

## ORIGINAL ARTICLE

# Is There a Connection between Tooth loss and Gastrointestinal Disorders?-A Mini Review

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## ABSTRACT

**Objective:** This mini review intended to study association between tooth loss and gastrointestinal disorders.

**Data Sources:** There was a manual search of major journals and references in the reference list as well as electronic databases such as Springer Link, Science Direct, and PubMed.

**Duration:** January 2000 and December 2021

**Methods and Results:** A total of 116 papers covering 17 categories of decontamination procedures were included in this evaluation. Among the decontamination techniques used were coatings, mechanical cleaning, laser treatment and photodynamic therapy, as well as air polishing and anodizing. Other techniques included radiation, sonication and thermal treatment. Biofilm generation and decontamination on titanium implants may be prevented and eliminated using most of the disinfection techniques studied. For future study in the creation of novel dental implants and decontamination processes, this narrative systematic review gives a description of methodologies.

**Keywords:** Tooth loss, gastrointestinal diseases, chewing efficiency, nutritional intake and nutrition are some of the topics covered in this article.

## INTRODUCTION

The oral cavity serves as a doorway to the digestive system. Good dental health is essential for the functions of chewing, taste, swallowing, phonetics, and aesthetics that are required for mastication. All of these tasks might be adversely affected by poor dental health. The teeth play an essential role in chewing food. Dietary limitations and changes in food preferences may result if chewing ability, taste perception, and swallowing processes are compromised [1–5]. 9-10 million persons worldwide are infected with Hepatitis B and C [4,5]. At the age of 45, one out of every three people has hypertension (a prevalence rate of 33 percent), and more than half of those with hypertension go untreated. If one or more teeth fall out, chewing becomes more difficult, which may lead to indigestion and other digestive problems. The quantity and health of teeth may appear self-evident to impact food selection, diet and nutrition. Only a small number of studies involving large populations can confirm this hypothesis, and even fewer studies can provide light on the nature of any connection. There are several health risks associated with a changing diet, such as nutrient surpluses and deficiency. There is an increased risk of systemic illness as a result of both shortages and excesses in nutrients. The impact of dental health on nutrition and overall health might be substantial. Because of the nutritional alterations that occur after tooth loss, Edentate patients may have a greater cardiovascular disease risk than their dentate counterparts. There's a lot of research on the link between dental health and heart and brain health. These disorders may be made more likely by oral infections and gum disease, however the data is mixed [6, 7]. When Rodriguez-Olleros presented his testimony in Puerto Rico, it was in 1947. They looked

through 3684 medical records and found 168 people with significant dental deficit. Primary gastritis affected 299 people, 83 of whom had no teeth. There were 50% of toothless people with gastritis, whereas only 6% of those with good masticatory function had it. Alcohol and caffeine intake, as well as other risk factors for gastritis, were included in to the study and found to be the same in both groups. However, age was not taken into consideration in this research, and the statistical methods used is quite restricted.[8]

Studying Farrell's idea that mastication affects the digestion of food, participants were instructed to swallow two tiny gauze bags linked together, one of which held around 1g of masticated food and the other 1g of food before mastication. Later, the faeces were removed, and the bags were weighed. The residue left behind by mastication was categorised into three types based on the results of the 29 foods evaluated. Some meals were better digested with mastication, whereas others were equally as well digested without mastication. The study was expanded to include patients who had lost their teeth and had low masticatory performance, and it was shown that even the tiniest amount of mastication was sufficient to guarantee maximum digestion. There may have been no variation in the amount of food utilised because of mastication, either because of physical grinding or because of more complicated mixing with saliva [9]. At this time the Ockerse study was published, which said that gastrointestinal problems were caused by a loss of teeth since 33 men who had dentures reported experiencing gut cramps after meals. However, "They did not make any more complaints". 26 of the 33 patients were hospitalised due to intoxication, and it was not determined if the use of dentures or abstinence

from alcoholic beverages improved their condition [10]. US researchers ran an experiment controlling for age and duration of hospitalisation in an effort to find a correlation between the two. Analyzing the effectiveness of chewing was done in comparison to reports of "gastric discomfort" (anorexia, epigastric distress, nausea, and vomiting). A higher percentage of inefficient masticators (14%) than proficient masticators (5%) reported a combination of two or more symptoms, leading the authors to draw the conclusion that masticatory efficiency had some bearing on gastrointestinal discomfort. In spite of this, it did not have a significant impact.[11]

Mastication and gastrointestinal discomfort have been studied in certain research. " The chewing response has been linked to stomach ulcers, according to some researchers. It was shown that the incidence of peptic ulcer was greater among Indians from the southern states than those from the northern states. To back up his theory that the ulceration is caused by a lack of chewing in the diet of North Indians, he used the fact that wheat chapattis need more chewing than rice-based meals in the South. That's because their rice-based diet is less likely to cause peptic ulcer disease than South Indians' is [12], and the two diets vary in other ways as well, such as the amount of fat and fibre and the amount of spice.

An acidic stomach may develop peptic ulcers, according to the research of Boccardo and Betancor.[13] Following injections of histamine subcutaneously, they measured the amount of gastric juice produced in dentate and edentate rats. Pre and post-histamine stimulation, the volume and acidity of secretion in participants with recently removed teeth was at least 35% larger (15 to 30 days previously). Subjects with long-term loss of occlusion, on the other hand, showed less variations in this regard. There was a 25 percent increase in overall acidity in the non-stimulated gastric secretions of the edentulous.

Researchers Brodeur and Laurin studied 367 edentulous people aged 60 and older to see how chewing efficiency affected nutritional intake and the frequency of gastrointestinal illnesses. The "Swallowing Threshold Test Index" (STTI) and a meal frequency questionnaire were used to evaluate denture masticatory function and gather dietary information. Researchers discovered that patients who were born without the ability to chew or swallow properly used 37% more laxatives and antacids than those who were born with it but lacked this ability (20 percent ). A lower intake of high-fiber meals may lead to the development of gastrointestinal diseases in edentulous elderly with a poor masticatory function [14].

On the basis of this available literature, this systematic review was aimed to synthesize published evidence on relationship of tooth loss and gastrointestinal disorders with the following objective.

- The association of tooth loss/edentulousness with gastrointestinal disorders

## MATERIAL AND METHODS

**Data sources:** Two electronic databases were used: PubMed and Google scholar, Manual search was also performed through key journals and reference list. We limited our search to articles from January 2000 to December 2020. The search terms were "tooth loss" AND

"gastrointestinal disease" OR "gastrointestinal disorders" OR "dyspepsia" OR "gastric reflux" OR "gastrointestinal disease" AND "chewing efficiency" OR "masticatory efficiency" AND "nutrient intake" OR "dietary intake" OR "nutrition".

**Study selection:** For consideration, studies had to meet the following criteria: (1) be in full text; (2) be in English to prevent translation bias; (3) be research articles only; (4) be published between January 2000 and December 2020 to ensure current research studies on the topic; and (5) be focused on tooth loss and gastrointestinal disease

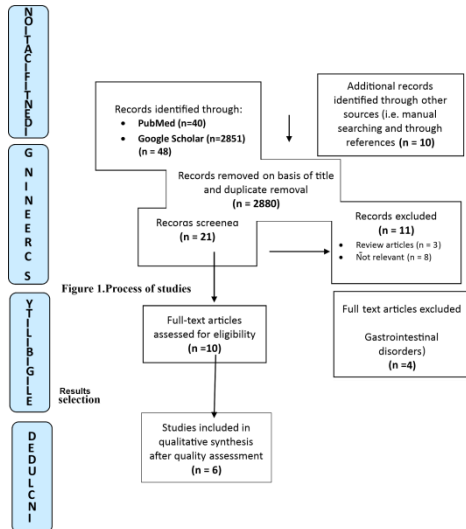
Figure 1 illustrates PRISMA flow chart of study selection process. The initial combined search identified 2891 articles from 2 databases and 10 articles from other sources (manual searching and through references). The titles of the articles were reviewed, and duplicates were removed which resulted in 2880 being excluded as they did not focus on edentulous patients and gastrointestinal disorders. The abstracts of the remaining 21 articles were read to ensure the relevance of the articles to our study. This resulted in 11 articles being excluded. Following the independent review, the two reviewers met to discuss preliminary findings and to reach a consensus on studies to be included. Out of the 21 reviewed, 15 were excluded. Therefore, there were a total of six articles for the purpose of analysis.

**Data extraction:** Fig 1 summarises the findings of the investigation. Two reviewers were involved in this process. The research specifics were agreed upon by both reviewers after a thorough assessment of each paper. The following data was gleaned from each of the studies that were included: The author (s), year of publication, title, purpose, setting-origin of sample, methodology, and findings are all included.

**Assessment of study quality:** The validity and reliability of exposure measures, identification of confounding factors, strategies for dealing with confounding factors, validity and reliability of outcomes measures and appropriateness of conclusions were all examined using the Joanna Briggs Institute critical appraisal tool (a checklist for analytical cross-sectional studies), which consisted of eight questions. It is possible to respond "yes" or "no" to each of the questions. Afterwards, a final decision was made on whether or not to include or omit a study, or to request further information, with notes.

**Data analysis:** All included studies' extracted data were analysed according to the Whittmore and Knafel principles of integrative review, which includes four stages: data reduction, data presentation, data comparison, and conclusion drafting and confirmation. A preset conceptual categorization matched with this study's goal of determining if tooth loss is linked to gastrointestinal disease/conditions was applied to all five main sources at the data reduction step. The single-page format of each primary source allowed researchers to compare primary sources on particular problems, variables, and sample features in a systematic manner. Also, it helps to arrange data into a more understandable structure. Extracted data from the five included studies was then shown in table form at step 2 of the data presentation (see fig 1). Seeing the patterns and connections between and among primary data sources is a huge aid in the analysis process. At the third step, data

comparison was utilised to uncover themes with comparable patterns and relationships via an iterative process of data examination. As a final step, patterns based on source data were used to identify any parallels or discrepancies, as well as to verify any erroneous conclusions. This was done so that critical information would not be lost.



**Characteristics of the studies:** In this review, six studies were found to be eligible and included. The included study settings involved two studies from Iran, one study each from United States of America, United Kingdom, Finland and Germany. The total sample size in each study ranged from 86 to 49120. The findings from 6 eligible studies are summarized in fig 1. A variety of gastrointestinal disorders and their association with tooth loss and oral hygiene has been studied and reported in these studies.

## DISCUSSION

This systematic review found that tooth loss may be associated with avoidance and lack of chewing ability of an individual. Edentulous people tend to eat softer foods but usually they eat foods that require mastication and are less well chewed. Improperly chewed food may add an extra burden on the gastrointestinal tract, which may not be able to cope, leading to gastrointestinal disturbances. There have been studies reporting gastrointestinal disturbances caused by inadequate chewing. Studies done in various parts of the world with varied dietary habits have reported association between tooth loss and Gastrointestinal complaints [15-17]

Dental health, denture quality, and masticatory dysfunction have been linked to digestive system problems in a research by Altenhoevel et al [18]. There was no significant correlation between dental status and gastrointestinal symptoms in Iranian participants studied by Adibi and colleagues [19].

Iranian researchers Zahedi et al [20] explored the link between DMFT, dental hygiene, and gastrointestinal diseases in a study conducted in that country. No correlation was discovered between the DMFT and Gastric problems. DMFT index scores of 0 to 3 indicate no

evidence of Helicobacter Pylori infection in the stomach, but scores of 3 to 5 indicate the presence of serious stomach illness.

This association between tooth loss, pancreatic cancer, and Helicobacter Pylori has only been studied once, by Rachael et al [21]. A total of 174 men with pancreatic cancer and 29104 male smokers between the ages of 50 and 69 were included in the research. Tooth loss was shown to be a risk factor for pancreatic cancer, whereas Helicobacter Pylori infection was found to be unrelated.

Sheiham and Steele [22] conducted a British study of the elderly and looked at factors including tooth density and food consumption. People who have poor oral health are more likely to have a tough time eating. As the number of natural teeth and occluding pairs of posterior teeth grew, so did the perception of chewing capacity. Nuts, apples, and raw carrots were difficult for more than half of edentate persons to consume in institutions. Their findings were not influenced by factors such as gender, race or socioeconomic background. In addition, it was shown that the capacity to influence nutrient intake and nutritional status in the elderly is linked to the quantity and distribution of natural teeth in the mouth. The results of Sheiham and Steele were echoed in another investigation by Johansson et al. Older Swedish males who had lost their teeth were more likely to eat less fruit and vegetables and less fibre than their dentate counterparts. In contrast to their dentate counterparts, edentate men and women chose to consume a greater number of sweet snacks. The researchers also considered things like the participants' chronological age and level of education. [17].

Also common are digestive ailments, with a reported 60% frequency of gastritis. Many cities around the nation have been discovered to have high levels of the bacterium H.pylori in their drinking water [24], which has been associated to gastritis, stomach ulcers, and insulin resistance. According to prior research, males are more likely to suffer from GI illnesses than women [25]. Helicobacter pylori may induce stomach issues and recurrence in those who ignore their dental hygiene [26]. Halitosis and glossitis may be caused by Sulfur compounds produced by this bacteria. Gastric mucosal damage has been associated to the formation of these chemicals in one research [27]. As a result, halitosis may be a sign of gastric injury. The D.M.F.T. score is also greater compared to controls, suggesting an increased risk of caries [28]. Many diseases that affect the digestive system may also have an impact on dental hygiene [29].

## CONCLUSION

Studies have pointed towards an association between gastric disorders and tooth loss. There are no studies in which other known related factors like social and health factors that affect foods choice and nutrition have been carefully controlled.

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