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The Role of Microbial Infection of Periodontal Tissues Among Diabetic and Non-Diabetic Patients in Al-Khoms Region-Libya

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دور العدوى الميكروبية لأنسجة اللثة بين مرضى السكري وغير المصابين به في منطقة الخمس-ليبيا

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Abstract:
The main objective of this research was to measure the prevalence of periodontal infections in diabetic and non-diabetic patients and to identify the microorganisms responsible for periodontal tissues infections and compare results with worldwide data. Chronic periodontitis is a long-lasting bacterial infection of the periodontium, which is highly prevalent in the general population. Several factors that may increase the risk of developing chronic periodontitis include oral hygiene practices, the presence of specific microorganisms, tooth-specific conditions, smoking and systemic diseases. Finally, to explore the sensitivity of the identified microorganisms to certain antibiotics used to treat periodontal infections. This is a retrospective study of total 220 cases and control persons were included in the current study, all cases were attending to private dental of Al-Nokba clinic, Al-khoms, Libya. 200 (125 diabetic and 75 non-diabetic cases) were diagnosed having symptoms of periodontal tissues infection. Patients were included in the study based on their gender, in Male cases were 120 (60%) and 80 (40%) were females. These studies aimed to identifying the diabetic patients at risk and bacteria & fungi causing per periodontal tissues infections. Assessing antimicrobial sensitivity of isolated bacteria to the commonly used antibiotic and the prevalence of periodontal disease among patients with type 2 diabetes mellitus.

Keyword: Performance. Periodontitis, Periodontal, Infections, Microorganism, Diabetic, Non-Diabetic, Bacteria.

Introduction

The oral cavity serves as a constant source of infectious agents, and its health often mirrors the progression of systemic diseases. In the past, oral infections were believed to be confined to the mouth, except in certain syndromes or untreated dental abscesses [1]. This shift in perspective has challenged the previous belief, leading to the development of a new understanding of the oral cavity's role and its influence on systemic health and disease. The World Health Organization Program has made significant efforts to raise global awareness of oral health as a crucial aspect of overall health and life quality [2]. At the same time, the prevalence of oral diseases is increasing in many low- and middle-income countries. While the most common oral conditions, such as chronic periodontitis and dental caries, are

not life-threatening, they are recognized as major public health issues worldwide due to their high rates of prevalence and incidence [3]. These oral diseases have significant consequences for both individuals and society. They often lead to pain, disability, and impairment. Chronic periodontitis is a complex condition influenced by multiple factors. It is an irreversible disease that starts with bacterial infection and is worsened by the body's immune response. Systemic factors, such as underlying health conditions, can further modify the disease's progression by affecting the immune and inflammatory systems [4]. Periodontal disease arises from a complex interplay of factors, including the host's response to plaque buildup on teeth and surrounding structures, genetic predisposition, and environmental influences such as smoking and socioeconomic status [5]. Several factors can affect the progression of chronic periodontitis and the body's response to treatment. These include race, ethnicity, genetics, systemic conditions (like HIV, stress, and obesity), medications (such as immunosuppressants and anticoagulants), malnutrition, excessive bite force, gender, socioeconomic status, and age. Additionally, factors contributing to the risk of developing chronic periodontitis include oral hygiene practices, microorganisms, and specific tooth characteristics [6], smoking and systemic diseases. The ultimate consequence of periodontal disease is the destruction of the tissues supporting the teeth, leading to tooth loss and difficulties with eating and overall function. It is widely acknowledged that the primary cause of periodontal disease is dental plaque, which contains bacteria, their byproducts, and triggers an inflammatory response [7,8]. However, the human mouth is a unique environment compared to other body surfaces. Teeth provide a stable, non-shedding surface that is in close contact with the gums and other periodontal tissues. This environment allows for the long-term growth and development of microbial communities [9].

The causes of tooth decay and gum disease are understood, and these conditions can be largely prevented [10]. Diabetes is presented with the symptoms like polydipsia, polyuria and polyphagia. It is often accompanied by chronic fatigue and weight loss. Complications of diabetes mellitus are retinopathy, nephropathy, neuropathy and cardiovascular disease. Now the Periodontitis is the sixth most common complication of diabetes [11]. The early diagnosis of (pre) diabetes mellitus is necessary for the prevention of complications of diabetes. It is suggested that periodontitis might be an early complication of diabetes and may be a useful risk indicator for diabetes screening [12]. Therefore, dental clinics could be in a good location for screening for (pre)diabetes in patients with periodontitis using validated glycated hemoglobin (HbA1c) analysis. Sharrad et al., (2019) found that both doctors and dentists often lack awareness of the connection between gum disease and systemic health problems [13]. Thus, it is recommended to strengthen collaboration between medical and dental healthcare providers.

Methodology

Study place:

This is a retrospective study of total 220 cases and control persons were included in the current study, all cases were attending to private dental of Al-Nokba clinic, Al-khoms, Libya.

Study period:

The data was collected from 1st April 2019 to 31st March 2020.

Sampling procedure:

All specimens will be processed and cultured following the guidelines of Monica, for isolation of pathogenic bacteria and fungi. Identification of the isolated microbial species and testing their antimicrobial susceptibility was done according to the instructions mentioned in BD Phoenix automated microbiology system user's manual. The development of periodontitis is assessed by attachment loss level, i.e., individuals who had more than a tooth with an attachment loss of >5 mm were classified into the periodontitis group and the others comprised the nonperiodontitis group (as reported by a specialized dentist).

Statistical analysis:

This analysis was performed to compare between diabetic and non-diabetic patients and age group for prevalence of periodontal infection. Data were analyzed using the chi-square test and the results of analysis showed that there was significant difference between diabetic, non-diabetic patients and prevalence of periodontal infection with P value, that is mean diabetic patients more susceptible to periodontal infection than non-diabetics. ANOVA test was done to compare between the distribution of different bacterial species among male and female in diabetic and non-diabetic patients. Staphylococcus aureus isolates were recovered from high number of cases diagnosed with periodontal diseases in both diabetic and non-diabetic state. While other bacterial species were recovered at lower rates compared with Staphylococcus aureus, their presence was significantly more common ($P = 0.0001$).

Results and discussion:

This study confirmed that there was significant difference between diabetic, non-diabetic patients and prevalence of periodontal infection and also demonstrated positive relation between age and periodontal infection. Bacteriological studies of the current research revealed the prevalence of single and mixed bacterial infection in diabetic and non-diabetic periodontally infected patients and demonstrated a different microbial species, such as Staphylococcus aureus, were isolated at high frequency rates followed by Actinobacillus actinomycetemcomitans[14], Prevotella gingivalis. Other bacteria isolated at lower rates including Streptococcus constellatus and Eubacterium nodatum [15]. Unlike periodontally infected non-diabetic patients, they are free from some bacteria isolated from periodontally infected diabetic patients as Pepto streptococcus micros and Fusobacterium nucleatum. Candida albicans was the only isolated fungi from periodontally infected diabetic and non-diabetic patients [16]. A total 220 Cases and control Persons were included in the current study. 200 (125 diabetic and 75 non-diabetic cases) were diagnosed having symptoms of periodontal tissues infection.

Table 1: Distribution of demographic characteristics of patients.

Demographic characteristics	T2 DM		Control group		P- value
	No	%	No	%	
Gender					0.0253
Male	120	60	12	60	
Female	80	40	8	40	
Age					
< 35	26	13	03	15	
36-55	49	24.5	12	60	
56-75	125	62.5	05	25	
Total	200	100	20	100	

(% calculated from total number of cases included in the study)

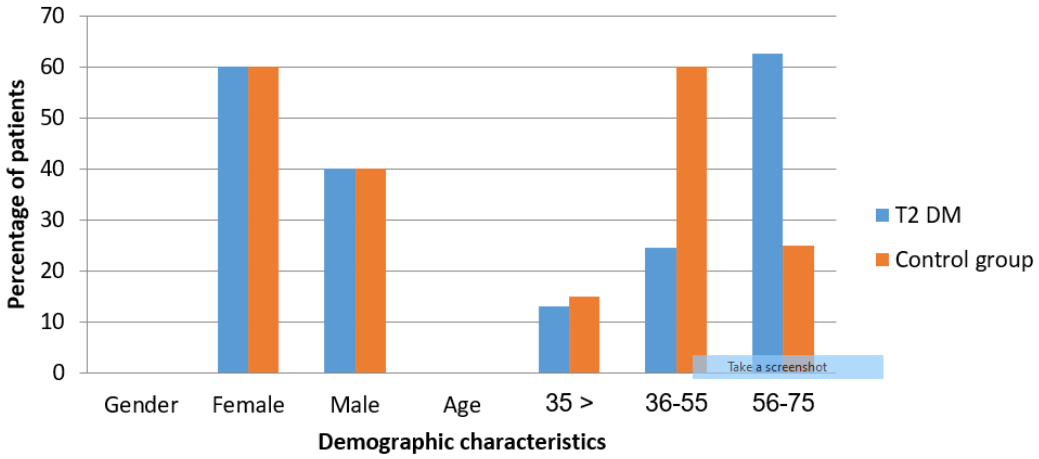

Figure 1: Distribution of demographic characteristics of patients.

A total 220 Cases and 20 control Persons were included in the current study. Male cases were 120 (60%) and 80 (40%) were females. Meanwhile distribution of apparently healthy controls, according to their gender where 12 (60 %) were male and 8.0 (40%) were females. The highest number was observed among patients was in age group range 56-75 (62.5% for Diabetes cases and 25% for control cases), followed by age group range 36-55 (24.5% for Diabetes cases and 60% for control cases). The lowest number was in age group range ≤ 35 (13% for Diabetes cases and 15% for control cases).

Table 2: Distribution of patients according to diabetic state.

Gender	Diabetic		Non diabetic		Total (n=200)	
	No	%	No	%	No	%
Male	80	40	40	20	120	60
Female	45	22.5	35	17.5	80	40
Total					200	100

(% was calculated from 200 patients)

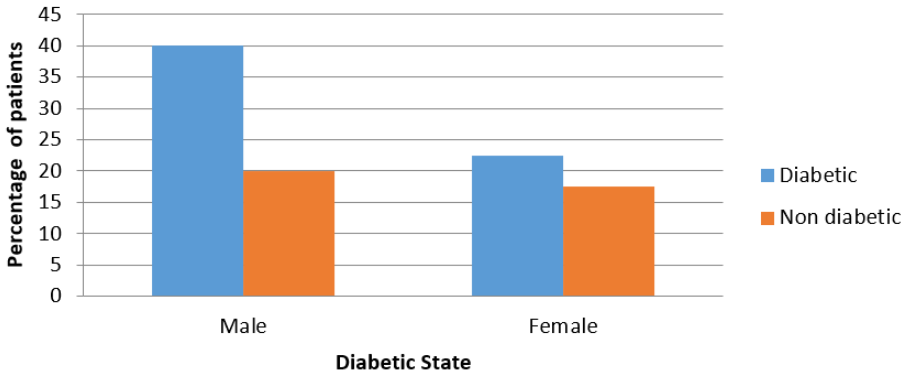

Figure 2: Distribution of patients according to diabetic state.

Table 2 showed the distribution of patients according to diabetic state. Diabetes mellitus are more prevalent among male than female patients. Eighty male patients (40%) complaining from diabetes mellitus, meanwhile forty-five female patients were diabetic (22.5 %).

Table 3: Number and percentage between diabetic and non-diabetic patients showing microbial periodontal disease.

Patients	Positive microbial infection		Negative microbial infection		Total	
	No.	%	No.	%	No.	%
Diabetic	110	55	15	7.5	125	62.5
Non-diabetic	55	27.5	20	10	75	37.5
Total					200	100

(% was calculated from 200 patients)

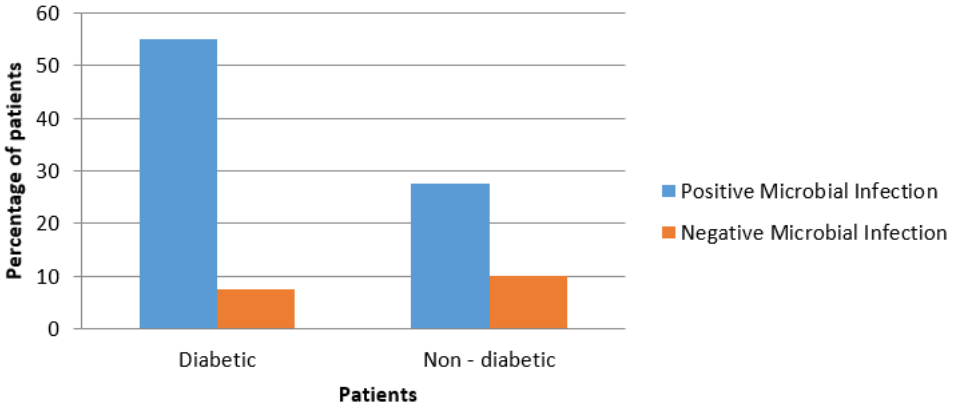

Figure 3: Number and percentage of diabetic and non-diabetic patients showing microbial periodontal disease.

A total of 200 specimen cultures were examined during the study period. As presented in table (3), out of 125 specimens collected from diabetic patients diagnosed having periodontal disease 110 (55%) showed significant microbial infection and 15 (7.5%) were negative. Meanwhile out of 75 specimens collected from non-diabetic patients diagnosed having periodontal disease 55 (27.5%) showed significant microbial infection, and 20 (37.5%) were negative.

Conclusion

Periodontal infections are more frequent and are likely to have a more complicated course in patients with diabetes mellitus. Concerning the relation between age of patient and the rate of periodontal infection; the outcomes of the present investigation demonstrated positive relation across different age groups and periodontal tissues infection. This study confirmed that overall, periodontal infection is more or less equal among females and males. From the above the researcher can conclude, the etiological pattern of periodontal infections with respect to bacterial pathogens is apparently similar worldwide. Finally, since the hospital and outpatient clinics environment is a sort of collection agency for many pathogenic microorganisms by virtue of the many seriously ill patients who passes through it, therefore,

it is extremely important for the hospital and outpatients clinics managements to do everything possible to minimize the spread of these organisms to other patients.

References

[1] Abusleme L, Hoare A, Hong BY and Diaz PI (2021) Microbial Signatures of Health, Gingivitis, and Periodontitis. Periodontology 2000, 86(1):57–78.

[2] Alhassani AA, Hu FB, Li Y, Rosner BA and Willett WC (2021) The Associations Between Major Dietary Patterns and Risk of Periodontitis. Journal of clinical periodontology, 48(1):2–13.

[3] Li A, Chen Y, Schuller AA, Tjakkes GE and Li A (2021) Dietary inflammatory potential is associated with poor periodontal health: A population-based study. Journal of Clinical Periodontology, 48(7):907-918.

[4] Alhassani AA, Hu FB, Rosner BA, Tabung FK, Willett WC and Joshipura KJ (2021) The relationship between inflammatory dietary pattern and incidence of periodontitis. The British Journal of Nutrition, 126(11):1698-1708.

[5] Kapila YL (2021) Oral health's inextricable connection to systemic health: Special populations bring to bear multimodal relationships and factors connecting periodontal disease to systemic diseases and conditions. Periodontology 2000, 87(1):11-16.

[6] Aral CA, Olçer SN, Aral K and Kapila Y (2020) Oxidative Stress, Neutrophil Elastase and IGFBP7 Levels in Patients With Oropharyngeal Cancer and Chronic Periodontitis. Oral diseases, 26(7):1393–1401.

[7] Martínez-García, M., & Hernández-Lemus, E. (2021). Periodontal inflammation and systemic diseases: an overview. Frontiers in physiology, 12, 709438.

[8] Benli M, Batool F, Stutz C, Petit C, Jung S and Huck O (2021) Orofacial Manifestations and Dental Management of Systemic Lupus Erythematosus: A Review. Oral diseases, 27(2):151–167.

[9] Beydoun MA, Beydoun HA, Hossain S, El-Hajj ZW, Weiss J and Zonderman AB (2020) Clinical and Bacterial Markers of Periodontitis and Their Association With Incident All-Cause and Alzheimer's Disease Dementia in a Large National Survey. Journal of Alzheimer's disease, 75(1):157–172.

[10] Pitts, N. B., Twetman, S., Fisher, J., & Marsh, P. D. (2021). Understanding dental caries as a non-communicable disease. British dental journal, 231(12), 749-753.

[11] Botros N, Iyer P and Ojcius DM (2020) Is There an Association Between Oral Health and Severity of COVID-19 Complications? Biomed Journal, 43(4):325–327.

[12] Chen N, Zhou M, Dong X, Qu J, Gong F and Han Y (2020) Epidemiological and Clinical Characteristics of 99 Cases of 2019 Novel Coronavirus Pneumonia in Wuhan, China: A Descriptive Study. Lancet, 395(10223):507–513.

[13] Nowicki EM, Shroff R, Singleton JA, Renaud DE, Wallace D, Drury J, Zirnheld J, Colleti B, Ellington AD, Lamont RJ, Scott DA and Whiteley M (2018) Microbiota and Metatranscriptome Changes Accompanying the Onset of Gingivitis. mBio, 9(2): e00575-e00618.

[14] Prince, Y. (2021). The oral microbiome and its association with chronic and systemic disease in a South African population (Doctoral dissertation, Cape Peninsula University of Technology).

[15] Curtis MA, Diaz PI, Van Dyke TE (2020) The role of the microbiota in periodontal disease. Periodontology 2000, 83(1):14-25.

[16] Lu C, Chu Y, Liu JR, Liu WY and Ouyang XY (2021) Subgingival Microbial Profiles of Young Chinese Adults with Stage I/II Periodontitis, Gingivitis and Periodontal Health Status. The Chinese journal of dental research, 24(3):167-175.

[17] Nemoto T, Shiba T, Komatsu K, Watanabe T, Shimogishi M, Shibasaki M, Koyanagi T, Nagai T, Katagiri S, Takeuchi Y and Iwata T (2021) Discrimination of Bacterial Community Structures among Healthy, Gingivitis, and Periodontitis Statuses through Integrated Metatranscriptomic and Network Analyses. Microbial Systems, 6(6):e0088621.

[18] Nikhil Ram M and Michelle MM (2020) Comparative Metatranscriptomics of Periodontitis Supports a Common Polymicrobial Shift in Metabolic Function and Identifies Novel Putative Disease-Associated ncRNAs. Frontiers in Microbiology, 11:482.

[19] Duran-Pinedo AE (2021) Metatranscriptomic analyses of the oral microbiome. Periodontology, 85(1):28-45.