. Therefore, good saliva production is important for dental health. Any factor that compromises good saliva production contributes to dental decay.

A lack of saliva causes a condition called xerostomia or dry mouth. This condition can lead to stomatitis (inflammation of the oral cavity).

Decreased salivary flow may be caused by any of the following conditions:

- Dehydration
- Depression
- Drug induced
- Decreased mastication
- Complication of disease and infection

- Radiation therapy
- Vitamin deficiency

Other symptoms which may occur with dry mouth can be: difficulty swallowing, problems with taste, sore throat, bad breath (halitosis), dry nasal passages, yeast infections (candidiasis), loss of glistening moist mucosa, red raw tongue, angular cheilitis, sores in the mouth, and cracked lips.

How can dry mouth be prevented?

Many drugs can cause dry mouth thus it is important to choose drugs correctly and appropriately, concentrating on those that will cause less dryness.

One should not overuse cold medication and antihistamines, ample drinking water should be available, be aware of the environment and temperatures surrounding the individual. In the summer keep cool and in the winter make sure that the air is not too dry by utilizing methods of humidifying the air.

How can symptoms be relieved?

Sucking sugarless candy, will stimulate salivary flow. Avoid salty foods, candy with sugar and carbohydrate snacks.

Avoid mouth rinses that contain alcohol.

Drink plenty of water and avoid abrasive foods.

WHAT ROLE DOES NUTRITION PLAY IN THE ORAL CAVITY?

The oral cavity is very important for accepting proper nutrition for the vitality of the teeth, mucosa, tongue mucosa, periodontal ligaments and bone. Not only is good nutrition important for a child's or adult's general health but also it is important for their dental health. Nutrition and oral health are intimately linked and play a major role not only in the growing child but in the teenager, midyears, the elderly and all those struggling with debilitating diseases. Diet and its nutritional value or lack of it consequently can have profound influence on tooth development and maintenance and on the development and progression of disease of the oral cavity. If health is not maintained at this portal, than the likelihood of one accepting food through this portal will be poor, triggering problems and causing malnutrition.

Tips for better dental health

Always keep the mouth moist by drinking plenty of water. Brush your teeth after each meal with fluoridated toothpaste or wipe the teeth of with a clean cloth.

When eating fermentable carbohydrates like crackers or cookies, eat them as part of the meals instead of by themselves.

Each time we eat foods that contain sugar and starches the teeth are attacked by acids in about 20 minutes. Foods that cling to our teeth promote tooth decay. Healthy snacks are nutritious foods such as fruits, vegetables, nuts.

We are what we eat

Food can be classified into four categories for decay potential.

- MODERATE POTENTIAL: fruit juices, canned fruit, soft drinks, breads
- HIGH POTENTIAL: dried fruits, hard and soft candy, cakes, cookies, pies, crackers, chips.
- NO POTENTIAL: Meat, fish, poultry, fats, oils.
- ABILITY TO STOP DECAY: cheese, xylitol, nuts.

These choices determine the substrate availability for growth of oral bacteria. The fermentable substrates in plaque development and subsequent caries or periodontal disease are affected by these choices. Nutrient intake and nutritional status influence tissue health and immune system function. Food choices are of primary importance and here the parent, dietician/nutritionist play a key role. It is their responsibility to learn this pyramid and recognize it's value and try to maintain it throughout the child's lifetime. The hospitalized patient the institutionalized individual or those in nursing /extended care facilities likewise benefit from adherence to these nutritional principles.

The Food Guide Pyramid is a guide of what to eat each day based on the Dietary Guidelines. It lists the major food groups and subgroups and suggests servings from each. It's not a rigid prescription but a general guide that lets you choose a healthful diet that's right for you.

The Pyramid calls for eating a variety of foods to get the nutrients you need and at the same time the right number of calories to maintain healthy weight (Fig.3).

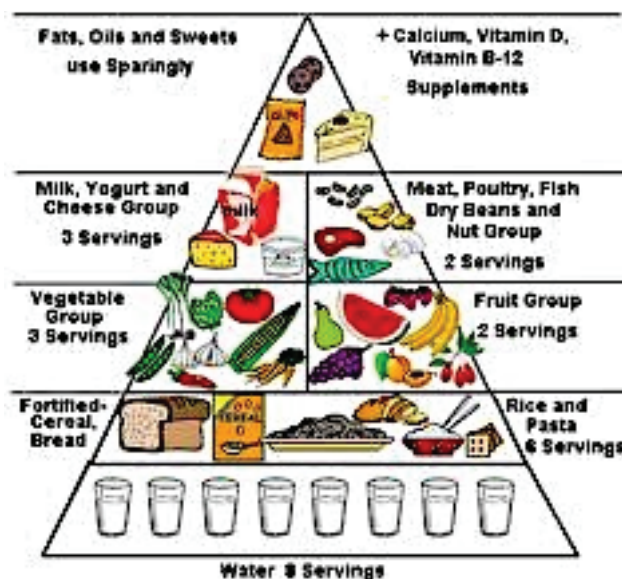


Figure 3. The Health Food Pyramid

Many developmental and systemic conditions have oral manifestations, some of the which are early indicators of disease. The following Table 1 shows oral conditions that may be symptoms of nutritional deficiencies of Vitamin A. The following Table 2 and Table 3 show oral conditions that may be symptoms of nutritional deficiencies of Vitamin B12 and Vitamin D, respectively. Deficiency of Vitamin K can cause gingival bleeding (caused by decreased formation of Vitamin K dependent clotting factors). Changes of oral cavity related to niacin and iron deficiency are represented in Tables 4 and 5. In many cases their early detection can increase the patient's comfort and wellbeing.

TABLE 1

DEFICIENCY OF VITAMIN A CAN CAUSE

- Gingivitis
- Periodontiti
- Decreased epithelial tissue development
- Impaired tooth formation
- Enamel hypoplasia
- Craniofacial and oral clefts (excess of A)
- Hyperplasia of the gingiva

TABLE 2

DEFICIENCY OF VITAMIN B12 CAN CAUSE

- Pernicious anemia as seen in the mouth
- Spongy red-blue gingiva
- Detachment of periodontal fibers
- Bone loss

- Halitosis
- Angular cheilosis

TABLE 3

DEFICIENCY OF VITAMIN D CAN CAUSE

- Rickets as seen in the mouth
- Enamel hypoplasia
- Absence of lamina dura
- Abnormal alveolar bone patter

TABLE 4

DEFICIENCY OF NIACIN CAN CAUSE

- Fiery red glossitis (devoid of Papilla)
- Ulcerative gingivitis
- Angular cheilosis

TABLE 5

DEFICIENCY OF IRON CAN CAUSE

- Red painful tongue (atrophy of the filiform papillae)
- Angular chielosis
- Dysphagia (difficulty swallowing)
- Slowed growth
- Salivary gland dysfunction
- Anemia

WHEN WE EAT

Structured meals and snacks patterns are ideal for both oral and systemic health. Defined meal patterns encourage food security, allow for development of appropriate appetite and limit the time for exposure to cariogenic foods.

A habit of three meals and three snacks, each at 30 minutes with an addition 30 minutes for the plaque pH to return to normal between 6.2-7.4.

HOW WE EAT

A proper dinning facility facilitates good eating habits. Even for children one has to consider that the tables and chairs fit the needs for every situation. Proper dishes and utensils, and meals should focus on eating with few distractions and stress. Both distractions and stress negatively affect the quality and quantity of food consumed, ultimately impacting both oral and systemic health. For example, handicapped children or adults need special attention and aids, yet there may be times when not enough time is allowed to help the individual deal with

the problems of swallowing, breathing, seeing the food talking instead of masticating the food properly and in the appropriate time. The same can be said for the healthy adult that consumes his/her breakfast on the run and not sitting down at the table and allowing the proper time to masticate and digest the food properly.

A child learns to eat as he learns to speak. If a child does not speak than his/her speaking skills are not developed. The tongue is a crucial machine. Imagine can one could speak without a tongue? Not at all. As a child learns to develop sound, this oral muscle becomes stronger and more agile. With the first suckling it begins to accept fluids, then with progression to soft and then textured foods, the tongue begins to manipulate more and becomes more agile and flexible.

Baby Bottle Syndrome

Oral health education emphasizes early transition from feeding with a bottle to drinking from a cup. It is very important to to LIMIT EXPOSURE TIME in feeding with a bottle.

However, because of lack of time, patience or for convenience by a parent or caretaker (as in orphanages where there is a lack of personal) one may see that bottles are propped up on pillows and children are fed slurry foods via this method. Many have not developed the suckling response and thus the feeding process takes longer then necessary. Sometimes children are allowed to fall asleep with the pacifier or the bottle in the oral cavity.

When a child falls asleep with a bottle in his / her mouth this is a dangerous situation as it leads to development of dental caries as manifested in the "Baby Bottle Syndrome".

Why should this transition be nurtured at an early age?

Older infants that continue to nurse from a bootle may begin to develop a myriad of developmental problems such as:

- Problems in tongue thrusting, and swallowing patterns.
- It may effect occlusion leading toward malocclusion.
- Speech articulation delay.
- Interfere with development of adult swallowing patterns.
- Develop baby bottle caries leading to abscesses pain and infection.

How do you Avoid Baby bottle syndrome?

- If a baby is put to bed with a bottle, it should be filled only with water.
- Use a clean pacifier at all times.
- Do not feed with a bottle filled with oatmeals, cereal, or any ground slurry liquids.
- Reduce overall sugar consumption.
- Do not allow children drink juices, milk and sugar drinks from a bottle.
- Drink water containing fluoride.
- IF YOU SUSPECT THERE IS A PROBLEM TAKE THE CHILD TO THE DENTIST. The earlier good dental hygiene is established and maintained the healthier will be the child's dentition.

Summary

There is a strong link between oral health and body health. Years ago, a physician who had a patient with heart disease would not consider referring the patients to a gum specialist (periodontist). The same would be true for many other medical conditions for example pregnancy, diabetes, malnutrition just to name a few.

The oral cavity serves as the main portal to a healthy body. The type of nutrition we practice will either enhance or deter the health of our teeth, gums, tongue, mucosa and help in the proper development and well being of other bodily structures. Early, proper dietary habits and hygiene are crucial in laying down the foundation for future bodily health.

Proper nutrients need to be delivered in the most effective way. However, if the teeth and oral mucosa are compromised this can lead to augmenting the preexisting medical conditions, creating new diseases and leading to many health complications.

Physicians and dentist need to work hand in hand in treating and educating their patients. No one particular strategy will solve every problem. Nor will one person be the solution to treatments. We need to work with other professional, read, ask questions, be open and flexible

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