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Abstract

Background: Truly the oral cavity is a mirror that reflects and unravels many of the human body's internal secrets. Some of these manifestations are disease-specific and help raise a high degree of suspicion for the alert clinician and dentist. So, the goal of this case-control study is to determine whether there is a link between gastric diseases and dental caries.

Methodology: Examinations were performed on (250) patients, all of them suffering from dental caries in varies degree: We will rely on statistical information that we gathered through a questionnaire form, which included the results of numerous different clinical outcomes for both (150) healthy people and those 100 with gastric disorders from a variety of genders, ages, residency, and we calculate DMFT index for both groups.

Results: There was a statistically significant differences in the mean DMFT between health and gastric disease participants.

Conclusions: a noteworthy correlation exists between gastric disorders and dental caries, as well as oral manifestation lesions and associated consequences like erosion.

Key words: dental caries; DMFT; gastric diseases

Introduction

The presence of oral manifestations in individuals may serve as possible markers for a variety of systemic disorders. The oral cavity serves as a reflective medium through which several interior secrets of the human body may be revealed and understood. Some of these manifestations are disease-specific and should arouse a high degree of suspicion in the clinician and dentist [1].

Numerous systemic disorders have mild impacts on oral health, resulting in the oral cavity being frequently disregarded as a means of identifying signs of these diseases. The mouth cavity serves as the entry point to the gastrointestinal (GI) tract and is derived from the same embryonic origin. Therefore, it is unsurprising that several gastrointestinal illnesses exhibit observable oral signs [2].

Dental caries (the most prevalent chronic diseases of people worldwide) is developed by a multifaceted interplay over a period of time involving acidogenic bacteria and fermentable carbohydrates, as well as other host components such as teeth and saliva; the risk factors for caries encompass several aspects, including physical, biological, environmental, behavioral, and lifestyle-related variables. These risks may include inadequate salivary flow, insufficient exposure to fluoride, suboptimal dental hygiene practices, and incorrect feeding practices for babies [3].

The gastric disorders have the potential to inflict harm upon the teeth through many mechanisms; gastroesophageal reflux disease (GERD) refers to the physiological process by which stomach contents are transported into the esophagus and oropharynx facilitated

by the relaxation of the lower esophageal sphincter [4] which cause tooth erosion, it affects the palatal surfaces of the maxillary anterior teeth and the occlusal and lingual surfaces of the mandibular incisors [5] and also, GERD may be the cause of changes in soft tissues and salivary flow. In addition to that there is a significant association of GERD with oral acid burning sensation, xerostomia, subjective halitosis, and uvula mucosal erythema [6].

Peptic ulcer is a most prevalent gastrointestinal condition characterized by the development of lesions in the lower esophagus, stomach lining, and duodenum [7]. It is important to bear in mind that many drugs employed in the treatment of peptic ulcers have the potential to induce adverse effects and impact oral health. Several oral health issues have been identified; tooth decay, black tongue, dry mouth, and alterations in taste [8].

Helicobacter pylori (H. pylori); It is generally recognized as a contributing factor to gastrointestinal problems. The detection of H. pylori in dental plaque has been documented [9]. The occurrence or non-occurrence of systemic H. pylori infection may be affected by dental caries, as dental caries and periodontal diseases can act as a reservoir for H. pylori [10-11]. Numerous research studies have demonstrated a correlation between H. pylori infections in the bloodstream and dental caries. The absence of dental caries treatment might potentially influence the occurrence of systemic H. pylori infection [12].

To achieve a comprehensive understanding of the correlation between dental caries and gastrointestinal diseases, further investigation is still necessary. One hypothesis posits that the correlation between gastric problems and dental caries may be attributed to the existence of oral bacteria within the stomach. Despite the current lack of apparent significance, research has demonstrated that oral bacteria, particularly Streptococcus Mutans, may be detected within the gastrointestinal environment of individuals afflicted with gastric disorders [13].

An alternative hypothesis posits that dental caries might potentially serve as an indicator of suboptimal oral hygiene practices and an imbalanced oral microflora, which may be associated with systemic inflammation and an elevated susceptibility to various ailments, such as gastrointestinal disorders [12,14]. So, the aims of our study to evaluate if any relationship between gastric diseases and dental caries through looking the dental caries among patients with gastric diseases.

Material and methods

Target population: between January and April 2023, this an observational case-control study at the College of Dentistry at the University of Basrah focused on patients with gastric disease (cases) and those with non-gastric disease (controls), all of whom were over the age of 18 years. Through random sampling, participants were chosen, and those chosen either served as cases or controls.

Male and female with stomach disorders proven by gastrointestinal endoscopy or by laboratory tests, including H Pylori (PCR), residing in Basrah (city, village), and undergoing treatment for the condition are included in the cases. Subjects from Basrah (city, village) who did not have any gastrointestinal illnesses made up the control group. Patients with diabetes mellitus, chronic kidney disorders, and blood dyscrasia are excluded from both the case and control groups.

Sample size: because there were no actual records of the frequency of gastric diseases in Basrah city, the sample size was determined using a calculation:

$$S = \frac{Z^2 P(1-P)}{e^2}$$

Where Z is projected to, have a confidence level of 1.96 to offer a confidence level of 95%, e is a confidence interval of 5%, and P is the estimated (about 20%) prevalence of gastric diseases in Basrah. The sample size was (243) participants, albeit it was actually (250); (100) cases, and (150) controls.

Data collection: was gathered over the course of four months with consent from the College of Dentistry's educational committee (BDC-6-08-22-9) in 19/9/2022. After receiving their informed consent to participate in the study, patients were interviewed using a structured questionnaire. Researchers created a questionnaire (appendix A) that was very reliable when tested on a small sample of patients (15 individuals). Following the questionnaire form's validation by two community medicine professionals, researchers filled it out by direct interview. Age, gender, place of residence, history of gastric disorders and duration, as well as the type of treatment received and how long it lasted, were among the demographic factors of both groups.

A dentist with expertise in oral diagnosis would collect dental indices (DMFT); decayed, missing, and filling teeth index to compare dental caries between the two case and control groups and make a diagnosis in accordance with WHO guidelines. the person sitting comfortably in a dental chair with enough lighting and a tooth surface that is clean and dry, and using a dental mirror and sharp probe and checking for evidence of caries after receiving written informed consent from each participant.

Enamel erosion, white spot lesions, discoloration, surface roughness, and the presence of cavitation are changes in tooth structure that are recorded as (D), even when other surfaces have had restoration. During the interview with the participants, missing teeth caused by prior caries were calculated as (M), while teeth with restorations, but no other carious surfaces or teeth with crowns due to caries were noted as (F). The DMFT for each participant in both groups is calculated, as well as the mean number of DMFT (which is the sum of all DMFT values divided by the number of populations of each group).

Statistical analysis The version 23 of the IBM SPSS software suite was used to analyze all of the data. The Mann- Whitney test and the Kruskal-Wallis test was used to compare continuous variables and the Chi-square test for qualitative data ($P < 0.05$, significant).

Results

To determine how gastrointestinal illnesses affect the occurrence of dental caries, a case-control study was created. 150 cases of gastric illness and 100 control subjects were involved, with 48% of the male participants and 52% of the female ones.

In the case and control groups, the mean DMFT did not differ significantly by gender, albeit, as shown in tables (1 and 2), the mean DMFT was somewhat higher in females (11) than in males (10.95). as for gender, there was no discernible variation in the participants' mean DMFT based on where they lived, despite the fact that respondents from rural areas had a marginally higher DMFT (11.04) than those from urban areas (10.96), according to table (3).

Table (1): distribution of gastric diseases according to gender

Gender	gastric diseases		Total
	No	yes	
Male	72 (60%)	48 (40%)	120
Female	78 (60%)	52 (40%)	130
Total	150	100	250

P value 1.0

Table (2) the mean DMFT according to gender

	Gender	N	Mean	Std. Deviation	Std. Error Mean
DMFT	male	120	10.95	4.931	.450
	female	130	11.00	5.324	.467

P value 0.939

Table (3) the mean DMFT according to residency

	Residency	N	Mean	Std. Deviation	Std. Error Mean

DMFT	urban	197	10.96	5.143	.366
	rural	53	11.04	5.125	.704

P value 0.922

The mean DMFT for people with gastric illnesses and healthy subjects were (12.27, 10.11), respectively, as shown in table (4), which indicates that there was a highly significant difference between the two groups when we compared the mean DMFT for both cases and the control group.

Table (4) the mean DMFT according to gastric diseases

	Gastric diseases	N	Mean	Std. Deviation	Std. Error Mean
DMFT	No (control)	150	10.11	4.932	.403
	Yes (cases)	100	12.27	5.170	.517

P value 0.001

As indicated in table (5), the mean DMFT was significantly correlated positively with the existence of gastrointestinal illnesses, and non-significantly correlated with participants' gender and place of residence.

Table (5) correlation between the mean DMFT and other variables

		Gender	gastric diseases	Residency
DMFT	Pearson Correlation	.005	.206**	.006
	Sig. (2-tailed)	.939	.001	.922
	N	250	250	250

**positive correlation

Discussion

This case-control study assessed the prevalence of dental caries and gastric illnesses among participants at the education clinic of Basrah College of Dentistry. A total of (250) individuals, consisting of 120 males and 130 females, were included in the study. The findings revealed that (40%) of the participants reported experiencing gastric diseases, while (78.8%) resided in urban areas. The DMFT score was found to be (10.98) with a corresponding standard deviation of (5.129). Both male and female participants demonstrated accurate DMFT scores and indicated indicators of dental decay. The

prevalence of gastric disease had an impact on the DMFT index, with rates of (10.11% and 12.27%) observed, respectively. The presence of gastric disorders exacerbates the occurrence and progression of tooth decay. Individuals who engage in drug use had a greater prevalence of dental caries, as shown by a higher mean DMFT index score of (12.31%) compared to (10.12%) among non-drug users. The dental caries experience, as measured by DMFT index, was shown to be greater among urban patients (10.69%) compared to rural patients (5.144%). However, this difference did not reach statistical significance. There may be variations in lifestyles, diets, and dental care between urban and rural areas. This study establishes a correlation between dental caries, gastric illnesses, medication consumption, and DMFT.

The findings of the present study are consistent with the research conducted by **Al-Zahrani *et al.*, (2021)**, which established a correlation between gastrointestinal diseases and oral health. According to their research, individuals diagnosed with peptic ulcers exhibited a significantly higher prevalence of tooth erosion due to the presence of gastric acids [2]. This finding aligns with the conclusions drawn by **Ranjitkar *et al.*, (2012)** and **Warsi *et al.*, (2019)**, who also observed elevated rates of tooth erosion, halitosis, and periodontal disease among patients with gastroesophageal reflux disorder (GERD). Notably, this correlation between GERD and dental attrition was particularly pronounced in women. Furthermore, it was discovered that older individuals were more susceptible to tooth erosion caused by stomach acids associated with GERD [15,16].. However, the findings of **Wild *et al.*, (2011)** and **Johansson *et al.*, (2012)** contradict these results, as they did not observe a statistically significant difference in DMFT scores between individuals with and without GERD [17,18].

The administration of medication might potentially have an impact on both gastrointestinal diseases and dental health. Proton pump inhibitors (PPIs) and other pharmaceutical agents targeting the gastrointestinal system have the potential to adversely affect tooth health. PPIs are commonly employed in the management of GERD and several other conditions associated with excessive gastric acid secretion. These medications are utilized to decrease gastric acid production in order to manage symptoms associated with indigestion and gastroesophageal reflux disease. The detrimental impact of reducing stomach acid on dental health has been supported by previous studies conducted by **Imhann *et al.*, (2016)** and **Mishiro *et al.*, (2018)**. These studies have demonstrated that the use of PPIs for the treatment of GERD can lead to a significant increase in salivary pH, potentially influencing the composition of the oral microbiome. Furthermore, individuals who use PPIs have been found to exhibit a higher abundance of oral microbiome species in their gut microbiome [19,20]. However, this viewpoint contradicts the findings of **Wang *et al.*, (2004)**, who reported no adverse effects of PPI use on the prevalence of acidic oral mucosal lesions and periodontal destruction [21]. In addition to that the maintenance of the stomach's microbiota is facilitated by the presence of acid. A reduction in gastric acid levels has the potential to alter the pH equilibrium inside the oral cavity, hence promoting the proliferation of pathogenic microorganisms and the onset of oral health conditions. The decreased production of gastric acid might

also impede the efficient absorption of nutrients, hence negatively impacting dental well-being [12,22].

In conclusion, a noteworthy correlation exists between stomach disorders and dental caries, as well as oral manifestation lesions and associated consequences like erosion. Consequently, additional research is warranted to explore the specific mechanisms underlying this association and to develop effective preventive and therapeutic approaches for individuals afflicted with stomach disorders.

Conflict of interest: There is no need to declare a conflict of interest.

Authors' contributions: Each of the authors has made significant contributions to the work presented here. The final text was reviewed and accepted after being revised by all authors.

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