International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 28-11-2018; Accepted: 29-12-2018
www.medicalsciencejournal.com
Volume 5; Issue 1; 2019; Page No. 318-321

A study of periapical and endodontic status of type 2 diabetic patients in India

Ajmal Mir[1], Shahid Ali Wani[2*], Mehnaz Rajab[3]

[1] MDS, Department of Conservative Dentistry and Endodontics, Government Dental College, Srinagar, Jammu & Kashmir

[2] Postgraduate Student, Department of Conservative Dentistry and Endodontics, Sardar Patel Postgraduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh, India

[3] BDS, MR Ambedkar Dental College and Hospital, Banglore, Karnataka, India

Abstract

Introduction: This cross-sectional study evaluated the prevalence of apical periodontitis (AP) and endodontic treatment in type 2 diabetic individuals as compared with nondiabetics from an adult Indian population.

Methods: Full-mouth radiographs from 30 type 2 diabetic and 60 age- and sex-matched nondiabetic individuals were examined, and the presence of AP lesions in untreated and root canal-treated teeth was recorded. The number of teeth and the prevalence of root canal treatment were also evaluated.

Results: AP was significantly more present in teeth from diabetic individuals (98/652, 15%) than in nondiabetic controls (162/ 1,368, 12%) (P = .05). A separate analysis of untreated and treated teeth revealed that significance was mostly because of the prevalence of AP in untreated teeth, which was 10% in diabetics and 7% in nondiabetics (P = .03). No significant difference between diabetics and nondiabetics was observed for the other parameters under study, including the prevalence of AP in root canal–treated teeth, the number of teeth in the oral cavity, the number of treated teeth per individual, the number of individuals with at least 1 AP lesion or 1 root canal treatment, and the number of teeth with AP per individual (P > .05).

Conclusions: AP was significantly more prevalent in untreated teeth from type 2 diabetics. This suggests that diabetes may serve as a disease modifier of AP in the sense that individuals with diabetes can be more prone to develop primary disease. However, findings do not confirm that diabetes may influence the response to root canal treatment because treated teeth had no increased prevalence of AP when compared with controls.

Keywords: diabetes, endodontic treatment, periapical

Introduction

Diabetes mellitus (DM) is a group of complex multisystem metabolic disorders caused by a deficiency in insulin secretion caused by pancreatic b-cell dysfunction and/or insulin resistance in liver and muscle. Diabetes affects more than 9% of the adult population and has a dramatic impact on the health care system through high morbidity and mortality among affected individuals [1]. DM alters many functions of the immune system and is associated with delayed healing and compromised immune responses [2]. This predisposes to chronic inflammation, progressive tissue breakdown, and diminished tissue repair capacity [3]. Evidence has consistently indicated that DM is a risk factor for increased severity of gingivitis and periodontitis [4], and aggressive forms of periodontal disease have been associated with increased serum glucose levels [5]. Chronic apical periodontitis (AP) is the inflammation and destruction of apical periodontium that is of pulpal origin, appears as a periradicular radiolucent area, and does not produce clinical symptoms [6]. Periradicular lesions consecutive to AP result from a periapical inflammatory response provoked by polymicrobial irritants from root canals. Despite numerous differences between chronic inflammatory disease of periodontal and endodontic origins, there are notable similarities [7] including the following: [1] both diseases are chronic infections affecting oral tissues [2], both conditions share a common microbiota that often is associated with gram-negative anaerobic bacteria [8], and [3] elevated systemic cytokines and inflammatory mediators levels have been observed in conjunction with both disease processes [9]. Thus, there is a biologic basis to suppose that DM could be associated with a higher prevalence of periapical lesions or a higher rate of endodontic treatment. Some studies have investigated this hypothesis [10] finding a greater prevalence of periapical lesions in type 1 diabetics [11], and reporting that in cases of poorly controlled DM periapical radiolucencies tend to develop during treatment [12, 13]. Ueta *et al.* [14] reported a disproportionately high percentage of clinically severe pulpal or periodontal infections in patients with DM, and Bender and Bender [15] found a high rate of asymptomatic tooth infections in diabetics exhibiting poor glycemia levels of an unclear cause. Fouad and Burleson [16] showed that patients with diabetes have a reduced likelihood of success of endodontic treatment in cases with preoperative periradicular lesions. Segura-Egea *et al.* [17] found a higher prevalence of AP in type 2 diabetic patients. However, Britto *et al.* [18] found no significant differences in the prevalence of AP between diabetics and controls but reported that men with type 2 diabetes who had endodontic treatments were more likely to have residual lesions after treatment. The aim of the present study was to investigate radiographically the prevalence of AP and endodontic treatment in a sample of type II diabetic patients and control subjects of India.

Materials and Methods

Individuals seeking routine dental care and attending the GDC, Srinagar, India for the first time were selected to take part in this study. The study group was composed of 30 type 2 diabetic individuals (18 women and 12 men), with ages ranging from 40 to 69 years (mean, 58.2±8.2 years). Controls were age and sex matched with diabetics so that there were 2 nondiabetic individuals for each diabetic patient. Ages for the 60 control individuals ranged from 41 to 70 years (mean, 58.3±8.0 years). The protocol for this study was approved by the College of Dentistry, India. Full-mouth periapical and panoramic radiographs from these individuals were digitized and independently analyzed on a computer screen by 2 experienced endodontists. The kappa coefficient was used at the end of the evaluation to analyze agreement between the 2 evaluators as for the presence/absence of AP (k = 0.84). Discrepant cases were resolved by joint discussion. The periradicular status was evaluated according to Strindberg's criteria [19]. A periradicular healthy condition was judged when the contour and width of the periodontal ligament space were normal or the periodontal ligament contour was widened mainly around excess filling. The appearance of the surrounding bone was normal. Diseased teeth presented any discernible apical radiolucency [19, 20]. The root with the worst condition was taken to represent the status of multirooted teeth. Radiographs were also examined for the number of teeth present and the prevalence of root canal treatment. As for the latter, root canal–treated teeth were categorized according to the radiographic qualities of the root canal filling following criteria described previously [21, 22]. Root canal treatment was ranked as adequate when all canals were obturated with no voids in the filling mass and the apical terminus of the filling was 0 to 2 mm short of the radiographic apex. In multirooted teeth with similar periradicular status for all roots, the root with the worst treatment quality was used. Coronal restoration was ranked as adequate when it was a permanent restoration that appeared radiographically intact with no detectable signs of overhangs, open margins, or recurrent caries. Data were statistically analyzed to evaluate the significance in the differences between type 2 diabetic individuals and controls using the Wilcoxon signed rank and McNemar tests when the individual was the unit of analysis, whereas the chi-square test with Yates correction was used when tooth was the unit of analysis.

Results

The average number of teeth per individual in the diabetic group was 21.7, whereas in the control group it was 22.8 (Table 1). This difference was not statistically significant (P > .05). Of the diabetics, 77% displayed 1 or more teeth with root canal treatment, with an average of 2.8 root canal–treated teeth per patient. Of the nondiabetic subjects, 87% presented endodontic treatment in at least 1 tooth, with an average of 3.4 treated teeth per individual. No significant differences were observed either for the number of subjects with at least 1 treated canal or for the number of root canal–treated teeth per individual (P > .05).

Overall, 80% of the diabetic individuals exhibited 1 or more AP lesions, with an average of 3.3 diseased teeth per patient. In the control group, AP occurred in 87% of the individuals, with an average of 2.7 lesions per subject. No significant differences were found either for the percentage of individuals with at least 1 diseased tooth or for the number of teeth with AP per subject (P > .05).

In the diabetes group, 53% of the individuals presented at least 1 root canal–treated tooth associated with post-treatment AP, with an average of 1.3 per patient. In the control group, 55% of the individuals exhibited at least 1 root canal–treated tooth with post-treatment disease, with a similar average of 1.3 per subject. The results were not significantly different either for the percentage of individuals or for the number of root canal–treated teeth with disease per subject (P > .05).

The overall prevalence of AP was evaluated using the whole number of teeth investigated (Table 2). This analysis showed that 98 of 652 (15%) of the teeth from diabetic individuals displayed AP lesions, whereas the correspondent values in nondiabetic individuals were 162 of 1,368 (12%). This difference was statistically significant, with a P value at the level of significance (P= .05). When analyzing separately the prevalence of AP either in untreated or in treated teeth, it became clear that the significant difference was mostly because of the prevalence of AP in untreated teeth, which was 10% in diabetics and 7% in nondiabetics (P = .03). Of the root canal–treated teeth from diabetic individuals, 46% were associated with AP, whereas 38% from nondiabetics evinced disease. However, this difference was nonsignificant (P > .05). The number of teeth with adequate endodontic treatment in the diabetes group corresponded to 41% of the treated teeth, 37% of which displayed AP lesions. In the control group, teeth with adequate endodontic treatment corresponded to 30% of the treated teeth, 23% of which had AP. This difference was not significant either (P > .05). As for teeth with both adequate endodontic treatment and adequate coronal restoration, 35% of those from diabetics and 27.5% from nondiabetics were associated with AP, a difference that was not significant either (P > .05).

Table 1: The Mean Number of Teeth in Diabetic and Nondiabetic Individuals (mean number standard deviation)

	Type 2 diabetic patients	Non -diabetic patients
Overall	21.7 ± 6.2	22.8 ± 5.7
Teeth with RCT	2.8 ± 3.4	3.4 ± 3.0
Teeth with no RCT	18.9 ± 6.9	19.4 ± 6.5

Table 2: Prevalence of AP Lesions in Diabetic and Nondiabetic Individuals

	Type 2 diabetic patients	Non -diabetic patients	p value
Total number of teeth	652	1368	0.05
With AP	98(15)	162(12)	
With no AP	554(85)	1206(88)	
Number of teeth with			
RCT	85	206	0.25
With AP	39(46)	78(38)	
With no AP	46(54)	128(62)	
Number of teeth with no			
RCT	567	1162	0.03
With AP	59(10)	84(7)	
With no AP	508(90)	1078(93)	
Number of teeth with			
adequate root	35	62	0.2
With AP	13(37)	14(23)	
With no AP	22(63)	48(77)	
Number of teeth with			
both adequate RCT	17	40	0.59
With AP	6(35)	11(27.5)	
With no AP	11(65)	29(72.5)	

Discussion

Because there are so far few studies in the literature reporting on diabetes as a disease modifier in endodontics, this cross-sectional study was conducted to investigate the prevalence of AP and endodontic treatment in type 2 diabetic individuals. A cross-sectional design was used because of the advantage of allowing the inclusion of a large number of individuals. Even so, the number of diabetic individuals gathered was not so large but was comparable with previous studies on this same issue [17, 18, 23]. Matching individuals by sex and age was performed with the purpose of reducing the interference of these variables and possible risk factors additional to the study. However, one of the limitations of cross-sectional studies is the fact that the mean time since completion of endodontic treatment is unknown. In an attempt to circumvent possible biases, all the individuals participating in the study were attending for the first time in the dental school and basically pertained to the same socioeconomic status (relatively low incomes).

The overall prevalence of AP was significantly higher in teeth from type 2 diabetics when compared with nondiabetics. When teeth were analyzed separately according to the presence/absence of root canal treatment, it was evident that the higher prevalence of AP was mostly associated with untreated teeth. Therefore, our findings showed that AP is more frequent in untreated teeth from diabetics as compared with nondiabetics. This is in agreement with a previous report showing a higher prevalence of AP in teeth from diabetics [17].

Even though the prevalence of AP was higher in teeth from diabetics, no significant differences were found when the analysis involved either the number of patients with at least 1 AP lesion or the mean number of lesions per individual. This is in contrast to 2 previous Spanish studies [17, 23], which also found significant differences for these 2 analyses. Nevertheless, one should have in mind that both analyses have limitations. In the former (individuals with at least 1 diseased tooth), the total number of teeth with disease per individual is not taken into account. In the latter (the number of lesions per individual), the total number of teeth per individual is not considered. In addition to incorporating all these factors, the prevalence analysis also used a much larger sample size (number of teeth) that permitted even an observed difference of only 3% between the groups to be statistically significant.

The prevalence of AP in root canal–treated teeth may be suggestive of the success rate of the treatment although data should be viewed with care because of the cross-sectional nature of the study. In this study, even though treated teeth from controls had a higher percentage of cases with no lesion (62% ‘‘success’’) when compared with diabetics (54% ‘‘success’’), this difference was not significant. A lack of significance was also observed for differences observed when only adequately treated canals were evaluated (77% ‘‘success’’ in controls vs 63% ‘‘success’’ in diabetics). Similarly, no significant differences were found for the 2 groups when comparing either the number of individuals with 1 or more treated teeth with post-treatment AP or the number of treated teeth with disease per subject. These findings corroborate those from the Spanish studies (17, 23) but are in disagreement with a previous study that included both types 1 and 2 diabetic patients and found a significant correlation between type 2 diabetic patients and the presence of post-treatment AP [18]. Methodological differences among the studies may have accounted for these differences. Based on our findings, it appears that diabetes may not influence the response to treatment. Because of inconsistency among findings in the literature, studies with well controlled variables using matched pairs of patients/controls and especially using a larger sample size are necessary to help illuminate this issue.

The prevalence of root canal treatment in this type of study usually serves as a surrogate for pulpal disease. The present findings are in consonance with Segura-Egea *et al*. [17], who found no significant differences between the percentages of diabetic and nondiabetic individuals with at least 1 treated canal as well as between the number of endodontically treated teeth per subject. Another previous study also showed no significant difference between the presence of root canal– treated teeth and diabetes [17]. It is worth pointing out that this factor involves other variables, such as the accessibility of patients to dental care. As reported earlier, we tried to avoid this bias by including only individuals belonging to a similar socioeconomic status and attending the dental school for the first time.

Other variables may have influenced the results, such as the time of diabetes, which is a variable not controlled in this and in most of the previous studies. The time of diabetes has been shown to be associated with changes in the presentation of AP in humans. Falk *et al*. [11] included in their study long- and short-duration insulin-dependent diabetics and reported no significant association with the mean number of endodontically treated teeth and AP lesions. However, women with long duration diabetes had more root canal–treated teeth with AP than women with short-duration diabetes and nondiabetic women. An altered host response to infection occurs in diabetic individuals and may be related to the accumulation of AGEs and interaction with their receptors in tissues. The accumulation of AGEs can lead to an exacerbated inflammatory response, with consequently higher bone resorptive and reduced bone formation activities [24].

Some authors claimed that diabetic individuals may have more tooth loss in comparison to nondiabetics as a consequence of increased incidence and seriousness of caries and aggressive forms of periodontal disease [14, 17, 23]. However, the present study did not find a significant difference regarding the mean number of teeth per subject between groups, which is in consonance with Falk *et al*. [11].

In conclusion, AP was significantly more prevalent in teeth from type 2 diabetic individuals. This higher prevalence was observed specifically for untreated teeth. These findings suggest that diabetes can serve as a disease modifier of apical periodontitis in the sense that individuals with diabetes may be more prone to develop primary AP. However, our findings do not confirm that diabetes may influence the response to root canal treatment because treated teeth from diabetics had no significantly increased prevalence of disease when compared with controls. Because of the inconsistencies in data available from the literature and considering the limitations of cross-sectional studies, further studies, especially using a prospective design, are required to elucidate some issues and confirm others.

References

1. Manfredi M, McCullough MJ, Vescovi P, *et al*. Update on diabetes mellitus and related oral diseases. Oral Dis,

2004; 10:187-200.
2. Delamaire M, Maugendre D, Moreno M, *et al*. Impaired leukocyte functions in diabetic patients. Diabetes Med, 1997; 14:29-34.
3. Iacopino AM. Periodontitis and diabetes interrelationships: role of inflammation. Ann Periodontol, 2001; 6:125-37.
4. Salvi GE, Carollo-Bittel B, Lang NP. Effects of diabetes mellitus on periodontal and peri-implant conditions: update on associations and risks. J Clin Periodontol 2008; 35(8 Suppl):398–409.
5. Katz J. Elevated blood glucose levels in patients with severe periodontal disease. J Clin Periodontol, 2001; 28:710-2.
6. AAE Glossary of Endodontic Terms. Available at: http://dev.aae.org/uploadedFiles/ Publications_and_Research/Member_Publications/03GlossaryofEndoTerms_Web (1).pdf. Accessed January 13, 2011.
7. Caplan DJ, Chasen JB, Krall EA, *et al*. Lesions of endodontic origin and risk of coronary heart disease. J Dent Res, 2006; 85:996-1000.
8. Sundqvist G. Ecology of the root canal flora. J Endod, 1992; 18:427-30.
9. Barkhordar RA, Hayashi C, Hussain MZ. Detection of interleukin-6 in human dental pulp and periapical lesions. Endod Dent Traumatol, 1999; 15:26-7.
10. JOE Editorial Board. Relationship between systemic diseases and endodontics: an online study guide. J Endod. 2008; 34(5 Suppl):195-200.
11. Falk H, Hugoson A, Thorstensson H. Number of teeth, prevalence of caries and periapical lesions in insulin-dependent diabetics. Scand J Dental Res, 1989; 97:198-206.
12. Bender IB, Seltzer S, Freedland J. The relationship of systemic diseases to endodontic failures and treatment procedures. Oral Surg Oral Med Oral Pathol, 1963; 16:1102-15.
13. Cheraskin E, Ringsdorf WM Jr. The biology of the endodontic patient: 3. Variability in periapical healing and blood glucose. J Oral Med, 1968; 23:87-90.
14. Ueta E, Osaki T, Yoneda K, *et al*. Prevalence of diebetes mellitus in odontogenic infections and oral candidiasis: an analysis of neutrophil suppression. J Oral Pathol Med, 1993; 22:1768-74.
15. Bender IB, Bender AB. Diabetes mellitus and the dental pulp. J Endod, 2003; 29:383-9.
16. Fouad AF, Burleson J. The effect of diabetes mellitus on endodontic treatment outcome: data from and electronic patient record. J Am Dental Assoc, 2003; 134:43-51.
17. Segura-Egea JJ, Jimenez-Pinzon A, Rıos-Santos JV, *et al*. High prevalence of apical periodontitis amongst type 2 diabetic patients. Int Endod J, 2005; 38:564-9.
18. Britto LR, Katz J, Guelmann M, *et al*. Periradicular radiographic assessment in diabetic and control individuals. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2003; 96:449-52.
19. Strindberg LZ. The dependence of the results of pulp therapy on certain factors. Acta Odontol Scand. 1956; 14(suppl 21):1-75.
20. Chugal NM, Clive JM, Spangberg LS. A prognostic model for assessment of the outcome of endodontic treatment: effect of biologic and diagnostic variables. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2001; 91:342-52.
21. Tavares PB, Bonte E, Boukpessi T, Siqueira JF Jr, Lasfargues JJ. Prevalence of apical periodontitis in root canal-treated teeth from an urban French population: influence of the quality of root canal fillings and coronal restorations. J Endod. 2009; 35:810-3.
22. Tronstad L, Asbjornsen K, Doving L, Pedersen I, Eriksen HM. Influence of coronal restorations on the periapical health of endodontically treated teeth. Endod Dent Traumatol. 2000; 16:218-21.
23. Lopez-Lopez J, Jane-Salas E, Estrugo-Devesa A, Velasco-Ortega E, MartinGonzalez J, Segura-Egea JJ, *et al*. Periapical and endodontic status of type 2 diabetic patients in Catalonia, Spain: a cross-sectional study. J Endod. 2011; 37:598-601.
24. Liu R, Bal HS, Desta T, *et al*. Diabetes enhances periodontal bone loss through enhanced resorption and diminished bone formation. J Dent Res. 2006; 85:510-4.