

Impact of Processed/Refined Foods on Oral Health: A Mini-Review

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Abstract

Since the evolution of the human beings, food habits and consumption patterns have been constantly changing. At the beginning, humans were depending primarily on hunting and gathering as nomadic hunter-gathers. Subsequently, humans gradually started engaging in agriculture, which acted as the major reason for the evolution of dietary patterns among humans. At the early periods of human civilization, burning food with fire or charcoal was practiced as the widely used food processing technique. However, with time humans recognized the importance of processing food by different means to make them more palatable and ensure preservation. In addition, adequately processed food with correct techniques can avoid a variety of food borne diseases. Therefore, at present providing access to a sufficient amount of safe and nutritious food remains as a key requirement, which ensure quality of life and well-being. Beside ensuring the food security, using the appropriate food processing approaches play a critical role in this aspect. During the processing, natural ingredients undergo changes and various non-edible constituents could be added into the food products. Food processing can lead into notable increments in refined carbohydrates and lipids and decrease naturally occurring components such as fibre, vitamins, and minerals. Often, this can lead to a plethora of diseases. Based on the NOVA classification of foods, food products may be classified into four broad categories as unprocessed/minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods and drinks. Among numerous diseases that can be caused by the consumption of poorly processed foods, oral and dental diseases have been limitedly focussed and highlighted. Therefore, the current article attempts to cater for this knowledge gap by reviewing the common oral and dental diseases manifested by consuming processed ultra-processed food such as candidiasis, dental caries, dental erosion and periodontal disease. Conversely, consumption of more natural kinds of food are more favourable towards maintaining a healthy oral and dental environment. Substantial knowledge of this can effectively support the relevant authorities to prevent and manage common dental problems, which have become a major challenge to the individuals and the health system. In addition, the food processing industries can understand the importance of adhering to standard food processing techniques and conditions, to maintain the desired quality of food.

Keywords: Dental Caries, Dental Erosion, Periodontal Disease, Processed Food

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INTRODUCTION

Processed/refined foods become significantly modified from their natural composition. The major changes are the increase in refined carbohydrates and lipids and the lack of naturally occurring components like fibre, vitamins, and minerals [1]. According to the American Dietetic Association, nutrition is a necessary component of oral health, and nutrition and diet affect oral health, which in turn affects the progression of oral diseases. Processed and/or refined foods can act as a major contributor to oral diseases such as dental caries (tooth decay), tooth erosion and periodontal disease [2]. However, the most significant effect of nutrition on teeth is the local action of diet in the mouth on the development of dental caries and enamel erosion. At present, dental erosion is increasing and is associated with dietary acids, a major source of which is soft drinks [3].

Processing of Food

The NOVA classification of foods proposes four categories of food as, unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and Ultra-Processed Foods and Drinks (UPFDs). The overall purpose of ultra-processing is to create branded, convenient (durable, ready to consume), attractive (hyper-palatable) and highly profitable (low-cost ingredients) food products designed to displace all other food groups. Ultra-processed food products are usually packaged attractively and intensively marketed. Multiple sequential processes are used to combine many ingredients and create the final product, hence leading to the term of "ultra-processed". These industrial processes have no domestic equivalent to processes followed in domestic food preparation such as hydrogenation and hydrolysis, extrusion and moulding, and pre-processing for frying.

Classes of additives are found only in ultra-processed products that include those used to imitate or enhance the sensory qualities of foods or to disguise unpalatable

aspects of the final product. These additives include dyes and other colours, colour stabilizers; flavours, flavour enhancers, non-sugar sweeteners; and processing aids such as carbonating, firming, bulking and anti-bulking, de-foaming, anti-caking, glazing agents, emulsifiers, sequestrants and humectants [4]. Some countries use the NOVA grouping for their dietary guidelines or goals, for instance: Brazil's dietary guidelines has recommend limiting consumption of processed food and avoiding ultra-processed food and France's public health nutritional policy goals for 2018-2022 aim to reduce consumption of ultra-processed foods by 20%.

Common Dento-Oral Manifestations

Consuming fermentable or refined carbohydrates leads to the development of dental caries [5]. These refined carbohydrates are commonly found in snacks like biscuits, and cakes etc. Increased consumption, both in frequency and amount, of these snacks, especially when taken as an in-between snack, escalates the incidence of dental caries [6]. A study conducted by Schroth *et al.* to find out the prevalence and risk factors of severe early childhood caries has concluded that dietary intakes of sweets, fast foods, and sugary drinks contribute to the increased risk of caries [5]. Figure 1 shows a photograph of a young child whose deciduous teeth (milk teeth) are extensively affected with dental caries.



Figure 1: Photograph of a Child Affected with Extensive Dental Caries, which are Marked with Green Arrows.

The chemical ingredients, especially acids in processed/refined foods, erode the enamel of the teeth (Figure 2). This leads to a rapid loss of tooth substance [7]. Furthermore, these acidic materials in the diet lead to gastritis and reflux disease (the travelling up of stomach contents towards the mouth), which leads to the oral environment being more acidic with greater dental erosion. In most cases, this erosion is associated with other types of tooth wear, like attrition and abrasion [8]. When combined, the effect and extent on the rate of tooth substance loss is more extensive and less controllable.

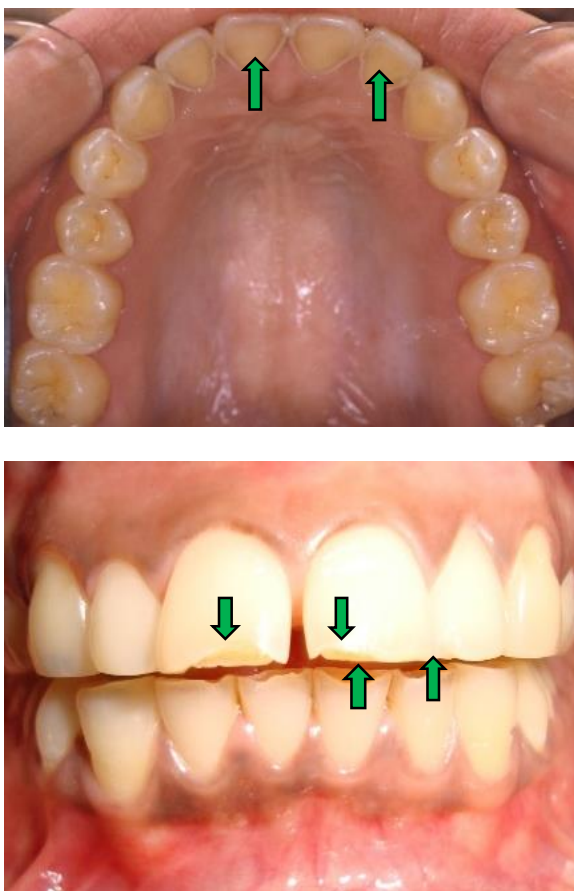


Figure 2: Photographs of a Patients Affected with Dental Erosion. Erosive Areas are Marked with Green Arrows.

Around two and a half decades ago, it was found that a significant fraction of the starch present in foods is not digested in the small intestine and continues to the large intestine, where it is fermented by the microbiota. This fraction was named

Resistant Starch (RS). It was also reported that there is a fraction of starch that is slowly digested, sustaining the release of glucose in the small intestine. Later, health benefits were found to be associated with the consumption of this fraction, called Slowly Digestible Starch (SDS). Researchers have reported both of these fractions to be "nutraceutical starch." An overview of the structure of both fractions (RS and SDS), as well as their characteristics, aver been intensively studied to determine methods and processes that will increase both fractions in starchy foods and prevent diseases that are associated with the consumption of glycaemic carbohydrates [9].

Glycaemic carbohydrates are the ones which increases the blood glucose levels quite significantly and the glycaemic index describes how quickly food affects the blood sugar (glucose) level after consumption. The link between carbohydrate intake and health is becoming increasingly important for the individual, particularly in the areas of Glycaemic Index (GI) and extended energy-releasing starches.

From a physiological point of view, SDS delivers a slow and sustained release of glucose along with the benefits resulting from low glycaemic response [10]. Scientific studies prove that consumption of refined/processed foods makes individuals more vulnerable to diabetes [11]. The consumption of highly refined carbohydrates in the absence of dietary fibre and the above-described RS and SDS contributes to oral diseases. The effects are two-fold. Firstly, the fermentable sugar concentration is high, and thus they are fermented by oral microbiota into acids, which results teeth decay in a more concentrated manner in the absence of the aforementioned dietary constituents. Secondly, they lead to diabetes and their complications indirectly affect the oral cavity and teeth.

Many studies have revealed that diabetic patients have advanced periodontal disease. The Periodontal disease is a type of

advanced gum disease, which would ultimately lead to loss of teeth [12]. Teeth will lose the bone and soft tissue attachment as shown in Figure 3. Periodontitis is said to be the sixth complication of diabetes [13]. According to the scientific analysis, the prevalence of severe periodontitis in diabetics as compared to non-diabetics has been found to be 59.6% compared to 39% [14]. In a vice versa scenario, the diabetic patients suffering from periodontitis have a poor glycaemic (blood sugar) control.

Control of periodontal disease may enhance glycaemic control in patients with type 2 diabetes. In turn, improved glycaemic control may contribute to better control of periodontal disease [15]. Uncontrolled diabetes also leads to xerostomia (dryness of the mouth). With xerostomia in oral cavity, the teeth become more vulnerable to diseases. Incidence of dental caries is very high under such conditions. Xerostomia also leads to many dental infections in addition to periodontitis mentioned above. Candidiasis (a fungal) is the commonest out of them all.



Figure 3: Photograph of a Patient Affected with Advanced Periodontitis. The Exposed Root Area is Marked with Green Arrows.

Imbalance and inadequacies of minor deficiencies in nutrients are associated with processed food. Such improper nutritional consumption also contributes to certain oral diseases and deficiencies manifested in the oral tissues [16]. Some Periodontal diseases are associated with deficiencies in vitamins C and D, and numerous clinical studies have

revealed that vitamin D deficiency affects the tooth development [17].

CONCLUSIONS

In conclusion, consumption of refined/processed foods is detrimental to the oral and dental tissues. A variety of oral and dental diseases such as candidiasis, dental caries, dental erosion and periodontal disease etc. could be caused by the consumption of such food. Conversely, consumption of more natural kinds of food are more favourable towards maintaining a healthy oral and dental environment. Enhancing the knowledge on these aspects among the community, can effectively prevent and manage common dental problems, which have become a major challenge to the individuals and the health system.

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CONFLICT OF INTEREST

Author declares that there is no conflict of interest regarding the publication of this paper.

AUTHORS' CONTRIBUTIONS

Author conceptualized the study, collected the literature, reviewed and compiled the manuscript.

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