

Dietary Habits And Periodontal Health In Saudi Arabia: A Qualitative Study

Arwa Abdullah Alsyefi¹, Dr. Mohammed Alasqah²

¹*Clinical Dietitian II, King Fahad Medical City, Riyadh, Kingdom of Saudi Arabia;*

²*Associate Professor, Department of Preventive Dental Sciences, College of Dentistry, Prince Sattam Bin Abdulaziz University, Alkharj, Kingdom of Saudi Arabia (Corresponding author)*

Email: ²mohasqah@gmail.com

ABSTRACT:

Aim: *The purpose of our research was to highlight the importance of diet as well as associated dietary habits in people; with the changes in oral environment leading to alterations in the periodontal health of an individual.*

Methodology: *A cross-sectional study was conducted on 200 enrolled subjects who underwent periodontal examination and treatment. A questionnaire was given to them, which was related to self-reported medical history, medication, physical activity and dietary habits and usual intake. Periodontist assessed the periodontal status of the participants and a clinical dietician analysed their dietary habits. Subjects were the periodontally examined and diagnosed according to the stage and grade of the periodontal disease. The collected data recorded through questionnaire and periodontal examination was analysed statistically.*

Results: *81.8% participants did not have any apparent illnesses. 14.5 % of the participants were taking medications for their diseases. Maximum study participants took sweet snacks daily (60.9%) as well as caffeinated beverages daily (86.3%). They also took fried foods (35.4%) as well as chips and junk food (34.5%) twice a week. The average Body Mass Index of the study participants was 35.8kg/m². 80% of the subjects had been diagnosed with chronic periodontitis. 22.7% of participants had stage 1 periodontitis whereas 27.2% of the subjects had stage 3 periodontitis.*

Conclusion: *It is imperative to reduce the consumption as well frequency of sticky and refined sugars in the diet, so as to limit the damage to the oral tissue especially the periodontium. Good oral hygiene also helps to maintain this homeostasis inside the oral cavity.*

Keywords : *Periodontal health, micronutrients, diet, oral hygiene habits, eating habits.*

1. INTRODUCTION

Health according to WHO in 1946, has been defined as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”. This definition also gives rise to the plethora of conditions, of which oral health is also a pivotal one which consists of prevention as well as treatment of the oral diseases. This is a holistic approach which includes oral hygiene practices, healthy diet and eating, prophylaxis with the help of

fluoride as well as regular dental visits.^{1,2} Hence, proper diet has an important role in a healthy lifestyle.

A calorie balanced and nutrient dense diet that consist of macro and micro nutrients is necessary for maintaining a healthy lifestyle³, the Concept of bio-Nutrition has recently become popular which is an association of diet with genetics, development and repair of the body as a whole. It helps in cellular regeneration and repair as well which is a vital aspect. Complete oral health involves proper maintenance of periodontal health, health of teeth as well as saliva and supporting tissues. This balance is generally disturbed if excess intake or deficiency is there of these bio-nutrients.⁴ Carbohydrates which include sugars, starches and fibers are the main source of energy used by the human body especially the brain cells, however, it is seen that high carbohydrate intake leads to many diseases like diabetes, cardiovascular diseases³, but in case of oral diseases, it causes an imbalance in the pH of the oral cavity which in turn leads to the development of dental caries and periodontal diseases⁵. However, even if carbohydrate free diet is taken, supplementation by oils and fats will lead to increase in other systemic diseases like myocardial infarction etc. So, a perfect balance needs to be maintained between the required amount of nutrients and the dietary intake.^{6,7} It is important to chart out a healthy diet which is beneficial to the oral cavity as well. Absence of caries, gingival diseases without oral hygiene practices, is a marker of a good diet; which requires a proper balance between macro and micronutrients. An example of nutrition can be seen in the case Vitamin C, deficiency of which leads to destruction of gingival tissues and results in bleeding, which cannot be controlled even with oral hygiene measures practices. So, Vitamin C needs to be added to the diet to reverse this condition.^{8,9} Deficiency of the micronutrients additionally affects the periodontal health too. Number of randomized trials have been conducted to show the effects of nutrients on periodontal health. A trial was conducted with diet supplementation of fruits, vegetables and berry juice in a population who was apparently healthy, positive effects were noted in a 2-month period on periodontal health and bleeding from the gums was also reduced.¹⁰ Another Vitamin which affects the periodontal health is vitamin D. It has been related to inflammation of the gingiva¹¹, loss of tooth as well as supporting structures has been reported when there is a deficiency of Vitamin D and calcium. Another important factor which affects the oral health is increased intake of carbohydrates and various sugars as well as more frequency of ingestion of these nutrients, leading to dental caries as well as enhanced gingival bleeding. Many trials have been undertaken to highlight the role of carbohydrates and diminishing oral health and even good oral hygiene measures can partly help in preventing oral diseases where intake of sugars are on the higher side.¹² Bacteria inside oral cavity crave for sugars, as they can initiate fermentation and in turn produce acids which lead to the destruction of tooth structure by demineralization as well as destruction of periodontal structure later on. Amongst all the sugars, lactose is less cariogenic.¹³ Direct links have been established now between frequency of intake of carbohydrates and diminishing oral health environment.¹⁴ To counter this, these days xylitol has become the sweetener of choice which is actually a sugar alcohol.¹⁵ Xylitol has many advantages over regular sugars and carbohydrates, it has an antibacterial effect. It counters the bacteria's like *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans*, which are prominent pathogens responsible for causing periodontal diseases.¹⁶ Fiber intake within the recommended dietary allowance is seen to have a positive effect on oral health and periodontal disease in recent literature.^{17,18,19} However, we cannot demean the importance of oral hygiene practices as well as preventive measures undertaken by dentists to counter the oral diseases like debridement as well as scaling and root planning, but it has to be coupled with reduced intake of carbohydrates as well.¹⁵ To counter periodontal inflammation, various vitamins like A, C, E can help to regulate the anti-oxidant

defence mechanisms. Vitamin C especially can enhance the antioxidant capacity of tissues by many folds, results of which are seen usually in non- surgical periodontal treatments. These vitamins have a crucial role in reducing the reactive oxygen particles and thus reducing the oxidative stress in the periodontium, which in turn decreases the destruction and inflammation of the surrounding tissues.²⁰

2. AIM OF THE STUDY

The purpose of our research was to highlight the importance of diet as well as associated dietary habits in people; with the changes in oral environment leading to alterations in the periodontal health of an individual.

3. METHODOLOGY

A cross-sectional study was conducted, in which 200 participants were recruited from patients seeking periodontal treatment at the postgraduate periodontal clinic, college of dentistry at Riyadh elm university, Riyadh, Saudi Arabia. Ethical clearance was obtained from the institution review board. Anonymity of the subject information was given priority. A questionnaire developed and evaluated by two investigators (a periodontist and a clinical dietitian) was given to the study participants, it was based on self- reported issues from patients having periodontal disease. The questions were scripted in English and then was translated into Arabic using a backward-forward translation method by the same investigators . Questionnaire contained sixteen questions with “multiple choice” options. These questions were related to self-reported medical history, medication, physical activity and nutrition. (Table 1, 2) measuring the frequent consumption of the major food groups (Carbohydrates, Proteins, Fat, fruits, vegetable and dairy products) to study their relationship with periodontal disease development in the research subjects. The questionnaire had a few questions measuring the texture of the fruits and vegetables to investigate whether food texture could play a role in the development of periodontal disease, the questionnaire also had a question about food and snack consumption at night which usually follows the habit of tooth brushing. The validity of the questionnaire was measured using test–retest method. The research team consisted of one periodontist who was responsible for periodontal examination methods and a clinical dietician who obtained and analyzed the diet information. Before periodontal examination, the study participants were asked to complete the self-reported questionnaire.

Periodontal Examination

After completion of self-reported diet questionnaire, all study participants were surveyed by a calibrated periodontist. The periodontist was blinded to the responses of participants on the self-reported questionnaire. Periodontal examination was directed to assess the Clinical attachment level (CAL), gingival recession (GR), and probing depth (PD). The participants were categorized according to the stage and grade of the periodontal disease. (Table 3) Staging and grading for all study participants was obtained following the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions.

Statistical Analysis

All the recorded informative data was assessed at 95% confidence interval, and were presented in frequency percentages. Results were analyzed using IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, NY, USA).

4. RESULTS

In our study, we observed that the medical history of the enrolled participants showed that 81.8% of the participants did not have any apparent illnesses. However, about 7.2% of the participants had diabetes mellitus, Hypercholesterolemia and cardiovascular diseases as the prominent diseases. 14.5 % of the participants were taking medications for their diseases with 49.1% having moderate physical activity. (Table 4) It was also noted that the maximum study participants took sweet snacks daily 60.9% as well as caffeinated beverages daily 86.3%. They also took fried foods 35.4% as well as chips and junk food (34.5%) twice a week. 83.6% of the study participants consumed baked goods and cereals on a daily basis, however only 36% of them were consuming fresh vegetable and only 39% were consuming fresh fruits on a daily basis, leading to an average Body Mass Index (BMI) of (35.8 kg/m²), which is classified as (obesity class 2) of our study subjects. This amounted to increase in their cariogenic diet which leads to increased caries risk and subsequent periodontal inflammation. 80% of the subjects had been diagnosed with periodontitis, 22.7% of participants had stage 1 periodontitis whereas 27.2% of the subjects had stage 3 periodontitis. Some participants (33.6%) had slow rate of progression of periodontal disease whereas maximum number (36.3%) had moderate rate of progression. 23.6% of participants had high risk and predisposition to caries attack.

Table 1- Questionnaire based on Demographic, medical history and Daily physical activity status of study subjects

Q. No.	Questions
1	<p>Personal Information</p> <ul style="list-style-type: none"> -Patient Age -Patient Gender - Patient weight -Patient height -Patient Body Mass Index
2	<p>Medical History</p> <p>-Are you suffering with one of the following diseases -Diabetes mellitus, Chronic Heart disease, Hypertension, Nephrotic diseases, Hypercholesterolemia, None, Other diseases.</p> <p>-Do you usually take any medications? (Yes/ No)</p>
3	<p>Daily Activities</p> <p>Please select your daily physical activities:</p> <p>A1: Mostly sedentary or relaxed.</p> <p>A2: Walking for up to 30 minutes per day.</p> <p>A3: Walking or exercising more than 20-60min for more than 3 times weekly.</p>

Table 2- Questionnaire for the study based on Dietary habits.

Q. No.	Questions
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1	How many main meals do you eat per day? <ul style="list-style-type: none">- One meal.- Two meals.- Three meals.- More than Three meals.
2	Do you usually wake up in the night to snack or eat meals? <ul style="list-style-type: none">- Always.- Mostly.- Sometimes.- Rarely.- Never.
3	Do you take Nutritional supplements or vitamins? <ul style="list-style-type: none">- Yes.- No. If your Answer is yes, please write them here:
4	How many cups of water do you drink per day? <ul style="list-style-type: none">- More than 8 cups per day.- Between 5-6 cups per day- Less than 5 cups per day- Rarely.
5	How many times per week do you eat cereals and bakery such as (rice, pasta)? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.
6	How many times per week do you eat fresh vegetables? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.
7	How many times per week do you eat cooked vegetables? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.

8	How many times per week do you eat fresh Fruits? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.
9	How many times per week do you drink fruit juices? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.
10	How many times per week do you drink milk and milk products? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.
11	How many times per week do you eat meats (chicken, fish, red meats ... etc.)? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.
12	How many times per week do you drink Soft drinks? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.
13	How many times per week do you drink caffeinated beverages (Coffee, tea...etc.)? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.
14	How many times per week do you eat fried foods? <ul style="list-style-type: none">- Daily.- More than 3 times weekly.- Twice per week.- Rarely.- Never.

15	<p>How many times per week do you eat chips and crackers?</p> <ul style="list-style-type: none"> - Daily. - More than 3 times weekly. - Twice per week. - Rarely. - Never.
16	<p>How many times per week do you eat sweet snacks?</p> <ul style="list-style-type: none"> - Daily. - More than 3 times weekly. - Twice per week. - Rarely. - Never.

Table 3- Periodontal examination questionnaire

1	<p>Old periodontal classification A1: Plaque induced gingivitis A2: Chronic periodontitis</p>
2	<p>Periodontitis A1: Stage 1 A2: Stage 2 A3: Stage 3 A4: Stage 4</p>
3	<p>Progression A1: Grade A slow rate A2: Grade B moderate rate A3: Grade C Rapid rate</p>
4	<p>Caries Risk Assessment and Examination A1: High Risk Factors A2: Moderate Risk Factors A3: Low Risk Factors</p>

Table 4- Data recorded in the study

Q. No.	Medical history of subjects	Data received through questionnaire (maximum %)
1	Illness in the study subjects	81.8% (no illness)
2	Medications taken by subjects	85.5% (not taking medications)
Q. No.	Dietary history of subjects	Data received through questionnaire (maximum %)
1	Main meals per day	64.5% (3 meals/day)

2	Night snacks consumed	80% (never had snacks at night)
3	Nutritional supplements	66.3% (no supplements)
4	Cups of water per day	53% (5-6 cups/day)
5	Frequency of consumption of Bakery/ cereals per week	83.6% (daily consumption)
6	Frequency of consumption of Fresh vegetables per week	36% (more than 3 times/week)
7	Frequency of consumption of Cooked vegetables per week	30.9% (2-3 times/day)
8	Frequency of consumption of Fresh fruits per week	39% (twice a week)
9	Frequency of consumption of Fruit juices per week	39% (rarely)
10	Frequency of consumption of Milk and milk products per week	51% (daily)
11	Frequency of consumption of Non- veg items per week	72.7% (daily)
12	Frequency of consumption of Soft drinks per week	25.4% (rarely)
13	Frequency of consumption of Caffeinated beverages per week	86.3% (daily)
14	Frequency of consumption of Fried foods per week	35.4% (twice per week)
15	Frequency of consumption of Chips and crackers per week	34.5% (twice per week)
16	Frequency of consumption of Sweet snacks per week	60.9% (daily)
Q. No.	Periodontal status of subjects	Data recorded (maximum %)
1	Old periodontal classification	80% (chronic periodontitis)
2	Periodontitis	27.2% (stage 3 periodontitis)
3	Progression	36.3% (moderate risk of progression)
4	Caries risk assessment	64.5% (had moderate risk)

5. DISCUSSION

An elevated BMI is a risk factor for developing periodontal disease, increased body weight and obesity, which is related to insulin resistance and oxidative stress that may be linked to the pro inflammatory secretions of cytokines by the adipocytes.^{21,22} Food in general have a systemic and topical effect on the teeth structure and surrounding soft tissue ,Carbohydrates, such as sugars, starches and fibers may affect the oral structure, furthermore simple and sticky refined sugars may increase the risk of periodontal disease and dental caries ^{23,24}, as they stick to the teeth and acts as a breeding environment for oral bacteria. On the other hand increased and sufficient fiber intake play a role in the mechanical clearing of plaque and enhances salivary production due to increased chewing which helps in the removal of the harmful bacteria.^{17,19} However this doesn't replace regular tooth brushing. Fibers also play an important role in reducing blood sugar levels and the development of cardiovascular disease due to its effect on reducing the plasma LDL levels and total cholesterol levels.^{25,26} Adequate intake of fiber is 25 grams per day for females and 30.8 grams per day for males³. Tooth loss may affect the dietary habits of an individual, by decreasing the intake of fruits and vegetables as a consequence of tooth loss.²⁷ Protein plays an important role in the structure of bones, periodontal ligaments and muscles. Periodontal lesions are considered wounds, in order to have a sufficient wound healing, one must make sure to consume enough proteins. Protein also play an important role in the immunity of the body and periodontal defenses include cell mediated immunity¹⁸ Omega 3 fatty acids acts as anti-inflammatory agent in the body. Research suggests that an intake of omega 3 fatty acids may reduce the inflammation associated with periodontitis.^{28,29} Vitamin D plays a significant role in maintaining healthy periodontal tissues, mitigating inflammation processes thereby enhancing the healing process of the periodontal tissues. On the contrary decreased levels of vitamin D is associated with periodontal attachment loss. Taking sufficient amounts of vitamin D is linked to decreased risk of developing gingivitis and chronic periodontitis.^{30,31} Due to the well-known role of vitamin C as an antioxidant , recent studies suggest that a decreased vitamin C levels in the plasma is associated with an increased risk of periodontitis.^{32,33} Probiotics are beneficial for the bacterial culture as it helps in the regulation of the gastrointestinal tract flora and is believed to inhibit the harmful microorganism colonization. Intake of probiotics is related to reducing pathogenic bacteria and improving clinical signs of periodontitis.³⁴ Periodontium is a complex environment, which consist of many bacteria's like Porphyromonas gingivalis, Prevotella intermedia, Tannerella forsythia, and Treponema denticola.³⁵ An inflammation of the periodontium known as periodontitis is characterized by deep pocket formation between the teeth and the surrounding gum and resorption of the alveolar bone ³⁶. Other pivotal bacteria's which cause the inflammation of periodontal pockets are Fusobacterium nucleatum, Prevotella species, Eikenella corrodens, Peptostreptococcus micros, and Campylobacter rectus.³⁷ Many studies have suggested that IL- alpha when activated against these microorganisms due to increased immune response causes the destruction of the tissues of periodontium leading to inflammatory damage.³⁸ Hence, a plethora of causes can be responsible for activating this immune response aggressively.³⁹ Commonest contributing factor to development of periodontitis is bad oral hygiene practices, that causes build up of plaque, which acts as a house of microorganisms. Many systemic diseases or conditions have also been linked with either the initiation or aggravation of periodontitis like diabetes, pregnancy, cardiovascular diseases etc. Following a healthy diet consisting of high fibers and low in simple refined sugars may reduce the incidence of developing type 2 diabetes⁴⁰ and cardiovascular disease⁴¹. Other factors which co-enhance the inflammatory damage in the periodontium along with the above mentioned factors are damaging habits like smoking, betel nut chewing, drug abuse etc.⁴² Inflammatory damage of periodontal tissues is due to the increased number of inflammatory cytokines which are released from immune cells. PMNs

reach the site of the inflammation due to the production of chemokines which tries to destroy the bacteria and then release Reactive oxygen species (ROS), defensins, which helps to engulf the pathogens.⁴³ But the damage to the tissues are also because of the products released due to increased production of immune complexes released. This free radical damage can be controlled by anti-oxidant mechanisms⁴⁴ which operate at cellular level, that can stop the progression of the periodontal disease. Vitamins like vitamin A (carotenoids and beta-carotene),⁴⁵ vitamin C (ascorbic acid),⁴⁶ vitamin E (alpha-tocopherol),⁴⁷ glutathione,⁴⁸ and melatonin,⁴⁹ are the store house of antioxidants. Even though these are micronutrients found in fruits and vegetables, they are still an essential part of the diet which overcomes inflammatory damage.⁵⁰ Excess of micro and macronutrients causes imbalance in oral environment and hence causes periodontal diseases. On the other hand, deficiency of these also leads to issues with regeneration and repair mechanisms of tissues at the cellular levels. Study done by National Health and Nutrition Examination Survey 2001/02, stated that decreased folate levels also leads to periodontitis.⁵¹ These kind of deficiencies are mostly seen in malnourished population, who do not get the adequate supply of these nutrients and have poor oral hygiene practices which has a double whammy effect on the oral cavity leading to aggressive diseases like Necrotizing gingivitis, Noma etc. In these cases, adequate nutritional support needs to be provided so as to regain the required nourishment to obtain the original periodontium status.⁵²

6. CONCLUSION

The study shows that adequate balance needs to be maintained between what is required by the body and what we are consuming. Changing dietary habits is essential to counter the effects of inflammatory damage on the periodontal tissues as well as to keep a tight control on bacterial population with the help of good oral hygiene practices. In conclusion, nutritional counseling may be beneficial for patients receiving periodontal treatment.

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