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The relationship between periodontitis and diabetic retinopathy: A cross-sectional longitudinal study

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RESEARCH

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ABSTRACT

Background
Periodontal disease is regarded as the sixth complication of diabetes mellitus. The association of periodontitis with diabetic retinopathy is controversial.

Aims
The study aimed to assess the association of periodontitis with diabetic retinopathy.

Methods
This is a cross-sectional descriptive study conducted at a diabetes centre in Omdurman, Sudan during the period from July to September 2018. One hundred and fifty-nine patients with type 2 diabetes were interviewed using a structured checklist. The demographic data and diabetes complications including retinopathy were recorded. An experienced dentist assessed the participants for periodontitis. The Statistical Package for Social Sciences (SPSS, version 20, New York) was used for data analysis. A P-value of >0.05 was considered significant.

Results
Out of 159 patients with type 2 diabetes mellitus (65.4 per cent females), their age mean±SD was 58.13±9.96, periodontal diseases were found in 22.0 per cent of patients, and retinopathy was present in 34.6 per cent, while the number of lost teeth was 3.86±3.05. Between patients, periodontal disease (+) *vs.* (-), the incidence rate of the followings did not differ retinopathy, neuropathy, nephropathy, and coronary history. However, those with periodontal disease, compared with those without, had significantly more lost teeth P-value<0.05.

Conclusion
The number of lost teeth was higher among patients with diabetic retinopathy. However, a cause and effect cannot be withdrawn. Further larger multi-centre studies assessing the association of retinopathy with the severity of periodontal disease and controlling for other causes of teeth loss are needed.

Key Words
Diabetic retinopathy, periodontitis, lost teeth

What this study adds:

1. What is known about this subject?
Periodontitis is regarded as the 6th complication of diabetes mellitus. The association of periodontal disease and diabetic retinopathy is controversial.

2. What new information is offered in this study?
The number of lost teeth was higher among patients with diabetic retinopathy.

3. What are the implications for research, policy, or practice?
The present data call for further studies assessing the causes of lost teeth among patients with diabetes mellitus with specific attention to periodontitis severity.

Background

The global incidence of diabetes mellitus has increased substantially in recent time, in the year 2014, 387 million people were affected (8.3 per cent). The cumulative percent of any retinopathy and advanced retinopathy is 84.1 and 50.2 per cent, respectively after forty years of diabetes.[1] Diabetic eye disease (retinopathy and macular oedema) is the most common microvascular complication of diabetes and is the leading cause of blindness in working-age adults.

Although, epidemiological studies have reported a decreasing incidence of vision-threatening diabetic retinopathy (DR) in the developed world attributed to improved diabetes care, however, such trends are not mirrored in the developing countries and are counterbalanced by the alarmingly increasing rates of diabetes.[2] It is estimated that in 2015 2.6 million people were visually impaired because of DR, and the projection for the year 2020 is 3.2 million.[3]

A study published in Khartoum State, Sudan reported a rate of 72.6 per cent of diabetic retinopathy.[4] Another study reported a prevalence of 40.2 per cent.[5] Previous researchers observed the association between periodontitis and poor glycaemic control.[6] The American Diabetes Association recommended a glycated haemoglobin target of <7 to prevent microvascular complications including diabetic retinopathy.[7] Periodontitis is a chronic inflammation of periodontal tissue and may result in tooth loss due to destruction of surrounding bone, the disease is the six complication of diabetes after microvascular and macrovascular complications and delayed wound healing. Besides, periodontitis could be considered as a potential modifiable and independent risk of diabetes mellitus.[8]

There is an increasing awareness regarding the association of periodontitis and dysglycaemia and insulin resistance, and a growing evidence regarding the bidirectional relationship between type 2 diabetes and periodontal disease, through the elevations of interleukin (IL)-1-β, tumour necrosis factor-α, IL-6, on the other hands people with diabetes mellitus and periodontitis demonstrate significantly higher levels of glycated haemoglobin compared to their counterparts without the disease.[9] To our best of knowledge, no researchers have assessed the relationship between periodontal disease and diabetic retinopathy in Sudan, the present survey investigated periodontitis among patients with type 2 diabetes and its relation to diabetic retinopathy in Sudan.

Method

This is a cross-sectional descriptive study conducted at a diabetes centre in Omdurman, Sudan during the period from July to September 2018. One hundred and fifty-nine patients with type 2 diabetes were interviewed using a structured checklist. The sample size was calculated using the formula: n=Z2 P Q/d2 where Z=95 per cent confidence (1.96), P=prevalence of diabetes mellitus in Sudan.[10]

The following information was recorded: age, sex, the duration since the diagnosis of diabetes, the number of lost teeth, and septic foot. The diabetes complications including retinopathy, neuropathy, nephropathy, and history of coronary artery disease were collected from the patient's records. Periodontitis was diagnosed by an experienced dentist according to the American Dentists Association Guidelines.[11] The ethical committee of Elnour Polyclinic approved the research and the Statistical Package for Social Sciences (SPSS, version 20, New York) was used for data analysis. The Chi-square and one-way simple test were used to compare categorical and numerical data. A P-value of >0.05 was considered significant.

Results

There were 159 patients with type 2 diabetes mellitus (65.4 per cent females), their age mean± SD Was 58.13±9.96, and the duration since the diagnosis of diabetes was 10.84±8.41 years. In the current study, periodontal diseases was found in 22.0 per cent of patients, retinopathy was present in 34.6 per cent, neuropathy in 40.3 per cent, and nephropathy in 26.4 per cent of participants, 11.3 per cent of patients had a history of coronary artery disease, septic foot was reported by 2.5 per cent, while the number of lost teeth was 3.86±3.05 (Table 1).

In the present study, between patients, periodontal disease (+) *vs.* (-), the incidence rate of the followings did not differ retinopathy, neuropathy, nephropathy, and coronary history. However, those with periodontal disease, compared with those without, had significantly more lost teeth (Table 2).

It is interesting to note that, the number of lost teeth was higher among patients with retinopathy compared to those without the disease with a significant statistical difference, P-value=0.044, and F=6.04 (Table 3).[11]

Discussion

The current data showed periodontal disease in 22 per cent of patients with diabetes, the observed rate was lower than a previous study which showed periodontitis in (32–48 per

cent) depending on glycaemic control.[12] In the current study, the number of lost teeth was higher among patients with retinal disease, no association was found between periodontal disease and other diabetes complications. Song et al.[13] conducted a study in Korea and found that the number of lost teeth is an independent risk factor for diabetic retinopathy, the findings of the Korean study are in line with the current findings. Incorporating both tooth and eye care in diabetes holistic care looking for causes of teeth loss (including severe periodontitis) and their association with diabetic retinopathy are needed. The earlier detection and prevention of periodontitis, calculus, plaque, and gingivitis were shown to reduce the disease progression, further loss of attachment and ultimately tooth loss.[14] The association of periodontitis with diabetic retinopathy is a matter of controversy, study based on the Korean National Health and Nutrition Examination Survey of the Korean population[15] found that diabetic retinopathy was positively associated with periodontitis in non-obese population in contradiction to the current findings in which periodontal disease was not higher among patients with retinopathy. Banthia et al.[16] published a study and concluded the association of periodontal disease and retinopathy and not in line with the present findings. Our findings were in line with a previous study conducted in Nigeria and found no association between retinopathy and periodontitis,[17] A previous study conducted in Sudan[18] reported a prevalence of 5.9 per cent of myocardial infarction among patients with diabetes and was lower than the current findings, a plausible explanation could be the higher rate of screening for coronary artery disease or the differences in acute coronary risk factors. The previous study reported retinopathy, neuropathy, and septic foot in 72.6 per cent, 68.2 per cent, and 12.7 per cent respectively, the findings were higher than the present findings. The lower rates of diabetes septic foot in the present sample compared to a previous study[19] conducted in Khartoum, Sudan (18.1 per cent *vs.* 2.5 per cent) may be due to the difference in the duration of diabetes or the degree of glycaemic control.

The study limitations

The results of the present study should be viewed in the face of several limitations including the fact that the study was conducted at a single diabetes centre, so generalization cannot be insured. Also, a cause and effect between periodontitis, the number of lost teeth, and diabetic retinopathy cannot be concluded. A big limitation of the present study is that we did not estimate the degree of glycaemic control and the degree of periodontitis that may affect the present findings.

Conclusion

More than one in five patients had periodontitis which was not associated with diabetic retinopathy in contrast to the number of lost teeth. Further multicentre studies investigating the severity of periodontal disease and the causes of teeth loss are recommended.

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PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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ETHICS COMMITTEE APPROVAL

The ethical committee of Elnour complex approved the research.

Figures and Tables

Table 1: Basic characteristics of the study group

Character	No %
Age (years)	58.13±9.96
Duration of diabetes (years)	10.84±8.41
Periodontal disease	35 (22.0%)
Retinopathy	55 (34.6%)
Neuropathy	64 (40.3%)
Nephropathy	42 (26.4%)
History of coronary artery disease	18 (11.3%)
Septic foot	4 (2.5%)
Lost teeth ± SD	3.86±3.05

Table 2: The relationship of periodontal disease to microvascular complications and coronary artery disease among the study group*

character	Periodontal disease present n=35	Periodontal disease not present=124	P-value	95% CI
Retinopathy	13 (23.6%)	22 (21.2%)	0.719	1.154
Neuropathy	19 (29.6%)	16 (16.8%)	0.055	2.08
Nephropathy	12 (28.6%)	23 (19.6%)	0.232	1.63
History of Coronary syndrome	6 (33.3%)	29 (20.6%)	0.218	1.93

*Chi-square test

Table 3: The relationship of periodontal disease to the number of lost teeth*

Character	Retinopathy	No retinopathy	P-value	F
No of lost teeth	4.55±3.44	3.44±2.72	0.044	6.04

*T-test