



Ministry of Higher Education and  
Scientific Research  
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# The Correlation Of Ulcer Lesions In Patients With Diabetes Mellitus

Submitted to the Council of the College of Medicine,  
Diyala University, In Partial Fulfillment of  
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# بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

{هُوَ الَّذِي بَعَثَ فِي الْأُمِّيِّينَ رَسُولًا مِنْهُمْ يَتْلُو عَلَيْهِمْ آيَاتِهِ وَيُزَكِّيهِمْ  
وَيُعَلِّمُهُمُ الْكِتَابَ وَالْحِكْمَةَ وَإِنْ كَانُوا مِنْ قَبْلُ لَفِي ضَلَالٍ مُبِينٍ}.

سورة الجمعة، آية: 2

## Abstract

**Background:** Diabetes Mellitus has become a global epidemic and presents many complications, usually proportional to the degree and duration of hyperglycemia. Patients with diabetes mellitus have been associated with a number of changes in the oral cavity, such as gingivitis, periodontitis, mucosal diseases, salivary dysfunction, altered taste, and burning mouth. Ulcers are recurrent lesions that result in tissue loss. They are relatively common oral mucosa lesions that damage both the mucosa and the underneath connective tissue. Oral ulcers are frequently excruciatingly painful and are a common reason for a doctor's visit. **Aim:** This study aimed to determine the prevalence of ulcer lesions in patients with diabetes mellitus.

**Subject and methods:** The current study is cross section study type was carried out in Diyala from 20th of November 2022 to the 23th of March 2023. The study design was by simple random sampling.

**Results:** The total sample of study was (40), the mean of age in this study (60.6) years old. the most of sample was male (57.5%), while female was (42.5%). the minor ulcer is the most type of ulcer in percentage (60%) then major ulcer in percentage (32.5%) and herpetiform ulcers is lowest percentage (7.5%). the lip is the most common site of ulcers (40%), then tongue and floor of the mouth in percentage (30%), (22.5%) respectively. There is no significant correlation between type and gender due to P Value more than 0.05. Since  $p\text{-value} > 0.05$ , we can-not reject the null hypothesis in correlation between type and HbA1c. there is no significant correlation between Duration OF DM/Month and type. about (62.5%) with family history of DM and (37.5%) without family history of DM.

**Conclusions:** Diabetes mellitus is a chronic, non-communicable and endemic disease. Type 2 compared to type 1 diabetes mellitus is more prevalent worldwide and increasing, especially in Iraq. The minor ulcer is the most type of ulcer and herpetiform ulcers is lowest. The lip is the most common site of ulcers and the lowest site was in buccal mucosa. There is no significance correlation between type and gender. There is no significance correlation between type and HbA1c. There is no significance correlation between duration OF DM/Month and type. Most of sample of study with family history of DM.

**Keywords:** Dentistry, Diabetes mellitus, Diabetes mellitus, Type 1, Diabetes mellitus, Type 2, Mouth diseases, ulcer.



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Finally, thanks to everyone who helped this study to be completed



## Dedications

*This project is especially dedicated to the doctors who helped and guided us to successfully complete this project work.*

*Also I would like to dedicate this project to my dear father, who has been a wonderful supporter until my research was completed, and to my beloved mother, who has been encouraging me for months.*



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## Abbreviations

(EBV): Epstein–Barr Virus

(RAS): Recurrent Aphthous Disease



## Introduction

Diabetes mellitus is a chronic disease affecting all age groups. It is one of the leading causes of mortality and morbidity worldwide. Many chronic macrovascular and microvascular complications of diabetes have been reported in the literature with few reports about oral complications, ulcers are recurrent lesions that result in tissue loss, they are relatively common oral mucosa lesions that damage both the mucosa and the underneath connective tissue [1]. Oral ulcers are frequently excruciatingly painful and are a common reason for a doctor's visit, among the causes are infectious processes, neoplasms, gastrointestinal diseases, blood disorders, rheumatic diseases, immunological diseases, trauma lesions, and other variables, due to the multiple variables that can cause them, a proper differential diagnosis is required [2].

Ulcerations can be classified based on (i) duration of onset (ii) number of ulcers and (iii) etiological factors; ulcerative lesion lasts for two weeks, is considered as the chronic ulcer, acute ulcer lasts for no longer than two weeks and is typically painful, whereas recurrent ulcers present with a history of comparable episodes with irregular healing and chronic ulcer may last for more than two weeks [3].

The solitary ulcer is the occurrence of a single ulcerative lesion, while the term multiple explains the incidence of numerous ulcerative lesions [4].

Because of the variety of presenting features and causative factors, identification of oral ulcerative lesions may be relatively challenging. Local or systemic factors can be contributing to developing ulcers [5].

Ulcers have different parts: the floor (uncovered ulcer surface), the base (ulcer rest seat), the margin (interface among the wall of ulcer and normal epithelium) and the edge (the part of the margin and floor). The extension phase, transition phase (preparation for healing) and the healing or repair phase are the three stages that are identified throughout a simple ulcer clinical course [6].

Canker sores, first described by Hippocrates in 400 BC, are most generally found in the oral and pharyngeal mucosa, although they could also be observed in the vaginal area direct ulceration owing to epithelial necrosis that transcends the basement membrane, exposing nerve endings and generating discomfort or suffering, is the primary lesion, not a vesicle or a blister. If they grow large enough, they may leave a scar when they heal, they appear clinically as painful ulcerations of various sizes, round or oval, with clean margins, yellowish-white fibrous exudate covers the necrotic fundus, which is framed by a border or red halo of hyper an EMI origin and has a tendency to relapse [7].

A full-thickness erosion of the epidermis into the dermis is known as an ulcer. Because oral mucous membranes are especially thin membranes that are sensitive to physical and chemical damage, it happens more frequently in the mouth. Allergic, viral, metabolic, nutritional, neoplastic, or systemic disorders can all affect these membranes. A variety of inflammatory illnesses can cause readily eroded vesicles and bullae in the oral mucosa, resulting in erosions and ulcers [8].

Oral mucosa ulceration is a common occurrence, resulting in painful “aphthae,” an old name for ulcers of any mucosal surface. Oral mucous membranes are fragile, specialized membranes that are prone to erosion. Painful ulceration is caused by full-thickness epithelial erosion into the lamina propria. The doctor is frequently sought for assessment and treatment of mouth ulcers since

they are both prevalent and painful. Minor irritation to cancer and systemic illness are all possible causes. A realistic approach to the clinical management of oral ulcers allows the doctor to assess patients accurately and begin treatment. Oral ulcers are unpleasant and come in a variety of shapes and sizes, including single, numerous, symmetric, and irregular [9].

They typically feature a core friable yellow-white exudative base with a bright erythematous ring. Once an ulcer has formed, it is irritated by saliva and bacteria regularly, and the acute inflammatory stage may be followed by a pattern of chronic inflammation. Oral ulcers have a lot of similarities clinically and histologically, despite the reality that they have a lot of different origins. In determining etiology, an algorithmic method based on length, repetitive nature, morphology, location, and systemic symptoms is effective. Acute oral ulcers last for a short time, and 6 weeks is a good point to distinguish between acute and chronic ulcers. Chronic mouth ulcers can be caused by a wide variety of factors, including malignancy, systemic disease, and various chronic inflammatory or immunological bullous disorders such as pemphigus, Para neoplastic disease, mucous membrane pemphigoid, and lichen planus [10]. Mouth ulcers are categorized as major, minor, or herpetiform based on the size and number of ulcers [11].

### **Couse of ulceration:**

Sores and erosions can be the last common indication of a variety of conditions, ranging from epithelial damage caused by trauma to an immunological attack such as lichen planus, select appropriate, or part of a particular, to damage caused by an immune defect such as Human immunodeficiency virus and leukemia, infections

such as viral pathogens, tb, and syphilis, or nutritional deficiencies such as vitamin deficiency [12].

### **Local causes of ulceration:**

Chemical burns, heat, ice, or ionizing energy burns, or factitious ulceration of the maxillary group includes, can appear at any age. Ulceration can appear at any age as a result of trauma, hard meals, or equipment. The lingual fraenum can be damaged by brushing the lowest incisors repeatedly as in cunnilingus, or by persistent cough as in rapid coughs, or by self-mutilation. After receiving a dental local anesthetic, children may bite their lower lip, resulting in ulceration. Non-accidental injury can manifest as ulcers of the higher labial fraenum, particularly in a youngster with slightly swollen lips, subluxed dentition, or a fractured jaw [13].

Recurrent oral ulceration trauma: Many of the most frequent causes of recurring mouth ulcers are oral trauma, this happens when the mucosa is irritated mechanically, chemically, or thermally. These are usually acute, short-term episodes that result in painful ulcers that heal quickly and without scarring within a few weeks. If the inciting stimuli are not removed, the ulcers may reoccur. Recurrent oral ulceration can be produced by dental appliances, dentures, and orthopedic devices [14].

Recurrent Aphthous Disease (RAS): RAS also called mouth ulcers, is thought to affect as many as 20% of people in North America. Recurrent aphthous ulcers are usually restricted to the oral mucosa and have a complex origin rather than being caused by a single source. Trauma, smoking, stress, hormonal impacts, heredity, food allergies, infections, and immunologic variables are all thought to be contributing factors, familial and genetic variables, autoimmune factors, hormonal changes, hypersensitivity to particular foods, medicines, blood shortage, zinc

deficit, stress, tobacco, local traumas, infectious agents, and numerous systemic disorders have all been implicated in the etiological factors of RAS [15].

### **Infections Caused By Viruses:**

Whether the herpes virus contamination is primary or secondary affects the clinical aspects of the virus in the mouth, Primary herpetic gingivostomatitis is the name for the initial infection. In very young children, it can be asymptomatic or extremely mild, but it is linked to increasingly severe general symptoms as the patient becomes older, gingivitis is the first symptom, followed by the production of vesicles that easily rupture, resulting in painful ulcers coated in a yellowish membrane that tends to coalesce after 2–3 days. Lips, tongue, oral mucosa, palate, and pharynx are still the most common locations such as Herpes simplex virus 1 and Epstein–Barr Virus (EBV) [16].

### **Ulcers caused by fungal infections:**

Candidiasis: Candidiasis is the most common fungal infection involving the oral cavity and shows a variety of clinical presentations, including ulceration, Diabetes mellitus patients appear to be more susceptible to Candida infection infections. Candida infection is more typically seen in patients who have been treated for an infectious condition with broad-spectrum antibiotics [17].

### **Ulcers caused by bacterial infection:**

Acute necrotizing ulcerative gingivitis: Acute destructive ulcerative periodontal is a nonspecific ulceration disease that affects the gingivae almost exclusively, poorly controlled diabetes, tobacco smoking, immune deficiency, and possibly psychological stress are all associated contributing factors [18].

Other causes such as Mycobacterial infection, Nutritional deficiency, Food allergies, Genetic factors, Chemical injuries, Immune system (Many researchers believe that aphthous ulcers are the result of a variety of disease processes, all of which are mediated by the immune system aphthous ulcers are hypothesized to emerge when the body becomes aware of compounds it doesn't recognize and assaults them) [19].

Diabetes mellitus is a metabolic syndrome considered to be caused by multiple factors resulting from a deficiency of insulin, which may be absolute due to pancreatic  $\beta$ -cell destruction (type 1) or relative due to an increased resistance of the tissues to insulin (type 2) [20].

A series of alterations in the oral mucosa in diabetic patients have been reported, including gingivitis, periodontitis, oral mucosal diseases that favor infections such as candidiasis, salivary gland dysfunction, altered taste, glossodynia, and stomatopyrosis, the presence of oral mucosal lesions such as lichen planus and recurrent aphthous ulceration has frequently been diagnosed in diabetic patients, although the actual prevalence is rarely addressed in clinical studies, some studies have shown a prevalence of 80% of oral mucosal lesions in patients with diabetes mellitus [21].

This study aimed to determine the prevalence of ulcer lesions in patients with diabetes mellitus.



Photo 1: Aphthous ulceration



Photo 2: traumatic ulceration

# Methodology

## Ethical and Approval Consideration

Permission was taken from patients to fill the information required and they were assured regarding the confidentiality of their responses. The aim of the study was explained and only those who agreed to participate are included in the study .

## Study Population

The study was performed among patients in privet clinic in Baqubah.

## Study design

The current study is cross section study type was carried out in Diyala from 20<sup>th</sup> of November 2022 to the 23<sup>th</sup> of March 2023. The study design was by simple random sampling.

## Sample size and sample procedure

The sample size was (40) of sample. Trained very well to interview the questionnaire carefully and in scientific way. Respondents were assured that the information obtained would be confidential and used only for statistical purposes.

## Data Analysis and Presentation

Data was analyzed for means and standard deviation (SD) for all parameters. Data analysis was done by Microsoft excel and SPSS, also all quantitative data were expressed as the means  $\pm$  SD.



## Results

The total sample of study was (40), the mean of age in this study (60.6) years old, the minimum of age was (33) years old and the older sample was (87) years old this shows in table (1).

**Table 1:** the mean of age.

		Age
N	Valid	40
	Missing	0
Mean		60.60
Median		63.00
Std. Deviation		13.86159
Variance		192.144
Range		54.00
Minimum		33.00
Maximum		87.00

**Table (2):** the distribution of gender in study.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	23	57.5	57.5	57.5
	Female	17	42.5	42.5	100.0
	Total	40	100.0	100.0	

This table shows that the most of sample was male in percentage (57.5%), while female was (42.5%).

**Table (3):** the distributions type of ulcer.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Minor	24	60.0	60.0	60.0
	Major	13	32.5	32.5	92.5
	Hepiteform	3	7.5	7.5	100.0
	Total	40	100.0	100.0	

This table shows that the minor ulcer is the most type of ulcer in percentage (60%) then major ulcer in percentage (32.5%) and herpetiform ulcers is lowest percentage (7.5%).

**Table (4):** the distribution of site of ulcer.

Site					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Tongue	12	30.0	30.0	30.0
	Lip	16	40.0	40.0	70.0
	Floor of the mouth	9	22.5	22.5	92.5
	Buccal Mucosa	3	7.5	7.5	100.0
	Total	40	100.0	100.0	

This table show that the lip is the most common site of ulcers (40%), then tongue and floor of the mouth in percentage (30%), (22.5%) respectively, and the lowest site was in buccal mucosa (7.5%).

**Table (5):** correlation between type and gender.

		Type			Total
		Minor	Major	Herpiform	
Gender	Male	13	8	2	23
	Female	11	5	1	17
Total		24	13	3	40

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.299 <sup>a</sup>	2	.861
Likelihood Ratio	.302	2	.860
Linear-by-Linear Association	.289	1	.591
N of Valid Cases	40		

There is no significant correlation between type and gender due to P Value more than 0.05.

**Table (6):** the correlation between type and HbA1c.

H0:  $m_1 = m_2 = m_3$

H1:  $m_1 \neq m_2 \neq m_3$

Since p-value > 0.05, we can-not reject the null hypothesis in correlation between type and HbA1c.

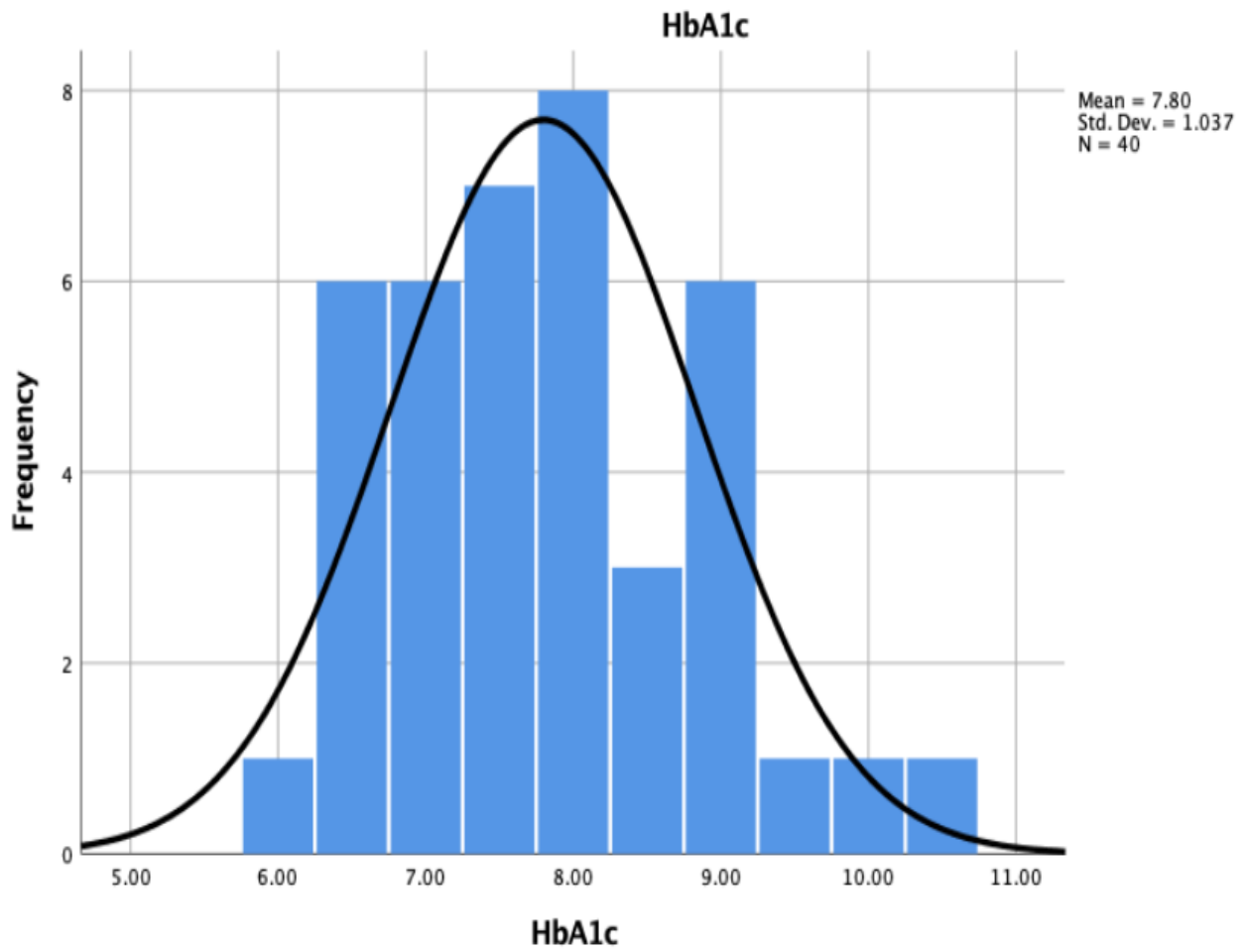
HbA1c								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Minor	24	7.8917	1.16690	.23819	7.3989	8.3844	6.00	10.50
Major	13	7.6538	.88658	.24589	7.1181	8.1896	6.50	9.00
Herpiform	3	7.6667	.57735	.33333	6.2324	9.1009	7.00	8.00
Total	40	7.7975	1.03713	.16398	7.4658	8.1292	6.00	10.50

ANOVA					
HbA1c					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.532	2	.266	.238	.790
Within Groups	41.417	37	1.119		
Total	41.950	39			

**Table (7):** correlation between Duration OF DM/Month and type.

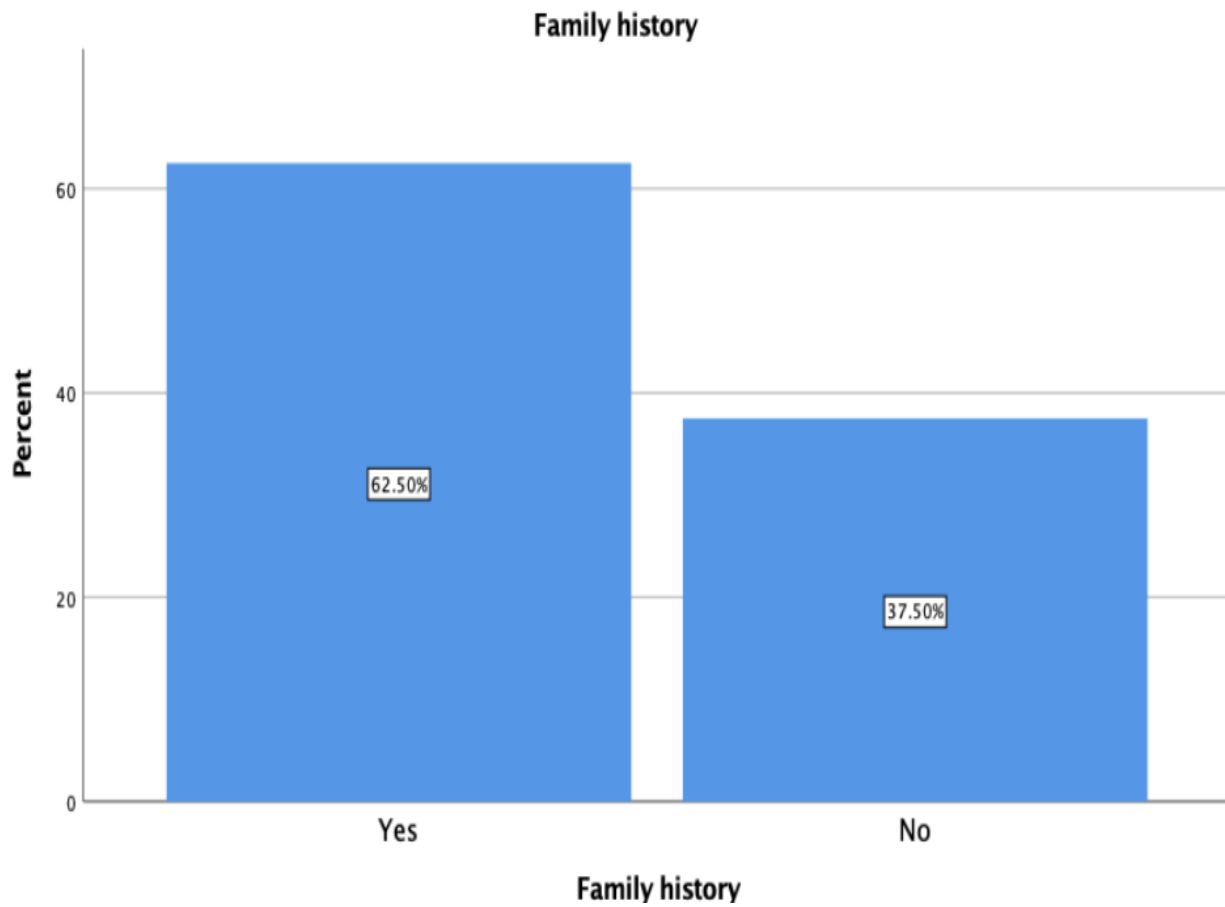
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Minor	24	23.7500	15.46173	3.15611	17.2211	30.2789	3.00	60.00
Major	13	16.8462	15.91564	4.41421	7.2284	26.4639	2.00	60.00
Herpiform	3	13.3333	11.84624	6.83943	-16.0944	42.7610	6.00	27.00
Total	40	20.7250	15.52333	2.45445	15.7604	25.6896	2.00	60.00

This table shows there is no significant correlation between Duration OF DM/Month and type.



**Figure 1:** the mean of HbA1c level.

this figure shows that the mean of HbA1c level in this study was (7.8).



**Figure 2:** the percentage of family history.

This figure shows that about (62.5%) with family history of DM and (37.5%) without family history of DM.



## Discussions

The total sample of study was (40), the minor ulcer is the most type of ulcer in percentage (60%) then major ulcer in percentage (32.5%) and herpetiform ulcers is lowest percentage (7.5%).

Also in study was conducted in João Pessoa, Brazil [22], the minor ulcer is the most type of ulcer in percentage (55%) then major ulcer in percentage (35%) and herpetiform ulcers is lowest percentage (10%).

In the present study, the lip is the most common site of ulcers (40%), then tongue and floor of the mouth in percentage (30%), (22.5%) respectively, and the lowest site was in buccal mucosa (7.5%).

This percentage agree with study was conducted in Muscat, Oman [23], that the lip is the most common site of ulcers (43%), then tongue and floor of the mouth in percentage (27%), (20%) respectively, and the lowest site was in buccal mucosa (10%).

In this study, there is no correlation between type and gender due to the P Value more than 0.05.

Also in study of João Pessoa, Brazil [22], there is no significant between type and gender.

In the present study, the correlation between type and HbA1c due to p-value > 0.05, also the same in study of Muscat, Oman [23].

In this study there is about (62.5%) with family history of DM and (37.5%) without family history of DM.

While in study of João Pessoa, Brazil [22], there is (40%) with family history and that difference due to low percentage of population with DM in João Pessoa when compare with Diyala city.

## Conclusions

- 1- Diabetes mellitus is a chronic, non-communicable and endemic disease. Type 2 compared to type 1 diabetes mellitus is more prevalent worldwide and increasing, especially in Iraq.
- 2- The minor ulcer is the most type of ulcer and herpetiform ulcers is lowest.
- 3- The lip is the most common site of ulcers and the lowest site was in buccal mucosa.
- 4- There is no significance correlation between type and gender.
- 5- There is no significance correlation between type and HbA1c.
- 6- There is no significance correlation between Duration OF DM/Month and type.
- 7- Most of sample of study with family history of DM.

## Recommendations

- 1- This was a single-centered study with a small-sized sample. So the findings of this study may not reflect the exact scenario of the whole city. For getting more specific information we would like to recommend conducting more studies in several places with a larger sized sample.
- 2- Awareness of oral complications among both diabetics and health providers.
- 3- Need for regular follow-up of patients with diabetes mellitus by both dentist and physicians.
- 4- The major role that dentists should play in recognising the signs and symptoms of diabetes and their oral complications.
- 5- Advice and counselling for diabetic smokers regarding smoking cessation, and vigorous treatment of oral infection either bacterial or fungal in these patients, especially if they have poor glycaemic control.

## References

1. Muñoz-Corcuera M, et al. Oral ulcers: clinical aspects. A tool for dermatologists. Part II. Chronic ulcers. *Clinical and Experimental Dermatology*. Clin Dermatol. 2009;34:456-461.
2. del Olmo-López J, et al. Úlceras orales. *Piel*. 2006;21:92-100.
3. Majorana A, Bardellini E, Flocchini P, Amadori F, Conti G, Campus G. Oral mucosal lesions in children from 0 to 12 years old: ten years' experience. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2010;110(1):e13–8.
4. Talacko AA, Gordon AK, Aldred MJ. The patient with recurrent oral ulceration. *Australian dental journal*. 2010;55:14–22.
5. Neville BW, Damm DD, Allen CM, Chi AC. *Oral and maxillofacial pathology*. Elsevier Health Sciences. 2015.
6. Michael G, William M. *Burket's oral medicine*. People's Medical Publishing House, Shelton. 2015;440.
7. Bruce AJ, et al. Diagnosing oral ulcers. *J Am Acad PAs*. 2015;28:1-0.
8. Vaishnavi Burley D, et al. Medicinal plants for treatment of ulcer: A review. *J Med Plants*. 2021;9:51-59.
9. Woo SB, et al. Recurrent aphthous ulcers: a review of diagnosis and treatment. *J Am Dent Assoc*. 1996;127:1202-13
10. Mittal S, et al. A review: herbal remedies used for the treatment of mouth ulcer. *Int J Heal and Clin Res*. 2019;2:17-23.
11. Singh S, et al. Formulation and Evaluation of Herbal Gel From Different Parts of *Cyamopsis Tetragonoloba* (L.) Taub. For Wound Healing. *World J Pharm Pharm Sci*. 2015;5:740-752.
12. Purushotham K, et al. Formulation of topical oral gel for the treatment of oral sub mucous fibrosis (OSMF). *Pharm Lett*. 2011;3:103-102.
13. Felix DH, et al. Oral medicine: 1. Ulcers: aphthous and other common ulcers. *Dental update*. 2012;39:513-519.
14. Budtz-Jørgensen E, et al. Oral mucosal lesions associated with the wearing of removable dentures. *J oral pathol*. 2019;10:65-80.

15. Lucavechi T, et al. Self-injurious behavior in a patient with mental retardation: Review of the literature and a case report. *Quintessence Int.* 2009;38.
16. Zonuz AT, et al. Factitial pemphigus-like lesions. *Med Oral Patol Oral Cir Bucal (Internet)*. 2007;12:205-208.
17. Kivovics P, et al. Frequency and location of traumatic ulcerations following placement of complete dentures. *J Prosthodont Res*. 2007;20.
18. Krawiecka E, et al. Tuberculosis of the oral cavity: an uncommon but still a live issue. *Postepy Dermatol Alergol*. 2015;32:302.
19. Basha BN, et al. Formulation and evaluation of gel containing fluconazole-antifungal agent. *Int J Drug Dev Res*. 2011;3:119-127.
20. American Diabetes Association Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2005;28:S37–S42.
21. Lamster IB, Lalla E, Borgnakke WS, Taylor GW. The relationship between oral health and diabetes mellitus. *J Am Dent Assoc*. 2008;139:19S–24S.
22. Silva MF, Barbosa KG, Pereira JV, Bento PM, Godoy GP, Gomes DQ. Prevalence of oral mucosal lesions among patients with diabetes mellitus types 1 and 2. *An Bras Dermatol*. 2015 Jan-Feb;90(1):49-53.
23. Al-Maskari AY, Al-Maskari MY, Al-Sudairy S. Oral Manifestations and Complications of Diabetes Mellitus: A review. *Sultan Qaboos Univ Med J*. 2011 May;11(2):179-86.