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Awareness and Behavior of the Diabetic Patients toward Periodontal Disease

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Abstract: ***Background: Periodontal disease is a chronic inflammatory disease that leads to tooth loss. It is influenced by multiple systemic diseases, Diabetes mellitus (DM) is one of the most commonly known diseases. Both disease entities have a bidirectional relationship, as periodontal disease effects glycemic control and diabetes effects progressions and severity of periodontal disease. The aim of this study is to evaluate the awareness of the diabetic patient toward periodontal disease through testing their knowledge and examining the oral cavity to assess their attitudes to periodontal health and oral hygiene practices. Materials and methods: This study is a Cross sectional clinical study that took place in the Benghazi Diabetic treatment center in Libya 2018. Ethical approval was gained from the diabetic center. Three hundred patients were examined and questioned by four periodontists with age range from 16 to 80 years old. Evaluation of Periodontal status was done by using Plaque index (PI), and Periodontal disease index (PDI). Statistical analysis was done using SPSS statistical package. Results: The mean age of patients were 55.3 years old, with 94% of them were type II DM. 59.7% of the sample were female. Less than half of the participants knew about periodontal disease (40.7%).Female patients showed significant better plaque index score than males with P value (0.001%). Furthermore, significant correlation was found between plaque index and periodontal disease index with (P value <0.001). In regard oral hygiene practice 40.3% brushed once daily. And a significant relation was found between using toothbrush and both of the PI and PDI. Conclusion: The awareness of the diabetic patients needs to be raised through education programs. Physicians should encourage diabetic patients to visit dentists regularly to help prevent periodontal disease progression and correct oral care behaviors.***

Keywords: Periodontal disease, Diabetes mellitus, knowledge, oral hygiene, awareness

1. Background

Periodontal disease is one of the most common causes of tooth loss. It is a chronic inflammatory disease with potential for systemic health implications initiated by the presence of a bacterial biofilm, called dental plaque.The dental plaque affects both the periodontal ligaments and bone surrounding teeth. [(1)]

Periodontal pathogens in dental plaque can destroy the epithelium of the periodontal pocket, thus allowing the entry of noxious endotoxins and exotoxins into the bloodstream[(2)]. This process leads to bacteria dissemination and systemic infection.

Periodontitis has been linked to a multiplicity of systemic diseases including diabetes mellitus (DM), cardiovascular disease, gastrointestinal and colorectal cancer and Alzheimer's disease, as well as respiratory tract infection and adverse pregnancy outcomes[(3)].Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycaemia due to a defect in insulin production by pancreatic β cells (type 1 diabetes), a decrease in insulin sensitivity (type 2 diabetes), or a combination of both[(4)].

It has been reported by several clinical trials that the susceptibility to periodontal disease increases by threefold in diabetic patients [(5,6)]. Also, it has been stated by multiple studies that DM has several complications, one of which is considered the sixth complication is periodontal disease [(7)]. The exact relationship between the two chronic diseases is still unknown, however; within the past decade the link between the two chronic diseases has been highly emphasized [(8-10)]. The link is said to be bidirectional, where the severity of periodontitis affects negatively the glycemic control, and the hyperglycemic state affects the periodontal health of the patient [(8)]. The link that has been described mostly concerns type II of DM, as its stated that both diseases occur in the age between 40s and 50s [(5)].

Furthermore, the link between the two diseases is explained by several pathways. It has been reported by recent systemic reviews[(11,12)], that patients with diabetes and periodontitis exhibit an increased immune-inflammatory response to the subgingival microbiota caused by the hyperglycemia state [(8,11)]. This would lead to increase levels of IL-1β, IL-6 and TNF in the gingival crevicular fluid and at the same period the increasing levels of C- reactive protein (CRP) in bloodstream, altogether may cause the insulin resistance [(12)].

Second mechanism suggested is by a non-enzymatic glycation of proteins and lipids leading to the formation of Advanced glycation end products (AGEs). These products bind to their receptors on the cells (RAGE) which causes oxidation stress and affects tissue repair by altering the cells morphology and function [(12,13, 14,15,16)].

The formation of AGEs products can be estimated by the level of glycosylated hemoglobin (HbA1c) in diabetic patients [(12,13)]. Monitoring the level of HbA1c is not only important to diabetic control but helps in the management of chronic periodontitis associated with DM [(12, 16)].

Because periodontal diseases are 'silent' in nature, most patients do not realize they have such conditions until significant destruction has occurred. Likewise, physicians may not know that their patients have a condition that could alter glycaemic control and make diabetes management more difficult[(17)]. Hence, in order to help in early diagnosis and prevention of developing periodontitis, dentists along with medical healthcare providers can aid in such manner by increasing the oral literacy and awareness of the patients[(8)].

According to WHO, education is the best way to prevent and control diseases [18]. Optimal oral health care and preventive measures such as teeth brushing, flossing and regular dental check-up could improve patient's periodontal and diabetic status [19]. Several studies conducted worldwide examined the knowledge, attitude and awareness of diabetic patients about the link between DM and periodontal disease [20-28]. It showed that there is lack of awareness about the relationship of diabetes with oral complications, as compared with general health knowledge [21, 25, 26, 27, 28].

Lack of awareness was not only about the link of diabetes with oral and periodontal complications, but also to the signs of gingival inflammation[23,27, 28]. Majority of diabetic patients do not receive any information from health care provider about oral and periodontal complications associated with their disease.[21, 22]Bahammam et al.2015 reported that 94% of the study population never received health advice from health professionals and only 5.2% had been informed about the importance of visiting dentist on a regular basis[21].Only a small number of patients consider dentist as a source of knowledge and education [26].A Siddiqi et al.2019 designate the lack of patient's awareness and knowledge to poor communication between the diabetic patients and medical and dental health care provider[8].

A recent Libyan study investigated the knowledge and practice of diabetics attended AL-Bayada diabetic clinic about oral health and foot care. [29]Nevertheless, it did not evaluate the diabetic patients in regard dental plaque accumulation and the severity of periodontal disease that patients are presented with.

Therefore, the aim of this study is to evaluate the awareness of the diabetic patient toward periodontal disease through testing their knowledge and examining the oral cavity to assess their attitudes to periodontal health and oral hygiene practices.

2. Materials and methods

This study is a Cross sectional clinical study that took place in the Benghazi Diabetic treatment center in Libya 2018. Ethical approval was gained from the diabetic center.

Study participants
Three hundred patients were enrolled in this study. Verbal consent was gained from the patients. Participants were questioned and examined by four periodontists from the Dental faculty- University of Benghazi. Subjects were male and female adults whose ages range from 16 to 80 years old. Patients included were Libyan, and diagnosed with either type I or type II diabetes mellitus. Pregnant women and those aged less than 18 years were excluded.

Data collection
A structured questionnaire was conducted to look at several variables. The questionnaire included three Sections. Section (A); addressing the socio-demographic and personal data, medical history Section (B); included questions testing the basic knowledge regarding periodontal disease. Section (C); Address how the participates practice daily oral hygiene. The questionnaire usedclose-end question.

Dental and Periodontal examination
After completing the questionnaire, patients were examined using the mouth mirror and Michigan O probe with Williams calibration. Periodontal status examination was done by using Plaque index (PI)[30] and Periodontal disease index (PDI) [31]. If the tooth indicated by the index was missed, the tooth mesial or distal to it was used for measurements. PI final score was calculated by adding scores of all examined teeth divided by their number. As for the PDI score the highest score was recorded.

Statistical analysis
All answering of the questions was coded and analysed using SPSS statistical package. PI and PDI scores were recorded and analysed. All data results were expressed in form of percentages.

3. Results

A total of three hundred patients were enrolled in this study. The mean age of the patients is 55.3 years old, with the maximum age is 80 years old and the minimum age is 16 years old. The majority of patients' ages were between 51 to 60 years old who were about 107 subjects. 90% of patients were living in Benghazi. About 89.3% of the participants owned houses, and 76.4% were employed. As for education, 38.3 % of the patients were at secondary level.

Table 1: Sociodemographic data of diabetic patients

Variables		No	Percentage
Gender	Male	121	40.3%
	Female	179	59.7%
Age	≤20	5	1.7%
	21 – 30	9	3%
	31- 40	13	4.3%
	41 - 50	68	22.6%
	51 - 60	107	35.7%
	61 - 70	80	26.7%
	>70	18	6%
Residency	Benghazi	270	90%
	Outside Benghazi	30	10%
Education	Illiterate	58	19.3%
	Elementary school	73	24.3%
	Secondary	115	38.3%
	University	54	18%

Patients had type I diabetes mellitus were 6 % of the sample size, whereas the majority of the population were type II DMas illustrated in figure 1. The control of diabetes was measured by the level of HbA1c levels which revealed about 65.3% of patients were uncontrolled as shown in Figure 2.

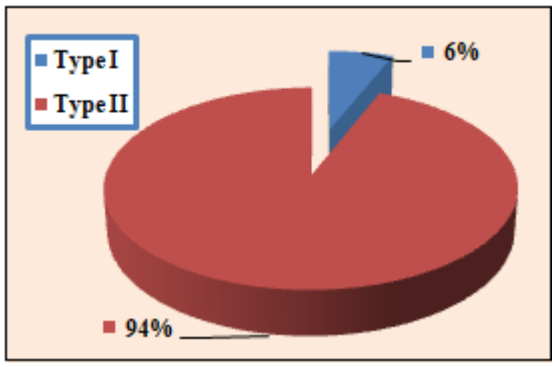

Figure 1: Distribution of patients according to type of diabetes.

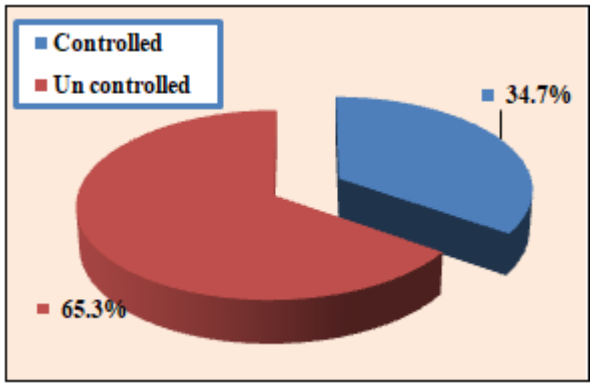

Figure 2: Distribution of patients according to control of diabetes.

In our study, 40.3% of the participants were males, and 59.7% were females as illustrated by figure 3.

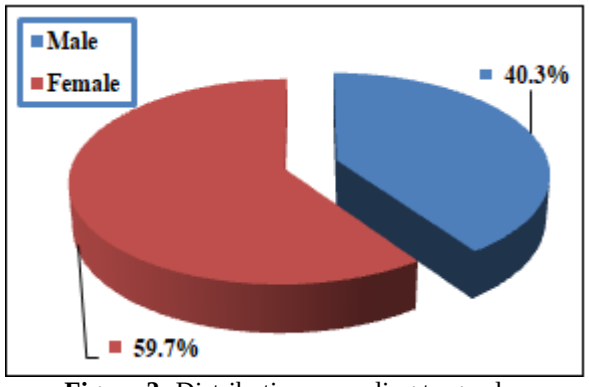

Figure 3: Distribution according to gender

In this study, there was a significant relationship between the type of diabetes and gender, where the majority of the type II DM were females as shown in table 2 with (P value of =0.1).

Table 2: Association between gender and type of diabetes

Sex	Type of diabetes				Total	
	Type I		Type II			
	No.	%	No.	%	No.	%
Male	10	8.3	111	91.7	121	100
Female	8	4.5	171	95.5	179	100
Total	**177**	100	117	100	294	100

When asking patients about the awareness in regard to dental plaque and periodontal disease, 71% of the subjects did not know what dental plaque means, and only 29% knew about dental plaque as shown in table 3. Second question was about periodontal disease symptoms as shown in figure 3, were 59.3 % of the subjects knew about periodontal disease symptoms and defined them as bleeding and swelling, whereas 40.7% of them did not know what the periodontal disease symptoms are.

Table 3: You know what dental plaque mean?

You know what dental plaque mean?	No.	%
Yes	87	29
No	213	71
Total	300	100

Figure 3: Are you aware of symptoms of periodontal disease?

Patients were asked about oral hygiene knowledge and practice through four questions. First question was about the frequency of toothbrush use, were only 31.7 % brushed their teeth twice daily as presented by figure 4. Second question was about the specific method of brushing (Bass technique), with only 23% of the whole sample used bass technique for brushing (Figure 5). Third question was about the use of the interdental cleaning aids and as shown in figure 6 only 23.7% actually used the interdental cleaning aids.

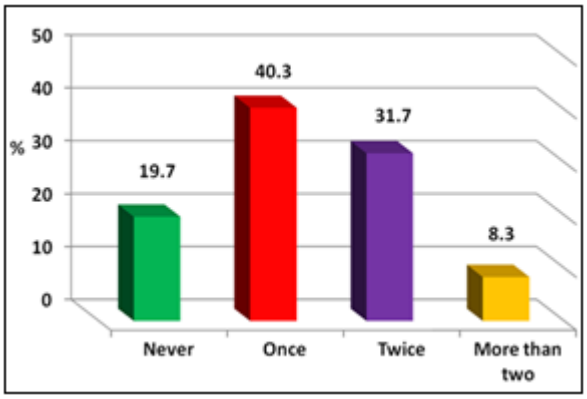

Figure 4: How often do you brush your teeth

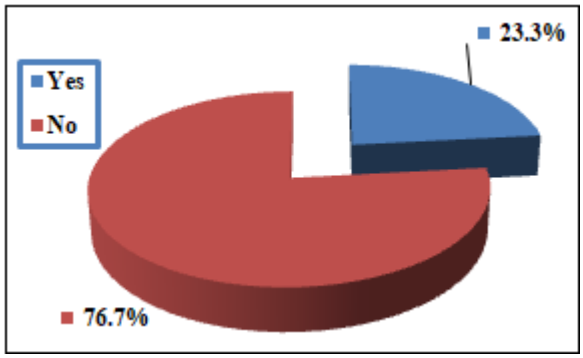

Figure 5: Do you have a specific method of brushing

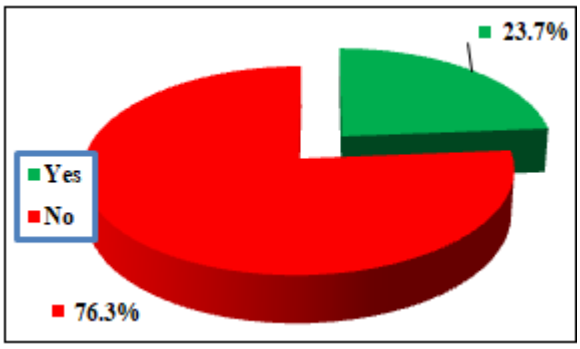

Figure 6: Do you use any interdental cleaning aids

Furthermore, most of the patients gained their information from the media, and only 12.7% of the patients from the dental clinics. (Figure 7)

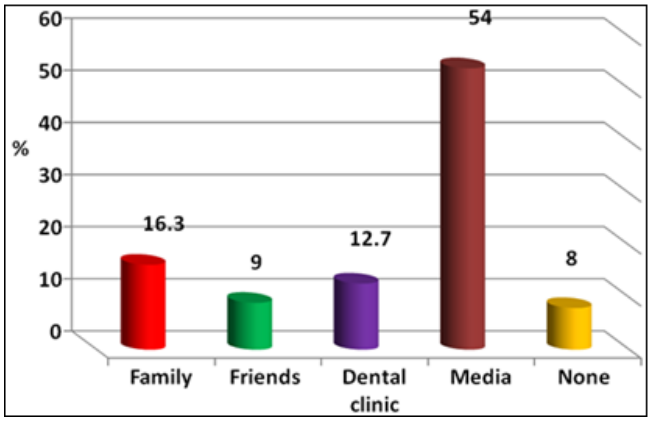

Figure 7: How do you gain information about Diabetes and periodontal disease

For the study herein, Plaque index showed about 40.3% presented with mild plaque accumulation whereas 12.7% showed severe plaque accumulation (figure 8). PDI scores presented 26.3% of the subjects suffered from severe loss of attachment as shown in (Figure 9).Female patients showed better plaque index score, were 49.2% were mild and only 9% were severe. In contrary to the males were 18.7% scored as severe, with P value (=0.001%)

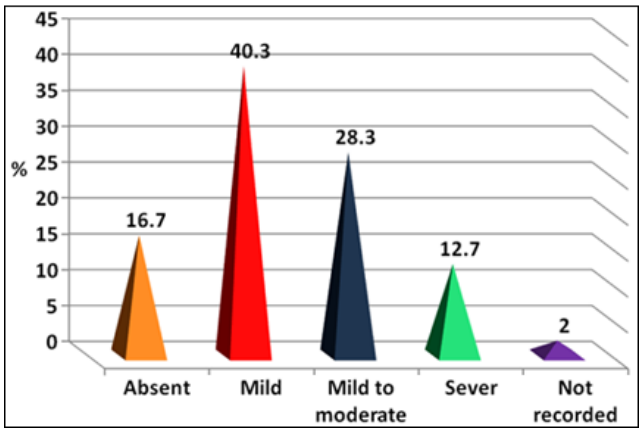

Figure 8: Plaque index score

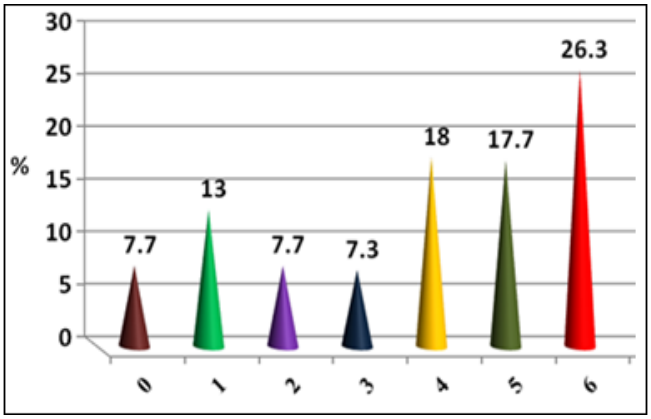

Figure 9: Periodontal disease index

Furthermore, a significant correlation between the level of plaque index and periodontal disease index was found with (P value <0.001) as shown in table 3.

Table 3: Correlation between PI and PDI

Periodontal disease index	Plaque index score									
	Absent		Mild		Mild to moderate		Severe		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
0	17	34.7	6	5	0	0	0	0	23	7.8
1	11	22.4	25	20.7	3	3.5	0	0	39	13.3
2	3	6.1	17	14	3	3.5	0	0	23	7.8
3	3	6.1	12	9.9	6	7.1	1	2.6	22	7.5
4	6	12.3	29	24	17	20	2	5.3	54	18.4
5	6	12.3	16	13.2	21	24.7	10	26.3	53	18.1
6	3	6.1	16	13.2	35	41.2	25	65.8	79	27
Total	49	**100**	121	100	85	100	38	100	293	100

The relation between the practice of oral hygiene, plaque index and periodontal disease index was found to be statistically significant with P value of 0.0001(Significant) for both indices as table 4 and 5.

Table 4: Correlation of patients according to the Plaque index score and oral hygiene practice using toothbrush.

Plaque index score	Never		Once		Twice		More than two	
	No.	%	No.	%	No.	%	No.	%
Absent	3	5.3	19	16	23	24.7	5	20
Mild	13	22.8	57	47.9	38	40.9	13	52
Mild to moderate	22	38.6	31	26.1	26	28	6	24
Sever	19	33.3	12	10.1	6	6.5	1	4
Total	**57**	**100**	119	100	93	100	25	100

Table 5: Correlation of patients according to the level of Periodontal disease indexand oral hygiene practice toothbrush uses.

Periodontal disease index	Never		Once		Twice		More than two	
	No.	%	No.	%	No.	%	No.	%
0	2	3.5	8	6.7	11	12	2	8
1	1	1.8	13	11	22	23.9	3	12
2	4	**7**	13	11	4	4.3	2	8
3	**5**	8.8	8	6.7	8	8.7	1	4
4	**6**	10.5	28	23.5	11	12	9	36
5	**11**	19.3	21	17.6	17	18.5	4	16
6	**28**	49.1	28	23.5	19	20.7	4	16
Total	**57**	**100**	119	100	92	100	25	100

4. Discussion

Poor oral health and shortage of dental care associated with low oral health quality of life OHQL [32, 33]. Therefore, our study investigated the awareness and attitude of diabetic patients about their oral/periodontal health and its association with periodontal disease, as well as their oral health behaviour.

In the present study, majority of the participants belonged to the age group of 51–60 years (35.7%). And this is similar to results from Al Habashneh's study where half of the respondents were ≥50 years old[27].Female participants accounted about (60%) of the population study as shown in figure 3,which is similar to the results from other studies conducted in Arabic countries [23,29,34]. This could be due to the economic status of the female patients that cannot afford going to private clinics, or more concerned toward their health problems when compared to men. There was a significant relationship between the type of diabetes and gender, where the majority of the type II DM were females. Most of the diabetic patients in this study were type II diabetes (94%) which is in agreement with WHO Global report on diabetes 2016[35]. However, in Benghazi, the type I diabetes were seen in the children hospital, which could explain the lower number of participants with type I DM in our study. About (65%) of the patients have uncontrolled diabetes which is in agreement with the previous study by Marwa et al.2019 [34]. Regarding education, (38.3%) of the patients were at secondary level of education, and (18%) were University graduates. These findings are lower than those reported by Al Habashneh's study[27]. However, this percentage is higher than that reported by other investigators. [23, 34]

In our study, there was a significant relationship between gender and plaque index, where females were better than males with lower plaque scores. This finding is in disagreement with the study by (Neelima et al. 2011)[36]which stated that there was no difference between both genders in terms of plaque scores. But a recent study by Schulze and Busse 2016[37], reported that diabetic males practiced oral hygiene poorly when compared with diabetic females. Where females in their study showed lower plaque scores by PI. In the Egyptian study female gender showed a fair self-reported practice when compared to males.[34]

Regarding the knowledge about the periodontal disease only (29%) knew about dental plaque. More than half (59.3 %) of the participants were aware of periodontal disease symptoms which bleeding and swelling were the most reported. This result was consistent with the results of a study conducted in Sharjah, UAE as the majority of the participants (70%) were aware of gingival bleeding and (63%) were aware that swelling of the gingiva as symptoms of periodontal disease[26].The recent Libyan study found that(72.1%) of diabetic patients included were aware that redness and swelling of the gingiva are signs of gingival disease[29]. This may be attributed to the increase in oral health information received in this area from health professionals. On the other hand, our findings are in disagreement with previous studies[23, 27, 28] where the level of awareness and knowledge in diabetic patients regarding periodontal disease symptoms was relatively low, this may be due to lack of dental health education.

Despite the high level of participants in the present study who knew about the relationship between diabetes and periodontal disease, it is in converse with the level of PDI index which shows that about (26.3%) of the sample had a score 6 (indicate severe level of periodontitis), and only (7.7%) had a score of 0 (no signs of periodontal inflammation). This indicates that this targeted group of patients do not perceive how preventive dental care can improve their diabetes outcomes. Diabetic patients should be advised that periodontal diseases can be reduced or prevented by means of preventive oral health measures, and so the effects of diabetic treatment could be enhanced. In addition, education can be extremely helpful in changing their attitudes and behaviours to maintain good periodontal health through proper oral self-care habits. It is crucial for the diabetic patients to realize that the dentist should be included in their health care team.

The third part of the questionnaire addressed the oral hygiene daily practice for the participants. Less than half of the patient brushed their teeth once a day (40%) while (31.7%) brushed twice a day and only (8%) more than twice a day. Unfortunately, (20%) never used a tooth brush. However only (23%) used the tooth brush correctly and cleaned the interproximal spaces. Similar findings have been shown in previous researches.[21, 26, 29, 38] but better oral hygiene attitude regarding using tooth brush (67%) and (95%) appeared by other investigators (Bowyer et al.2011, Yean et al. 2009) [22,39]. Encouraging the use of inter dental brush in collaboration with education of their use could improve or prevent periodontal disease in this high-risk population.

In our study, the majority of diabetic patients (54%) did not receive any information from health care providers about oral and periodontal complications associated with their disease, but received their information through the media. Family came in the second place and dentist came last with (12.7%). This result agrees with previous studies.[21, 22. 40]But it was noticed that the proportion of diabetics whom were educated by the dentists in our study is the lowest in the literature (37% Eldarrat et al. and 23% Almassiet al.) [26,38]which could reflect the lack of dental role in the whole diabetes care program. Another possible explanation for this result is a lack of information among dentist and physician about the association between diabetes and periodontal disease. In cross-sectional survey of 240 diabetic patients in Lahore, Pakistan,(45%) of the participants admitted that they would maintain proper oral hygiene if they were informed about their increased risk to oral disease.[25]Bahammam et al.2015 reported that (94%) of the study population never received health advice from health professionals and only(5.2%) had been informed about the importance of visiting dentist on a regular basis[21].

In this study, we found a significant relationship between the oral hygiene practices and both of the plaque index and periodontal disease index. This is in agreement with several studies [40,41,42] where they showed that poor oral hygiene presented with high scores in PI. The importance of oral

hygiene practice is highly emphasized by a recent meta-analysis which highlights that poor oral hygiene practices could lead to the risk of developing periodontal disease from two to five times [(43)].

This reflects a lack of sufficient awareness in our population of the value of routine dental checkups. Also fear from dentist and the cost of dental treatment could also be the cause for of this. Furthermore, lack of the knowledge about the importance of periodontal health as an integral part of their general health and exclusion of dental care from the routine diabetic team could explain these results. Therefore, regular dental visit in all diabetic centers should be promoted in order to maintain good oral and periodontal health. It is recommended that diabetic patients with typeI and II DM received dental referral as a routine part of diabetes care.

5. Conclusion

In conclusion, the awareness of the diabetic patients needs to be raised through education programs. These should be facilitated by all healthcare providers. Physicians should encourage diabetic patients to visit dentists regularly to help prevent periodontal disease progression and correct oral care behaviours.

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