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The prevalence correlation of median rhomboid glossitis in diabetic and non-diabetic patients: A cross-sectional study on a sample of Libyan population

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Abstract

Background: tongue lesions are reflecting many systemic diseases of the body. Despite the relative frequency of Median Rhomboid Glossitis (MRG), its exact etiopathogenesis is controversial. A direct association between tongue lesions including MRG and oral candidiasis, tobacco smoking, denture wearing, and systemic conditions such as diabetes mellitus (DM) has been reported.

Objective: The objective of this present study was performed to determine the prevalence of MRG among Libyan diabetic and non-diabetic patients (NDPs), and hence detect and estimate the possible associations.

Method: The sample was made of 928 patients, divided into 2 groups. Group1 consist of 464 diabetic patients (DPs), while group 2 consists of 464 NDPs as a control group.

Results: the prevalence of MRG in all diabetic cases was (12%) whilst in NDPs was 3.4%. MRG was present in 56 DPs 39 (70%) were males and 17(30%) were females. There was a significant association between MRG and burning sensation $P < 0.001$.

Conclusion: MRG among Libyan patients was significantly more prevalent in DPs than in NDPs.

Keywords: Median Rhomboid Glossitis (MRG), Diabetes Mellitus (DM), Prevalence correlation, glycemic controlled DPs, Glycosylated hemoglobin (HbA1c)

Introduction

DM is defined as a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both according to the American Diabetes Association [1]. DM can be divided into two types based on the age group. In type 1 diabetes, the β -cells of the pancreas are destroyed by the autoimmune mechanism. In Type 2 diabetes, insulin resistance is developed [2]. DM is a disease affecting multiple organs and this combined with changes in the oral cavity causing a shift in the homeostasis of the oral microflora [3]. Studies have reported that diabetic patients have increased predisposition to the manifestation of oral candidiasis, including MRG, denture stomatitis, and angular cheilitis [4]. HbA1c is routinely used as a marker to indicate long-term glycemic control [5]. Poorly controlled DM, represented by elevated HbA1c, further exacerbates this persistent hyperglycemia is a risk factor for DM complications [6]. According to the guidelines set forth by the American Diabetes Association, the goal of type 2 diabetes therapy is to reduce glycated hemoglobin (HbA1c) to 7% or 6.5% [7]. MRG was first described by Brocq in 1914 [8]. MRG is defined as the central papillary atrophy presents in the posterior region of the dorsum of the tongue [9]. MRG is also known under the terms central papillary atrophy of the tongue (CPA), localized atrophy of the tongue papillae (LAT), atrophy of the tongue papillae (ATP) median type [10]. Etiopathogenesis of MRG is uncertain [11], but several factors have been proposed as possible causes such as denture wearing, smoking, DM, use of corticosteroids sprays or inhalers and human immunodeficiency virus (HIV) [12]. In addition, salivary dysfunction in patients with diabetes can also contribute to the higher carriage of fungi in this group of patients. [13] However, in the past MRG was considered a developmental malformation, with the persistence of *Tuberculum impar* [14].

The most widely accepted theory is that candidal infections play an important role in aetiology [15]. Although MRG is often an asymptomatic lesion, persistent pain, irritation or pruritus have been reported [16]. Men are affected three times more often than women [17]. The condition most commonly affects adults and is only occasionally identified in children [18]. MRG is typically located at the midline, anterior to the circumvallate papillae with round or rhomboid shape. It is commonly smooth and flat but may be depressed or have a lobular to papillary surface [19]. It sometimes appears in the paramedial location [20]. The affected area may vary in size (between 1 cm and 2.5 cm) [21]. When MRG is associated with palatal inflammation, it is called the kissing lesion; immune suppression should be suspected and investigated in these patients. This is considered a marker of AIDS [22]. The mucosal response in MRG comprises an inflammatory reaction without degenerative changes in the subepithelial tissues [23]. Diagnosis is typically made on a clinical basis although diagnostic tests are available when needed [24]. Candidal infections, in particular, the development of a MRG are strongly associated with DM, with an incidence of 30% of patients [25].

Materials and Method

This cross-sectional study was performed on 928 Libyan patients attending the National Center for Diabetes and Endocrine gland diseases and Tripoli Dental Centre, Ministry of Health / Tripoli - Libya. The sample was divided into 2 groups. Group 1 consists of 464 diabetic patients, while group 2 consists of 464 NDPs as a control group. Demographic and medical data were collected for all respondents, from 2018 to 2019. Medical history, past dental history in the questionnaire we asked for information about age, gender, smoking habits, oral hygiene maintenance and HbA1c value for diabetic patients (DPs). When the DPs with HbA1c value $\leq 7\%$ were considered as glycemic controlled while the DPs with HbA1c value $> 7\%$ were considered as glycemic uncontrolled. Clinical examination of the tongue was performed to detect MRG and recorded according to the designed examination sheet. The diagnosis was based on clinical findings alone obtained by oral pathology and oral medicine specialists. The study was explained to the patients and informed consent was obtained. The collected data contain different variables, including quantitative and qualitative, variables. To examine the association of (categorical or continuous) independent variable(s) with one dichotomous dependent variable, Logistic regression analysis was employed using SPSS 26 (IBM, USA). to describe data and to explain the relationship between one dependent binary variable (MRG) Vs eight independent nominal, ordinal and scale variables (Age, Gender, HbA1c, glycemic controlled and uncontrolled DPs, treatment Type, symptoms and Oral Hygiene), to obtain the significant and affective variables on MRG. A *p*-value less than 0.05 was considered significant.

Results

Out of 464 patients with medically diagnosed DM were considered for this study showed 237 (51%) were males and 227(49%) were female, with a male to female ratio approximately (1:1). Amongst 464 diabetic patients, only 56 patients were diagnosed with MRG (Fig1). Consequently, the prevalence of MRG in all diabetic cases was (12%) (Fig 2). MRG was present in 56 DPs 39 (70%) were males and 17(30%) were females with a male to female ratio was 2.3:1 (Table1). It was found to be a significant difference $p= 0.001$. The ages of diabetic participants in this study varied between 18 and 89 years old with a mean of 54.2 years, a standard deviation (SD) of 12.3 years, and median age was 56 years.

Subjects were categorized into eight groups. Overall, the prevalence of MRG according to the age distribution was found significantly higher in the 50-57 years old. On the other hand, MRG was found to be least in both > 81 years ($< 3.6\%$) and 47-81 years (3.6%). The difference was found to be statistically not significant $P = 0.966$ (Fig. 3) (Table 2). According to the HbA1c values of among the entire DPs with MRG 141 (30.3%) were glycemic controlled and 323 (69.6%) were glycemic uncontrolled, this result indicated that no significant relationship ($p = 0.298$) (Table 3). The number of glycemic uncontrolled DPs with MRG was greater than the number of glycemic controlled DPs with MRG in all age groups, while the distribution shows equality in age over the age of 81years (Fig 4).

Table (4) showed and concluded that there was no significant association between MRG and oral hygiene. ($P = 0.492$). Among 56 (12.1%) DPs with MRG 52 were asymptomatic (92.8%) and 4 were symptomatic (7.1%), this result showed a significant association between MRG and burning sensation symptom $P < 0.001$ (Fig 5) (Table 5).

Regarding 464 NDPs (control group), 162 (35%) were males and 302(65%) were females. Furthermore, amongst 464 non-diabetic cases, 16 (3.4%) were diagnosed with MRG. Consequently, the prevalence of MRG in all non-diabetic cases was (3.4%) (Fig 6), 9 (56%) of them were male and 7 (44%) were female, whilst the male to female ratio of MRG in NDPs was 1.3:1. However, the prevalence of MRG in DPs was greater than the prevalence of MRG in NDPs (Fig 7).

Table 1: Distribution of MRG in DPs according to gender

Male DPs with MRG	Female DPs with MRG	Total
5	7	12
8	10	18
28	18	46
35	34	69
49	78	127
64	66	130
30	18	48
8	6	14
227	237	464

Table 2: The prevalence of MRG present according to age groups

<i>n</i>	(%)	Age groups
1	1.8%	18-25
4	7.1%	26-33
5	8.9%	34-41
8	14.3%	42-49
14	25.0%	50-58
13	23.2%	59-66
9	16.1%	67-74
2	3.6%	75-82
56	100%	Total

Table 3: Distribution of MRG in controlled and non-controlled DPs according to the age groups

Age groups	MRG in glycemic controlled DPs	MRG in glycemic uncontrolled DPs	Total
18-25	4	8	12
26-33	16	12	18
34-41	13	33	46
42-49	25	44	69
50-58	39	88	127
59-66	31	99	130
67-74	19	29	48
75-82	3	9	12
>82	1	1	2
Total	141	323	464

Table 4: Association of oral Hygien with presence of MRG

Oral Hygiene	Number & percentage	MRG		Total
		Absence	Present	
Poor	n	213	28	241
	%	88.4%	11.6%	100.0%
Fair	n	178	25	203
	%	87.7%	12.3%	100.0%
Good	n	17	3	20
	%	85.0%	15.0%	100.0%
Total	n	408	56	464
	%	87.9%	12.1%	100 %

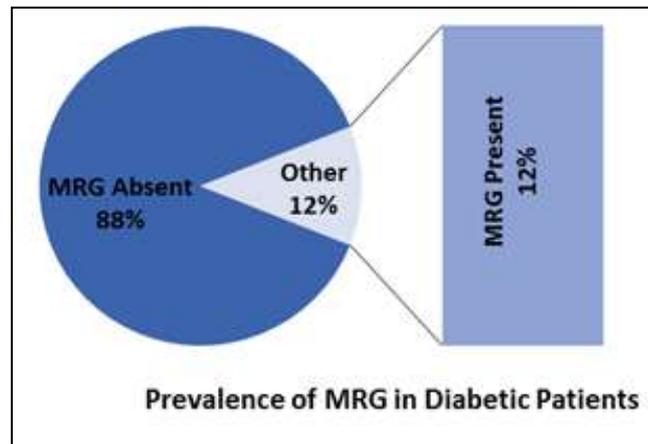


Fig 2: Pie chart representing the prevalence of MRG in DPs

Table 5: Association of presence or absence of MRG with Presence or absence of symptoms (burning sensation)

Presence or absence of MRG	Number & percentage	Symptoms		Total
		No burning sensation	Burning sensation	
Absence	n	407	1	408
	%	99.75%	0.25%	100%
Presence	n	52	4	56
	%	92.86%	7.14%	100%
Total	Count	459	5	464
	%	98.92%	1.08%	100%

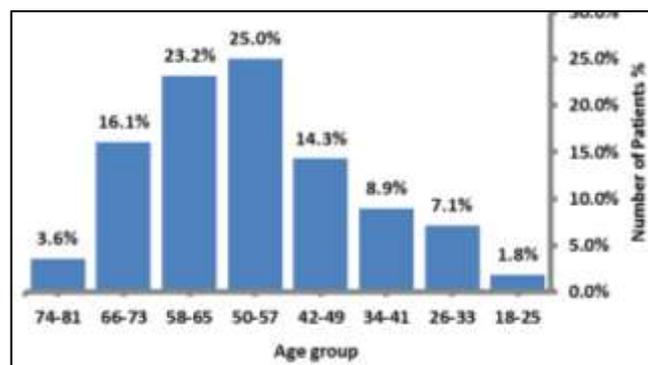


Fig 3: Bar graph shows the prevalence rate of MRG in DPs according to different age groups



Fig 1: Intra- oral Photographs showing MRG of the tongue in male patient.

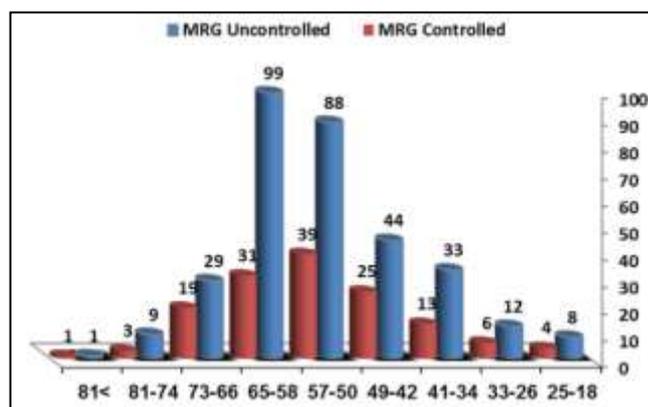


Fig 4: Bar graph demonstrating the age distribution and the number of glycemic controlled and uncontrolled DPs diagnosed with MRG

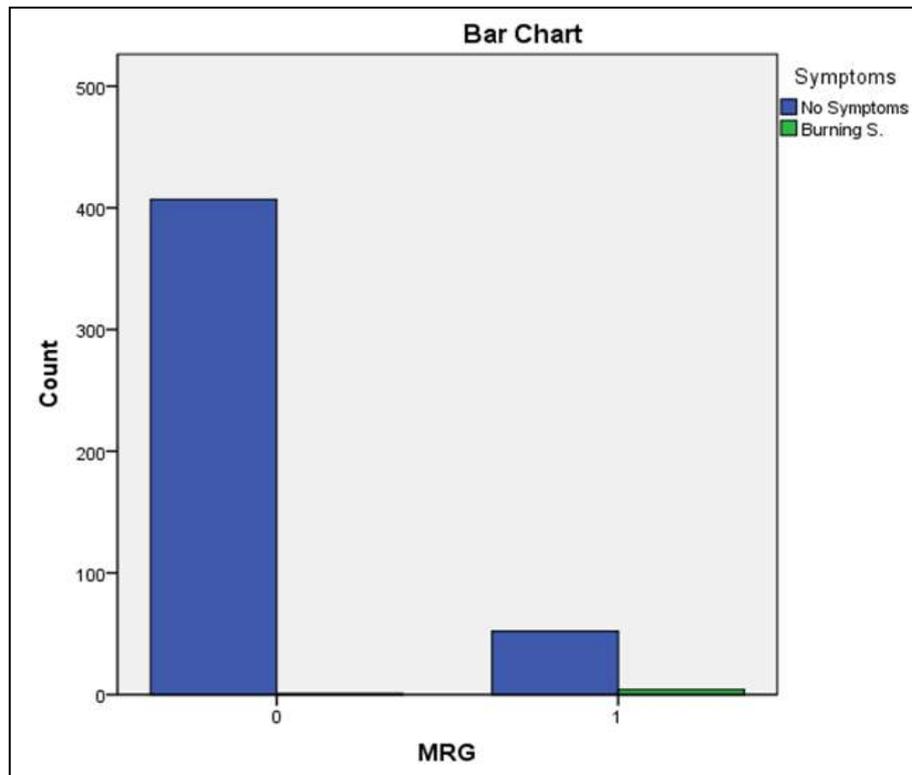


Fig 5: Bar graph shows significant association between MRG and burning sensation symptoms

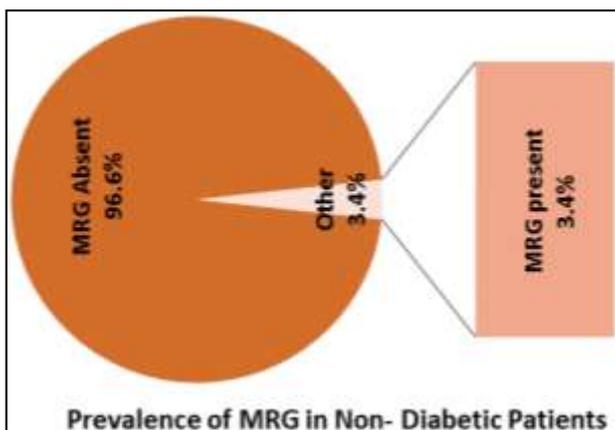


Fig 6: Pie chart representing the prevalence of MRG in NDPs

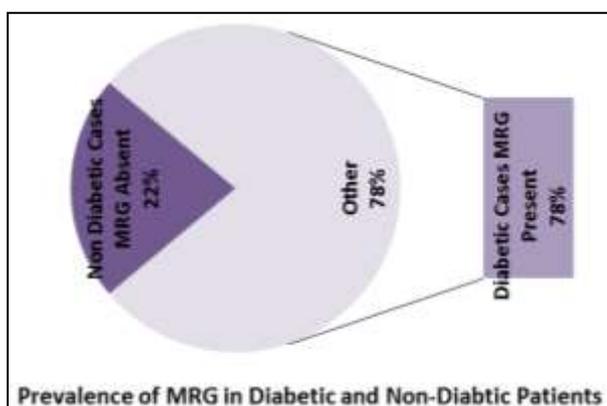


Fig 7: Pie chart demonstrating the prevalence of MRG in diabetic and NDPs

Discussion

This study aimed to determine the prevalence correlation of MRG with DPs and to detect possible associations. Several studies have reported the prevalence correlation of MRG in DPs with different percentages. Our study showed a high

prevalence of MRG in DPs (12%) compared with a control group (NDPs) (3.6%). Furthermore, our results revealed that there was an association between MRG and DM, particularly in glycemic uncontrolled DPs 323 (69.6%). this may be attributed to DM is an immunosuppressant disease. Nevertheless, it was found to be statistically not significant. These findings were similar to a study reported by Mojabi (2009) [26] who reported that the prevalence of MRG in DPs and the control group was 7.4% and 1.2%, respectively and disagreement with Yarom (2004) [27] who found that the prevalence of MRG was 2.4% in DPs. Although the prevalence of MRG varies around the world, it is slightly higher among individuals who have DM.

Adult males being more commonly affected than females [28]. In the present study, males 39 (70%) are more affected with MRG than females 17(30%) with male to female ratio of 2.3:1. It was observed that there were a significant association between MRG and gender distributions $p=0.001$ which indicated that gender is an influential factor in MRG condition. This was consistent with many previous studies observed in the literature and inconsistent with a study done by Ghabanchi (2011) [29] who found that MRG was equally prevalent in both genders and also inconsistent with Wright (1978) [30] who reported a 4:1 female predominance. MRG is present in about 1% of the population and most often affects men between the ages of 30 - 50 years old [31]. In this study, the age group most frequently involved and significantly higher was 50-57 years old (25%). Furthermore, the number of glycemic uncontrolled DPs with MRG increases with the increase in age and it also occurs in the same direction with the glycemic controlled DPs of MRG. This was in agreement with Jankittivong (2007) [32]. Who found that MRG occurred between 30-59 years old and in disagreement with Goregen (2011) [33]. Who reported that DPs 20-39 years of age were significantly related to MRG occurrence. However, in our study, the association between MRG and 50-58 years of age was not statistically significant. MRG is usually asymptomatic but in some situations, may cause a burning sensation [15]. In

the current study, 65 patients with MRG (92.8%) were asymptomatic and 7.1% were symptomatic (had a burning sensation of the tongue). This result showed a highly significant association between MRG and burning sensation symptom $P < 0.001$. This may be due to the higher sensitivity of the depapillated areas on the tongue dorsum or due to neurosensory disorders present in DM complications. However, this finding was consistent with most previous studies observed in the literature and inconsistent with Azmi (2011) [34] who reported an absolute asymptomatic MRG in the entire study sample.

Conclusion

Our study demonstrated that MRG was significantly more prevalent in DPs than in NDPs that confirmed the evidence which clarifies there is a strong prevalence correlation between MRG and glycemic uncontrolled DPs. A burning sensation in the mouth was found to be more prevalent and had a higher significance with DPs. Therefore, in patients who complain of glossopyrosis (burning sensation of the tongue), the presence of MRG condition with uncontrolled DM is expected. The presence of MRG is indicative of undiagnosed DM which can be identified by dental practitioners. Consequently, they refer the patients to a physician for further biochemical investigations to avoid post-extraction, post-surgical complications, delayed wound healing as well as hypoglycemic risk. The aetiology of MRG is controversial. Regarding our study observations in described cases, we believe that MRG is a developmental anomaly of the tongue which is more prone to fungal infection because Tubercle Impar is mesoderm in origin and thin tissue. In addition, it has no defensive first immune line (epithelial barrier) that is present in the thickness of epithelium tissue, as a result, it becomes more susceptible to candidal infection, particularly in debilitated and poorly controlled DPs.

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