



## Oral Manifestations of Reflux Oesophagitis in a Cameroonian Tertiary Hospital

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### Authors' contributions

This work was carried out in collaboration among all authors. Authors AMA, YBT, ZS, KL and HL designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript, managed the analyses of the study. Authors AMA and YBT managed the literature searches. All authors read and approved the final manuscript.

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### ABSTRACT

**Introduction:** Reflux esophagitis also known as gastro-esophageal reflux disease (GERD) is an esophageal mucosal injury that occurs secondary to retrograde reflux of gastric contents into the oesophagus. The aim of the present study was to determine the oral manifestations of adults suffering from gastro-esophageal reflux at the General Hospital of Douala, Cameroon.

**Methodology:** This was a descriptive and comparative study carried out on between December to June 2019. The study was based on a questionnaire survey and clinical oral examinations on adults attending the gastroenterology department of the Douala general hospital.

**Results:** A total of 200 adults aged 18 to 68 years made up of 100 participants with GERD+ and 100 participants without GERD- participated in our study. Our study population consisted of 118 (59.0%) women and 82 (41.0%) men with an average age of 38.2±5 s.d.

All of our population used a toothbrush for hygiene and 98% of the GERD+(positive) group used toothpaste; 151 (75.5%) participants, including 81(81%) of patients with GERD+ versus 70(70%) in

controls brushed their teeth twice a day. Despite their acceptable oral hygiene, all patients living with GERD+ had at least one dental pathology against 89% without GERD with a significant difference  $p = 0.002$ . The most declared reason for consultation for patients with GERD+ was dental sensitivity.

Xerostomia, dental erosions, mucosal burns, soft / hard palate erythema, dental sensitivities, dental caries, halitosis was more prevalent in subjects with GERD. Oral pathologies associated with factors such as duration of the disease included dental erosions, halitosis, xerostomia ( $p < 0.001$ ). The unmet treatment needs for population included restorative care (76%) and pharmacological intervention (44%) with a significant difference in the two populations  $p < 0.001$ .

**Conclusion:** The prevalence of oral pathologies was high in the population studied, probably reflecting the situation in the general population. This study has showed that there was a significant difference at the oral level between healthy people and those living with gastro-esophageal reflux.

**Recommendation:** Dental surgeon faced with these oral manifestations or one of them should refer the patient in consultation with a gastroenterologist for suspicion of gastro-esophageal reflux. A multidisciplinary approach is recommended for management.

*Keywords: Oral manifestations; gastro oesophageal reflux; tooth wear; sensitivity; Cameroon.*

## 1. INTRODUCTION

The mouth form the first part of the alimentary canal and as such dentists are often the first health care professionals to diagnose a systemic disease through observation of its oral manifestations. Gastro-esophageal reflux disease (GERD) occurs when stomach acid frequently flows back into the tube connecting your mouth and stomach (oesophagus). This backwash (acid reflux) can irritate the lining of the oesophagus leading to an inflammation (oesophagitis). Gastro-esophageal reflux disease (GERD) is the most common pathology of the digestive system known to have oral damage [1]. Its symptoms are multifaceted with 80% of cases presenting with heartburn and / or acid regurgitation which is the atypical form as they are digestive or not. Patients do not usually consult the gastroenterologist when symptoms are atypical [2]. Therefore GERD is defined as involuntary muscle relaxing of the lower esophageal sphincter, which allows refluxed acid to move upward through the oesophagus into the oral cavity [3]. It is a relatively common condition worldwide, with prevalence rates in adults ranging from 21% to 56% in different countries.

In healthy individuals, most gastric fluid is returned to the stomach by peristalsis stimulated by swallowing. The remaining fluid is cleared by secondary peristalsis stimulated by direct contact of the juice with the esophageal mucosa [4]. In contrast, patients with GERD have delayed acid clearance [4] and the gastric acid and contents are involuntarily passed through the oesophagus and into the oral cavity [5].

The typical manifestations of GERD are heartburn, regurgitation, dysphagia, and retrosternal pain [6]. Atypical manifestations, such as asthma, chronic cough; hoarseness, noncardiac chest pain, and dental erosion are often underappreciated and poorly understood [7,8,9]. Dentists are commonly the first to diagnose GERD through erosion of teeth because most people are not aware of the presence of the disease [10].

A recent study has showed that the prevalence of GERD is 18.1–27.8% in North America, 8.8–25.9% in Europe, 2.5–7.8% in East Asia, 8.7–33.1% in the Middle East, 11.6% in Australia, and 23.0% in South America [11]. The increase in GERD prevalence may be due to multiple factors such as older age, male sex, race, intake of analgesics, consumption of certain types of food and drinks, , smoking, family history of GERD, obesity ,overweight or high body mass index (BMI), and limited physical activity. These risk factors are mostly related to a patient's lifestyle [12]. In Africa, Epidemiological and clinical studies that have reported very low prevalence's of GERD in all regions of sub-Saharan Africa studied (South Africa, Ethiopia, Nigeria, Zimbabwe, Kenya and Uganda) though *H. pylori* infection was ubiquitous with an overall prevalence of 61-100% [13].

Gastroesophageal reflux is a physiologic retrograde flow of gastric contents into the esophagus that occurs mostly postprandial (after meals) for around one hour per day [14]. A GER (gastroesophageal reflux) episode is diagnosed when oesophageal pH drops below 4.0 for at least 30 seconds [15]. But, in healthy individuals,

the acidic reflux is cleared by esophageal peristalsis and saliva within 1-2 minutes [16]. Saliva also helps to buffer (neutralize) esophageal acid [17] and to lubricate the oesophagus against mechanical damage from a food bolus [14].

Though increasing evidence of associations between GERD and tooth erosion has been shown in both animal and human studies, relatively few clinical studies have been carried out under controlled trial conditions [11,18]. Suspensions of an endogenous source of acid being associated with observed tooth erosion requires medical referral and management of the patient as the primary method for its prevention and control [18]. Sleep-related GERD is particularly insidious as the supine position enhances the proximal migration of gastric contents, and normal saliva production is much reduced. Gastric acid will displace saliva easily from tooth surfaces, and proteolytic pepsin will remove protective dental pellicle [18]. The presence of acid in the oral cavity does not affect on the oral hard tissues, it affects the soft tissues as well.

Though some few studies have been carried out on GERD in Cameroon, there is paucity of literature on the impact of GERD on oral tissues. Therefore this study was carried out to describe oral manifestations in patients with typical GERD gastroesophageal reflux.

## 2. METHODOLOGY

It is a cross sectional descriptive study carried out at the department of gastro-enterology from December to June 2019 of the Douala General Hospital a tertiary referral hospital located at the economic capital of Cameroon. Selected in this study were patients aged 18 above diagnosed of GERD who came to consult at the gastroenterology department of the General Hospital of Douala, patients who have never received regular medication for treatment of GERD and those who gave their informed consent. Also, a group of unpaired patients aged 18 and over who do not have GERD consulting in the same hospital who accepted to participate in the study were selected as a control group. Patients on dental treatment for more than 6 months and patients on medications that can affect the oral health like sodium diphenylhydantoinate or Dihydrant, cyclosporine were excluded. Incomplete information or missing data were excluded from the study. Patients

were selected using a convenient sampling. A self-administered data captured sheet was used in collecting information which included the personal and medical information of the patients like age, sex, level of education, profession, past medical and dental histories ; history of GERD (duration in months), oral hygiene status and oral health seeking behaviour, nutritional habits and oral pathologies.

The second part of the study involved the clinical examination of the mouth under bright light by a dental surgeon. The oral examination made it possible to identify the pathologies of the oral mucous membranes, dental erosions, the DMFT index, assessment of the level of hygiene, gingival bleeding, periodontal pockets, periodontal recessions, the CPITN (Community Periodontal Index treatment needs). The non-carious loss of dental hard tissues was measured using the Smith and Knight tooth wear index (Table 1).

Data analysis was carried out using Epi-info 7 and was expressed in frequency and percentages in the form of tables and figures. Bivariate analysis was carried using chi squared test and  $p \leq 0.05$  was considered as statistically significant.

## 3. RESULTS AND DISCUSSION

### 3.1 Results

A total of 200 participants made up of 100 GERD<sup>+</sup> 43 (43%) men, 57 (57%) women and 100 were a control group 39 (39%) men and 61 (61%) women) GERD<sup>-</sup> took part in the study (Table 2). The average age of all participants was 38.2 yrs  $\pm$  5 s.d with a minimum of 18 years and a maximum of 68 years. The age group most affected by GERD was that of 30-40 representing 36.0% and the least represented that  $\geq$  50 years representing 10%.

#### 3.1.1 Distribution of GERD

More than a third 39 (39%) of the participants presented with GERD in less than 60 months ago and 26 (26%) those  $>$  120 months.

There was no significant difference in the type of food of the two populations. The most consumed during this were spicy foods, 173 (86.5%) divided into 85 (85%) in GERD<sup>+</sup> against (88%) GERD<sup>-</sup> , 142 (71%) of the population

consumed alcoholic drinks, as seen in 66 (66%) GERD + and 76 (76%) GERD- (Table 3).

Two thirds 148 (74%) of patients had already consulted a dentist, these include 69 (69%) living

with GERD<sup>+</sup> against 79 (79%) GERD<sup>-</sup>. Dental sensitivity was the most frequent reason for consultation in patients living with GERD 43 (43%) against 213 (13%) in controls with a p < 0.001 Table 4.

**Table 1. Smith and knight tooth wear index (TWI) or tooth wear index [19]**

SCORE	AREA	CRITERIA
0	VLOIC	No loss of enamel surface characteristics No cutting change
1	VLOIC	Loss of enamel surface characteristics Minimum cutting loss
2	VLOIC	Enamel loss exposing just dentin < 1/3 of the surface Loss of enamel exposing just the ivory Defect less than 1mm deep
3	VLOIC	Enamel loss exposing just dentin < 1/3 of the surface Enamel loss and substantial loss of ivory but no pulp exposure Fair dentine < 1 / 3 exposure of surface defect 1 enamel loss Loss of enamel exposing just the ivory Defect 1-2mm thick
4	VLOIC	Complete enamel loss, or pulp exposure, or 2 ° ivory exposure Reduce pulp exposure, or ivory exposure by 2 ° Desert more than 2mm deep, or pulp exposure, or exposure ivory 2 °

**Table 2. Distribution of groups according to sex, level of education, profession, age, and duration of the pathology**

Gender	GERD <sup>-</sup> N (%)	GERD <sup>+</sup> N (%)	Total N (%)	SD	p-value
Feminine	61 (61.0%)	57 (57.0%)	118 (59.0%)	Ref, 1.18 [0.67; 2.07]	0.666
Male	39 (39.0%)	43 (43.0%)	82 (41.0%)		
<b>Level of study</b>					
No education	2 (2.00%)	3 (3.00%)	5 (2.50%)	Ref, 1.22 [0.16; 9.47]	0.621
Primary	6 (6.00%)	11 (11.0%)	17 (8.50%)		
Secondary	35 (35.0%)	32 (32.0%)	67 (33.5%)		
Superior	57 (57.0%)	54 (54.0%)	111 (55.5%)	0.63 [0.10; 3.93]	
<b>Profession</b>					
student / pupil	20 (20.0%)	19 (19.0%)	39 (19.5%)	Ref, 0.97 [0.42; 2.25]	0.911
unemployed	26 (26.0%)	24 (24.0%)	50 (25.0%)		
worker	54 (54.0%)	57 (57.0%)	111 (55.5%)	1.11 [0.54; 2.31]	
<b>Mean age ± s.d</b>	38.2 (11.8)	38.3 (10.2)	38.2 (11.0)	1.00 [0.98; 1.03]	0.918
<b>Age range:</b>					
18-30	29 (29.0%)	20 (20.0%)	49 (24.5%)	Ref, 1.80 [0.85; 3.81]	0.301
30-40	29 (29.0%)	36 (36.0%)	65 (32.5%)		
40-50	28 (28.0%)	34 (34.0%)	62 (31.0%)		
more than 50	14 (14.0%)	10 (10.0%)	24 (12.0%)	1.76 [0.82; 3.76] 1.04 [0.38; 2.79]	

**Table 3. Distribution of GERD**

Duration GERD (months)	GERD <sup>+</sup> N (%)	Total N (%)	SD	P value
less than 60	100 (100%)	0 (0.00%)	100 (50.0%)	<0.001
60-120	0 (0.00%)	39 (39.0%)	39 (19.5%)	
more than 120	0 (0.00%)	26 (26.0%)	26 (13.0%)	
<b>Food</b>				
Spicy foods :	85 (85.0%)	88 (88.0%)	173 (86.5%)	0.679
Alcoholic drink:	66 (66.0%)	76 (76.0%)	142 (71.0%)	0.161
Acid drink:	52 (52.0%)	61 (61.0%)	113 (56.5%)	0.254
Fatty foods	59 (59.0%)	57 (57.0%)	116 (58.0%)	0.886
Soft drink:	63 (63.0%)	58 (58.0%)	121 (60.5%)	0.563

**Table 4. Distribution of patients by reason for consultation**

Reasons for consultation	Absences from reflux N (%)	Presence of reflux N (%)	Total N (%)
Number Consultation	79 (79.0%)	69 (69.0%)	148 (74.0%)
Reason for consultation :			
Pain	41 (41.0%)	32 (32.0%)	73 (36.5%)
Uncomfortable	7 (7.00%)	2 (2.00%)	9 (4.50%)
Sensitivity	13 (13.0%)	43 (43.0%)	56 (28.0%)
Other	8 (8.00%)	2 (2.00%)	10 (5.00%)

All the participants used tooth brushes while the majority used tooth paste, a third 60 (30.0%) used mouth washes, 136 (68.0%) brush twice a day.

**3.1.2 Oral pathologies**

All the GERD + patients in study group presented at least one oral pathology against 11.0% of the controls who did not present an oral pathology. This difference was significant p = 0.002 (Table 6).

The most representative oral pathologies in our populations were successively, erythema of the mucous membranes (35% GERD + against 12% GERD-), burning sensation of the mucous membranes (58% GERD + against 24% GERD-), dental erosion (55.0% GERD + against 24% GERD-), Halitosis (54.0% GERD + against 31.0% GERD-), and xerostomia (49.0% GERD + against 19.0% GERD-).

**Table 5. Distribution of patients according to oral hygiene**

	Total N(%)	No N(%)	Yes N(%)	CI	p-value
Toothbrush	200 (100%)	100 (100%)	100 (100%)	Ref.	.-
Toothpaste:	198 (99.0%)	100 (100%)	98 (98.0%)	0.00 [0.00;]	0.497
Dental floss:	37 (18.5%)	18 (18.0%)	19 (19.0%)	1.07 [0.52; 2.18]	1,000
Mouthwash:	60 (30.0%)	25 (25.0%)	35 (35.0%)	1.62 [0.88; 2.98]	0.165
Other	88 (44.0%)	47 (47.0%)	41 (41.0%)	0.78 [0.45; 1.37]	0.476
<b>Frequency of brushing</b>					
> 3 times	4 (2.00%)	0 (0.00%)	4 (4.00%)	Ref.	0.013
1 time	49 (24.5%)	29 (29.0%)	20 (20.0%)	0.00 [0.00 ;.]	
2 times	136 (68.0%)	69 (69.0%)	67 (67.0%)	0.00 [0.00 ;.]	
3 times	11 (5.50%)	2 (2.00%)	9 (9.00%)	0.00 [0.00 ;.]	
<b>Moment brushing</b>					
morning	48 (24.0%)	29 (29.0%)	19 (19.0%)	CI	
other	151 (75.5%)	70 (70.0%)	81 (81.0%)	1.77 [0.91; 3.42]	0.100
evening	1 (0.50%)	1 (1.00%)	0 (0.00%)	0.00 [0.00 ;.]	

On the other hand, certain pathologies such as cellulitis (8.0% GERD + against 16.7% GERD-), candidiasis (6.0% GERD + against 16.7% GERD-), and pearls (0.2% GERD + against 6.7% RG0-) were the least represented.

**3.1.3 Periodontal exam**

Of the 200 participants in our study, 153 (76.5%) or 69 (69.0%) of people living with GERD versus 84 (84%) of people with control had periodontal disease. With a significant difference p = 0.020. Class 1 of gingival recession was the most represented in the two groups either (50 for GERD + and 40 for GERD-) (Table 6).

Class 1 gingival recession was common in participants with gingival recession 50 (50.0%) while class 2 was common in 28 (28.0%) of class

2 (Table 7). There was no significant difference in the periodontal status of both groups.

On dental examination, more than half of the population living with GERD, ie 55 (55%) against 24 (24%) in GERD- had dental erosion; 63 (63%) GERD + versus 32 (32%) GERD- had blocked teeth and 168 (84.0%) or 93 (93.0%) GERD + against 75 (75.0%) had tooth decay. This difference was significant p <0.001.

**3.1.4 Factors associated with oral-dental pathologies**

Pathologies such as xerostomia, halitosis, mucosal burns and dental erosion have been strongly associated with the duration of GERD (Table 8).

**Table 6. Distribution according to oral manifestations**

Variables	Total	No N(%)	Yes N(%)	CI	p-value
Oral Pathology	189 (94.5%)	89 (89.0%)	100 (100%)	. -	0.002
Erythema	47 (23.5%)	12 (12.0%)	35 (35.0%)	3.95 [1.90; 8.19]	<0.001
Aphthus ulcers	75 (37.5%)	35 (35.0%)	40 (40.0%)	1.24 [0.70; 2.20]	0.559
Gingivitis	60 (30.0%)	32 (32.0%)	28 (28.0%)	0.83 [0.45; 1.51]	0.643
Candidiasis	17 (8.50%)	11 (11.0%)	6 (6.00%)	0.52 [0.18; 1.46]	0.310
Dental abscess	22 (11.0%)	12 (12.0%)	10 (10.0%)	0.81 [0.33; 1.98]	0.821
Tonsillitis:	26 (13.0%)	11 (11.0%)	15 (15.0%)	1.43 [0.62; 3.28]	0.528
Cellulitis :	19 (9.50%)	9 (9.00%)	10 (10.0%)	1.12 [0.44; 2.89]	1,000
Benign tumor:	3 (1.50%)	2 (2.00%)	1 (1.00%)	. [.;]	0.431
Xerostomia:	68 (34.0%)	19 (19.0%)	49 (49.0%)	4.10 [2.17; 7.73]	<0.001
Hyposialia:	45 (22.5%)	25 (25.0%)	20 (20.0%)	0.75 [0.38; 1.46]	0.498
Mucosal burn:	82 (41.0%)	24 (24.0%)	58 (58.0%)	4.37 [2.38; 8.02]	<0.001
Perleche	12 (6.00%)	6 (6.00%)	6 (6.00%)	1.00 [0.31; 3.21]	1,000
Erosion:	79 (39.5%)	24 (24.0%)	55 (55.0%)	3.87 [2.11; 7.09]	<0.001
halitosis:	85 (42.5%)	31 (31.0%)	54 (54.0%)	2.61 [1.47; 4.66]	0.002
Other pathologies:	11 (5.50%)	7 (7.00%)	4 (4.00%)	0.55 [0.16; 1.95]	0.535

**Table 7. Distribution of patients according to periodontal disease**

Recession gingival :	Total N = 200	No N(%)	Yes N(%)	CI	P-value
Normal	50 (25.0%)	21 (21.0%)	29 (29.0%)	Ref.	0.063
Class 1	90 (45.0%)	40 (40.0%)	50 (50.0%)	0.91 [0.45; 1.82]	
Class 2	44 (22.0%)	28 (28.0%)	16 (16.0%)	0.41 [0.18; 0.95]	
Class 4	1 (0.50%)	1 (1.00%)	0 (0.00%)	0.00 [0.00 ;.]	
<b>CPI index</b>					
Score 0:	43 (21.5%)	15 (15.0%)	28 (28.0%)	2.20 [1.09; 4.44]	0.039
Score 1:	24 (12.0%)	13 (13.0%)	11 (11.0%)	0.83 [0.35; 1.95]	0.828
Score 2:	110 (55.0%)	58 (58.0%)	52 (52.0%)	0.78 [0.45; 1.37]	0.477
Score 3:	23 (11.5%)	14 (14.0%)	9 (9.00%)	0.61 [0.25; 1.48]	0.375
Score 4:	2 (1.00%)	2 (2.00%)	0 (0.00%)	0.00 [0.00 ;.]	0.497
Periodontal diseases	153 (76.5%)	84 (84.0%)	69 (69.0%)	0.42 [0.21; 0.84]	0.020

**Table 8. Non pathological hard tissue loss**

Loss of substance	N(%)	GERD <sup>-</sup> N(%)	GERD <sup>+</sup> N(%)	CI	p-value
Erosion:	79 (39.5%)	24 (24.0%)	55 (55.0%)	3.87 [2.11; 7.09]	<0.001
Attrition:	19 (9.50%)	12 (12.0%)	7 (7.00%)	0.55 [0.21; 1.47]	0.335
Abrasion:	51 (25.5%)	22 (22.0%)	29 (29.0%)	1.45 [0.76; 2.75]	0.330
abfraction:	3 (1.50%)	0 (0.00%)	3 (3.00%)	-	0.246
<b>DMFT</b>					
Caries:	168 (84.0%)	75 (75.0%)	93 (93.0%)	4.43 [1.82; 10.8]	0.001
Absent Teeth:	100 (50.0%)	57 (57.0%)	43 (43.0%)	0.57 [0.33; 1.00]	0.066
Closed teeth	95 (47.5%)	32 (32.0%)	63 (63.0%)	3.62 [2.02; 6.49]	<0.001

Xerostomia 28 (28.0%), burning mouth sensation 22 (62.9%), Halitosis 22 (62.9%), dental erosion 23 (65.7%), palatal erythema 14 (40.0%) were more common in GERD+ patients (Table 9).

**3.1.5 Unmet treatment needs**

All patients with GERD had at least one need for oral care. Motivation for dental hygiene was systematically used by all participants in the two groups. More than half of the patients (126) had a need for restorative care i.e. 76 in GERD<sup>+</sup> versus 51 in GERD<sup>-</sup> with a significant difference p <0.001. Pharmaceutical needs were significantly represented (p <0.001), i.e. 44 in GERD patients versus 18 in controls.

**3.2 DISCUSSION**

**3.2.1 Socio-demographics**

Our population ranging in age from 18 to 62 has an average age of 38.2 with a female predominance. These results were different from those observed by Pandolfino et al. in The United states of America, who reported an average age of 46.1 ± 4.0 with a minimum of 19 years and a maximum of 79 years [20]. This would be explained by the fact that the sample size of our study was much smaller than that of Pandolfino et al. [20]. The frequency of dental consultation in GERD + patients is slightly lower than the control population. This is in agreement with the current study which underlined the lack of awareness of GERD+ patients to this important health problem. This could be due to the fact that the GERD + patients in our study were workers with a lack of time. In addition, they had limited knowledge of the potential impact of GERD on oral health.

The age group less represented was that > 50 years and this could be explained by the fact that

at more than 50 years are generally found atypical GERD and / or associated with other digestive pathologies. Patients living with GERD had a spicier, more alcoholic diet than those living without GERD. This being a factor favouring increase in regurgitation frequencies consequently faster presence of oral damage.

**3.2.2 Oral pathologies**

The current study showed, burning sensation, dental erosion, xerostomia and halitosis are the most frequent symptoms associated with GERD, with 58.0% versus 24.0% for burning sensation, 55.0% versus 24.0% for erosion, 54.0% against 31.0% for halitosis and 49.0% against 19.0% for xerostomia. With a value p<0.001 for all these pathologies. This is in agreement with previous studies done by Di Fédé et al. [21]. However, halitosis has been rarely reported by patients due to its impact on quality of life, although it was evident during interviewing patients. The appearance of xerostomia in patients with GERD has already been studied, but the results have often been controversial. Saliva is considered to be one of the main mechanisms of protection of the esophageal mucosa against gastric reflux, its absence or reduction is linked to the pathogenesis of GERD [22] although it has not been studied. Based on current results, xerostomia may well be included in the extraoesophageal symptomatology of GERD because its pathogenesis seems disconnected from the production of saliva. Recent studies have reported that the possible contributing factors for these pathologies in recent times may include the duration of exposure of dental tissues to gastric fluid, rising obesity rates, greater consumption of medications affecting esophageal function, and potentially changing prevalence rates of Helicobacter pylori infection [20].

**Table 9. Distribution of oral pathologies according to the duration of GERD**

Pathologies	Total N(%)	GERD- N(%)	GERD+ N(%)	P- value
Xerostomia	49 (49.0%)	5 (12.8%)	20 (57.1%)	<0.001
Hyposialia	20 (20.0%)	8 (20.5%)	8 (22.9%)	0.767
Burning mouth sensation	58 (58.0%)	15 (38.5%)	22 (62.9%)	0.002
Halitosis	54 (54.0%)	8 (20.5%)	22 (62.9%)	<0.001
Erosion	55 (55.0%)	9 (23.1%)	23 (65.7%)	<0.001
Palatal erythema	35 (35.0%)	14 (35.9%)	14 (40.0%)	0.564
Apthus ulcer	40 (40.0%)	20 (51.3%)	10 (28.6%)	0.135
Gingivitis	28 (28.0%)	11 (28.2%)	10 (28.6%)	0.989
Candidiasis	6 (6.00%)	4 (10.3%)	1 (2.86%)	0.499

**Table 10. Unmet treatment needs**

Treatment needs	Total N(%)	GERD-N(%)	GERD+ N(%)
Oral hygiene improvement	198 (99.0%)	98 (98.0%)	100 (100%)
Scaling and polishing	154 (77.0%)	81 (81.0%)	73 (73.0%)
Curettage	48 (24.0%)	25 (25.0%)	23 (23.0%)
Conservative care	127 (63.5%)	51 (51.0%)	76 (76.0%)
Dental Extractions	37 (18.5%)	21 (21.0%)	16 (16.0%)
Prostheses	62 (31.0%)	18 (18.0%)	44 (44.0%)

### 3.2.3 Dental pathologies

The frequency of dental erosions in our two groups was 55% in GERD against 24% in controls with a significant difference  $p < 0.001$ . These results are similar to those found by Milani et al in Brazil [23], Di Fédé et al. in [21] who reported significant associations between tooth wear and tooth. As symptoms commonly considered directly linked to erosion, this result can further confirm the significant difference in dental erosion in the two groups. Unlike that of Jensdottir and colleagues (2004), who found a low prevalence of dental erosion in GERD patients [24]. This difference can be explained by the fact that all of our patients evaluated with GERD, have been diagnosed, especially without treatment, which increases acid regurgitation, the main etiological factor of these erosions in these patients. There are also many variables involved in the pathogenesis of erosions, such as the frequency of regurgitation episodes, eating habits which were not significant in the two population groups, the buffering capacity of saliva, the salivary flow, salivary pH and time elapsed without treatment. This is the case with our study which showed a significant association. Therefore, our results suggest that the complex pathogenesis linking GERD to dental erosion is based on oral acidification or lower oral pH related to reflux and decreased saliva protection, rather than increased acidification of food. The population living with GERD had more cavities and had a greater

number of dental fillings with a significant difference  $p < 0.001$ . These results are similar to the studies by Madrid et al. [25] in Switzerland . This showed that the incidence of decayed, missing and filled teeth is generally high in GERD+ subjects. The fact the carious lesions were very high in the GERD + group despite their better oral hygiene can be explained by the fact that the repeated acidification of the oral environment by GERD demineralizes the dental tissues thus favouring bacterial proliferation particularly *Streptococcus mutants* thus favoring decay. The presence of a large number of filled teeth could also correspond to erosion fillings as much as to decay. But Muñoz et al. [26] observed that the prevalence of caries and periodontal lesions was similar in patients with gastro-oesophageal reflux disease and in healthy volunteers suggests a lack of relationship of caries and periodontal lesions with gastro-oesophageal reflux disease [26].

### 3.2.4 Periodontal pathologies

The CPI index and gingival recession were not significantly different in the two groups. These results were similar to those of Munoz et al. in who did not find a difference between the two groups except the gingival recession which was high in GERD+ [26]. This can be explained by the fact that more than two thirds of the population practiced an inappropriate brushing technique as poor brushing technique being a factor favoring receding gums



### 3.2.5 Factors associated with the occurrence of oral pathologies

Symptoms such as belching, unexplained sour taste and heartburn usually alert the patient to the condition GERD (27). The current study showed that xerostomia, dental erosion and halitosis were significantly correlated with the duration of the disease. Ali et al. who had found that long-term GERD could be detrimental to oral soft tissues, dental structures and salivary pH [27]. In the current study, although GERD patients consumed more spicy, acidic and alcoholic foods, we cannot say that diet is a factor associated with these different pathologies because patients without GERD were exposed to the same type of diet.

### 3.2.6 Unmet treatment needs

The requirements for conservative and pharmacological care were significantly different in the two groups ( $p < 0.001$ ). This difference can be explained by the presence of erosions and dental caries, hence conservative care such as fillings at the same time of xerostomia so its prevention or treatment will help prevent acid reflux from occurring. Its treatment involves chewing gum with xylitol, with fluoride tooth paste, drink plenty of water at room temperature, avoid alcoholic beverages.

### 3.2.7 Limitation of the study

1. Reflux esophagitis as a result of other gastric diseases such as peptic ulcer disease, achalasia, gastritis, dyspepsia and gastro paresis could serve as a confounding factor if proper diagnosis is not done. This was taken into consideration as the gastric entomologists was the one confirming the diagnosis.
2. Patients suffer from dental erosion as a result of egestion of acidic diet could also serve as a confounding factor.

## 4. CONCLUSION

GERD was found in adults aged 18, 68 years, predominantly women (59%) and in adults of mean age  $38.2 \pm 5$  s.d.

Xerostomia, dental erosions, mucosal burns, soft / hard palate erythema, dental sensitivities, dental caries, halitosis was more prevalent in subjects with GERD.

Oral pathologies associated with factors such as duration of the disease included dental erosions, halitosis, xerostomia ( $p < 0.001$ ). The unmet treatment needs for population included restorative care (76%) and pharmacological intervention (44%) with a significant difference in the two populations  $p < 0.001$ .

## 5. RECOMMENDATIONS

Patients should take seriously the threat that oral diseases pose to their general health and to make biannual oral consultations especially when they discover that there are anomalies in the teeth.

A multidisciplinary management team is recommended for GERD patients and a systematic biannual oral examination is required by the team to evaluate the evolution and cause of the disease.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## CONSENT AND ETHICAL APPROVAL

Authorisation to carry out the study was taken from the Institutional Research Ethics Committee of the Université des Montagnes and ethical clearance from the General Directorate of the Douala General Hospital. The potential participants were fully informed about the different aspects of the study, and their inclusion in the study was only made after signing the informed consent form which was presented to them and explained in advance. Our study was conducted in strict compliance with medical confidentiality and without any financial participation of the various participants.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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