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RESEARCH ARTICLE

KNOWLEDGE, ATTITUDES AND PRACTICES REGARDING THE BIDIRECTIONAL RELATIONSHIP BETWEEN DIABETES AND PERIODONTAL DISEASE: CROSS SECTIONAL STUDY

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Abstract

Background: Diabetes and periodontal disease are common chronic diseases in a bidirectional relationship. Therefore, elevating the level of awareness among diabetic patients about their complications to overcome any unfavorable effects of diabetes on their quality of life. Additionally, increasing the awareness of medical and dental professionals will improve their attitude and behavior towards the management of diabetic patients.

Objective: This cross-sectional survey aimed to assess the diabetic patient's knowledge about the relationship between diabetes and periodontal disease and the role of physicians in diabetic patients referred for oral care.

Methods: Researchers have created a questionnaire of their own and the examiner conducted a face-to-face interview in local language with the patient, it included 25 questions grouped under 5 categories.

Results: A total of 289 participants, most of them type II diabetes 92.4%, age range (18 to 60 years) were included in this study. Only 61.6% had knowledge about the relation between diabetes & periodontitis. More than 90% of the patient didn't receive any information or educated in oral health by specialists.

Conclusion: Diabetic patients lack knowledge regarding the relationship between diabetes and periodontal disease. The lack of inter-professional patient care between doctors and dentists when treating patients with diabetes.

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Introduction:-

A frequent oral illness that affects the tissues that support and surround teeth is called periodontal disease, which includes gingivitis and periodontitis (Bui et al., 2019). Severe periodontal disease ranked as the 11th most widespread disease in the globe, according to the Global Burden of Disease Survey (2016). According to reports, the prevalence of periodontal disease varies between 20% and 50% worldwide (Nazir, 2017). Public health issues arise from the high frequency of periodontal disease in older people, adults, and adolescents. It is one of the main causes of tooth loss, which can reduce mastication, esthetics, quality of life, and self-confidence (Tonetti et al., 2017).

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The periodontitis, which affects the periodontal supporting structures, is thought to be the result of the host's defense mechanism against anaerobic gram-negative microbes found in dental plaque. (Mootha et al., 2016). Long-standing bacterial plaque on the soft and hard tissues of the oral cavity is that a first causes of gingivitis, which is marked by bleeding, swollen gums, and pain, if neglected, the problem proceeds to periodontitis, which results in the loss of periodontal attachment and supporting bone (World Health Organization, 2018). The interplay of risk factors such genetic predisposition, smoking, stress, and some systemic disorders like diabetes affects periodontal disease susceptibility (Graziani et al., 2018).

Dentists have long recognized the importance of detecting diabetes in their patients, and they also know that a number of oral health conditions, including periodontitis, xerostomia, and candidal infections, are connected to diabetes (Cicmil et al., 2018).

Periodontitis and diabetes both have intricate pathogenetic mechanisms. The rate at which glycemic control declines is correlated with the advancement of periodontitis. Moreover, a link between diabetes and periodontal disease has been demonstrated (Strauss et al., 2010). It is generally acknowledged that PD and DM have a reciprocal relationship. When compared to non-DM controls, DM patients who have their condition poorly treated may be more likely to get severe PD (Mealey and Oates, 2006). On the other hand, PD patients with DM show worse glycaemic control and a higher presence of comorbidities connected to diabetes. Diabetes that is not controlled well leads to higher blood sugar (glucose) levels in the mouth fluids. This promotes the growth of bacteria that can cause gum disease. On the other hand, infections from untreated periodontal disease can cause the blood sugar to rise and make it harder to control diabetes (Sanz et al., 2018).

Reduced levels of glycated hemoglobin (HbA1c; ranging from 0.27 to 0.48%) have been observed after periodontal therapy at 3 months after treatment, which are comparable to the effects of adding a second medication to the diabetic pharmacological regimen. (Little et al., 2006). According to the prevalence of diabetes in 32 nations, incidence climbed from 4% in 1995 to 5.4% in 2025, and the number of diabetics would rise by up to 122% over that time. Accordingly, from 135 million persons in 1995, there would be 300 million diabetics by the year 2025 (World Health Organization, 2018).

People with diabetes can live long and healthy lives if they are properly diagnosed and well-controlled with small doses of medications, interventions to promote healthy lifestyles, patient education to facilitate self-care, and regular control for the early detection and treatment of complications through a multidisciplinary team (Nordin et al., 2021). Therefore, Carrying out such a study could be beneficial in raising patient awareness and the community's willingness to accept diabetes mellitus and periodontal disease as a real problem. Furthermore, there is little information available in Libya about the relationship between periodontal disease and diabetes. A questionnaire and patient interviews were used in this study to assess the diabetic patient's knowledge and awareness of the relationship between diabetes and periodontal disease. Finally, the role of physicians in diabetic patients referred for oral care.

Materials and Methods:-

The present study protocol was reviewed and approved by the Faculty of Dentistry University of Benghazi (October/2022) [Reference code: 0137]. All participants were given an explanation about the process and asked to sign a consent form.

This prospective cross-sectional study was conducted with an estimated sample of (289) diabetic patients. The diabetic patients interested in the study were selected from public dental clinics (Benghazi Center for Diagnosis and Treatment of Diabetes) in the city of Benghazi/Libya. During the period between (December 2022 to May 2023), Screening for ineligible patients continued until the target sample size was reached. Inclusion criteria included patients were suffering from type 1 or type 2 diabetes (diagnosed with diabetes for at least 6 months ago) with Age \geq 18 and having at least two natural tooth. Exclusion criteria included those were mentally handicapped and edentulous patient.

Through extensive literature review, researchers have created a questionnaire of their own. (Bahammam, 2015, Siddiqi et al., 2020, Teles et al., 2021) and to ensure accuracy, the examiner conducted a face-to-face interview in local language with the patient, in which the materials were translated to Arabic beforehand.

The questionnaire is available as the Additional file appendix (1), it included 25 questions grouped under 5 categories: 1-Demographic characteristics (sex, Age, Education level). 2-Medical history type of diabetes, medications used, duration, recent testing for blood glucose and family history of the disease). 3-general health and oral hygiene practices (Number of visits to the dentist per year, several reasons for visiting dentists and Materials used to maintain oral hygiene). 4- Knowledge statement about oral health and periodontal disease. 5- Medical–healthcare professional’s attitude toward oral health information.

The study outcomes are (i) the diabetic patient’s knowledge of the relationship between diabetes and periodontal disease (ii) the role of physicians in diabetic patients referred for oral care.

All data were analyses using Statistical Package for Social Science (SPSS), version 20. Chi-square test was performed to analyze Responses of knowledge about symptoms of periodontitis. p value of <0.05 was considered to be statistically significant. The output of data was presented in a table format (total responses and percentage) as well as in a graphical format.

Results:-

Demographic characteristics [see table (1)].

A total of 289 participants completed the questionnaire. Participants were majority female (n=226) 78.2% and male represent (n=63) 21.8%, with age extended from 18 to more than 60 years. More than half of participant 59.9% had attended school but not complete the graduation, while 20.8 % of participants never attending the school, 18% were graduate and 1.4% were postgraduate.

Medical history [see table (2)].

The majority of the patient suffered from type II diabetes 92.4 % and only 7.6 % of them had type I diabetes. 64.4% of the members said their families had a history of diabetes while 34.3 % didn't had a family history of diabetes and 1.4 % were unsure of their family history. When asked about the length of time since participants had been diagnosed with diabetes, 55 % had the disease for more than 10 years while the remaining 45% had received diagnoses at intervals between 1 to 10 years.

Regarding recent blood glucose tests, 92.3% of those with diabetes said that their condition was under good control. When asked about medication used to control diabetic 36.3 % used oral anti- hyperglycemic medication, 23.9 % used insulin and 39.8 % of the patient used both insulin and oral anti-hyperglycemic medication.

Oral hygiene practices [see table (3)].

About brushing behavior, 34.6% of the respondents reporting brushing their teeth twice day while, 28.4 % never brushing their teeth. In general, flossing was less important, with 94.5% of respondents saying they never floss their teeth. According to the survey, 79.6% of patients said they had visited the dentist at least 1-2 times in the last 12 months. Some of the reasons for going to the dentist include: extractions, pain, gum treatment and restorative procedure.

The majority of the patient had been done extraction procedure 58.2 %. On the other hand, 17.2 % of the patient had been received periodontal therapy, 15.5% had been received restorative treatment and 9.2% attending dental office due to dental pain.

-Knowledge statement about oral health and periodontal disease [see table (4)].

Over all most of the diabetic patient did not had enough knowledge regarding symptoms of periodontitis except for knowing that bad breath could be a symptom, which 80.6% of patients were aware of. Whereas the less information was around that poor gum health can make it harder to control their blood sugar levels. 69.6% of diabetic patients don't know.

Medical–healthcare professional’s attitude toward oral health information [see table (5)].

About 56.1% of diabetic patient under care of general medical practitioner. The majority of patient (90.3%) reported that never their diabetic specialist asked them about oral health or check their gum or teeth, while only 9.7% of diabetic specialist asked them. 91% of the patient stated that the diabetic specialist never instructs them to take good care of their gum & teeth while, Only 9% of doctors and diabetic educators had been educated them. Most of

patient 91% Saied never received information or educated in oral hygiene measure by dentists, hygienist and medical practitioner. However, 9% of patient reported that they received instruction about oral hygienic instruction.

Discussion:-

Diabetes and periodontal disease are common chronic diseases. It is generally accepted that the interrelationship between diabetes and periodontal disease is a bidirectional relationship and that the presence of one disorder tends to increase the risk and severity of the other, and vice versa (Eldarrat et al., 2011). Therefore, this study evaluated the level of knowledge of this bidirectional relationship among patients with diabetes and the role of physicians in diabetic patients referred for oral care.

A total of 289 participants, most of them type II diabetes 92.4 %, undergraduate and age range (18 to 60 years) were included in this study. Only 61.6% of our respondents had knowledge about the relation between diabetes & periodontitis except 48.8% know that poor glycemic control are at higher risk of developing periodontitis and 30.4% know that poor gum health may be associated with more difficult control of blood glucose level in DM patients. Similar findings were reported by several researchers, that diabetic patients didn't have enough knowledge of their increased risk for periodontal diseases (Siddiqi et al., 2019, Oguntimein et al., 2020, Maia et al., 2023]. As well the information of the etiology and manifestation of the periodontal disease was assessed, the responses were improper except the Halitosis most of them 80.6% know that it is a symptom of periodontitis.

Concerning tooth brushing frequency, 32.9% of the participants brushed their teeth once daily, 34.6% of the participants brushed their teeth twice daily, and 28.4% did not brush on a daily basis, In addition, most of the participants 94.5% never used dental floss or interdental brush to clean between their teeth. Similar outcomes were reported in a previous study by Eldarrat(2011), who reported that half of the participants brushed their teeth once daily, 31% of the participants brushed their teeth twice daily, and 19% did not brush on a daily basis. In addition, more than half of the participants never used dental floss to clean between their teeth. Also around 79.6% of participants reported attending the dentist during the past 1-2 years. Several reasons for visiting the dentist were mentioned, including extractions 58.2%, gum treatment 17.2%, restorative work 15.5% and pain 9.2%.

These data suggest that these patients are not receiving adequate information. This is what we found in our research more than 90% of patients didn't instruct in oral hygiene measure or take good care of their gum & teeth by dentists, hygienist and medical practitioner. Such a finding is consistent with other researchers which have noted that diabetic patients had inadequate oral health knowledge. One factor contributing to inadequate knowledge was a lack of discussion between the patient and the clinician about dental health and diabetes (Sanz et al., 2018, Siddiqi et al., 2019, Siddiqi et al., 2022) and the absence of inter-professional patient care between medical and dental experts when addressing patients with DM was another significant factor (Nazari et al 2020).

This study emphasizes the necessity of alerting diabetic patients about their higher risk of periodontal disease. Furthermore, health care providers should advise their diabetes patients to see a dentist on a frequent basis, and for dental health providers to encourage their diabetic patients to brush and floss on a regular basis to avoid periodontal disease and enhance glycemic control. Both sorts of providers should collaborate on their respective care and treatment teams. This can be a significant first step toward eliminating dental and diabetes disparities, which leads to improved quality of life for diabetic patients.

Our study has limitations, where the sample was limited to one major diabetic center in Benghazi city without inclusion of other areas; thereby, the percentage of diabetic subjects in our study may not be generalized to the whole population in Libya. At the same time, we were unable to verify the participant's dental history, dental hygiene condition, or whether their diabetes was controlled.

In order to determine if patients who got the information improved their oral conditions, we advised that future research take into account the oral clinical examination with complete mouth probing depths, bleeding, and plaque scores. Along with their dental health state, additional data about patients' diabetes control status (HbA1c values) can be incorporated and examined. Health literacy, glycemic indices, probing depths, bleeding, and plaque scores can all be correlated to show that patients who had access to information could understand the significance of making the necessary lifestyle changes for better diabetes management and oral health status and could then apply this knowledge to their daily lives. Furthermore, because our study was cross-sectional, the cause-effect relationship cannot be established; however, future studies evaluating the effect of access to information on improving oral

conditions (even clinical parameters) and diabetes control through clinical and/or longitudinal studies may clarify this relationship.

Table 1:- Demographic characteristics:

Variable	Frequency	Percent
Age		
18-40	14	4.8
40-60	153	52.9
>60	122	42.2
Sex		
Male	63	21.8
Female	226	78.2
Education level		
Illiterate	60	20.8
Under graduate	173	59.9
Graduate	52	18.0
Post graduate	4	1.4

Table 2:- Medical history.

Variable	Frequency	Percent
type of diabetes		
Type I	22	7.6
Type II	267	92.4
family history of the disease		
Yes	186	64.4
No	99	34.3
Don't knew	4	1.4
Duration		
1-5Y	72	24.9
5-10 Y	58	20
Above 10	159	55
patient undergoing periodic examination		
Controlled diabetic	267	92.3
Non controlled diabetic	22	7.6
medications used		
Oral hypoglycemic	105	36.3
Insulin	69	23.9
Both	115	39.8

Table 3:- General health and oral hygiene practices:

Variable	Frequency	Percent
Oral hygiene practices		
Tooth brush		
Never	82	28.4
Once a day	95	32.9
Twice a day	100	34.6
More than twice	12	4.2
Dental floss		
Yes		
No	16	5.5
	273	94.5
Number of dentist visits per year		
None		
1-2 times	50	17.3
3-4 times	230	79.6
	9	3.1
Reasons for visiting dentists		
Extraction		58.2
pain		9.2
Periodontal treatment	139	17.2
Filling teeth	22	15.5
	41	
	37	

Table 4:- Knowledge statement about oral health and periodontal disease:

Variable	Frequency	Percent	P value
Dental plaque can cause periodontal disease			
Yes	172	59.5	0.001
No	117	40.5	
Gingivitis appears clinically as swelling gum			
Yes	180	62.3	0.000
No	109	37.7	
smoking a modifying risk factor for periodontitis			
Yes	187	64.7	00.00
NO	102	35.3	
Bleeding from the gingiva can be a sign of periodontitis			
Yes	193	66.8	0.000
NO	96	33.2	
Periodontitis can cause teeth to become mobile			
Yes	225	77.9	0.000
No	64	22.1	
gum swelling may be a symptom of periodontitis			
Yes	194	67.1	0.000
No	95	32.9	
Halitosis may be a symptom of periodontitis			

Yes	233	80.6	0.000
No	56	19.4	
Do you know the relation between diabetes & periodontitis.			
Yes	178	61.6	0.000
No	111	38.4	
Do you know Poor glycemic control are at higher risk of developing periodontitis.			
Yes	141	48.8	0.681
NO	148	51.2	
Do you know Poor gum health may be associated with more difficult control of blood glucose level in DM patients			
Yes	88	30.4	0.000
No	201	69.6	

Table 5:- Medical–healthcare professional’s attitude toward oral health information.

Variable	Frequency	Percent
Are you under care of general medical practitioner?		
Yes	162	56.1
NO	127	43.9
Did your diabetic specialist ever ask about your gum, oral health or check your gum, teeth?		
Yes	28	9.7
No	261	91.0
Did your diabetic specialist ever instruct you to take good care of your gum & teeth?		
Yes	26	9.0
No	263	91.0
Have you ever been instructed in oral hygiene measure by dentists, hygienist, medical practitioner?		
Yes	26	9.0
No	263	91.0

Conclusion:-

Diabetic patients have limited information about the relationship between diabetes and periodontal disease. Health care professionals are not providing adequate information to their patients about this important relationship, the dentist is not the primary source of information to motivate them, and the information received by the patients has not been effective/individualized for them to understand and apply changes in their daily lives.

Conflict of interest:

We declare that we have no potential conflicts of interest.

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