|| Print ISSN: 2589-7837 || Online ISSN: 2581-3935 ||

International Journal of Medical Science and Diagnosis Research (IJMSDR)

Available Online at www.ijmsdr.com

NLM (National Library of Medicine ID: 101738824)

Volume 4, Issue 9; September: 2020; Page No. 30-34



Original Research Article

A COMPARATIVE STUDY ON PERIAPICAL HEALING FOLLOWED BY ENDODONTIC THERAPY IN TYPE II DIABETES MELLITUS VS NON –DIABETES-A SYSTEMATIC REVIEW

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Conflicts of Interest: Nil

Corresponding Author: Dr. Amitha Ponnath DOI: https://doi.org/10.32553/ijmsdr.v4i9.667

Abstract

Introduction: There is high occurrence of apical periodontitis in diabetes mellitus patients. The healing process of periapical tissue in diabetes is affected by the altered immunity. The aim of the study is to determine the periapical healing followed by endodontic therapy in type 2 diabetes mellitus and compare with non-diabetes

Methodology: This review was directed as per the PRISMA and JBI guidelines. A total of six articles published over a period of past 15 years were included in qualitative synthesis.

Results: Total of 1424 articles was searched out of which 26 articles were selected after reading title and abstract. As a next step, full text papers were obtained. However studies in which periapical healing in type II diabetes and non- diabetes were selected. Finally a total of 26 articles were included out of which 20 articles were excluded on basis of insufficient data and 6 articles were selected for final synthesis.

Conclusion: Patients with type II diabetes mellitus had slower healing rate compared to non-diabetes patients.

Keywords: Type II diabetes mellitus, Non- Diabetes, Root Canal Therapy, Periapical Healing

Introduction:

Diabetes mellitus (DM) is one of the supreme common metabolic disorders. The prevalence of diabetes is rapidly rising all over the globe at alarming rate. Polydipsia, polyuria, polyphagia and glycosuria represent signs and symptoms of diabetes (Bender & Bender 2003, Al-Maskari et al. 2011). This condition presents two main types. Type 1, previously named 'insulin-dependent diabetes', is an autoimmune reaction that destroys pancreatic b-cells and inhibits insulin secretion (Iwama et al. 2003, 2006). Type 2, the most common type of diabetes, is characterized by tissue resistance to insulin action, showing glucose hormone intolerance or b-cell dysfunction. ^[1]Type 2 diabetes mellitus is the commonest form of diabetes & its prevalence is 2.4% in rural population & 11.6% in urban population ^[2].

Type 2 diabetes is caused by resistance to insulin joint with a failure to produce enough additional insulin to compensate for the resistance. Type 2 diabetes is commonly connected to obesity, which contributes to insulin resistance through elevation of circulating levels of free fatty acids derived from the adipocytes; these free fatty acids inhibit glucose uptake, glycogen synthesis and glycolysis. [2]

Apical periodontitis (AP) is an inflammatory process surrounding the apex of a root, subsequent to bacterial infection of the root canal system. Apical periodontitis is associated with a bone lesion characterized radiographically by a radiolucent image around the root apex of the affected tooth. AP is a remarkable health problem, being one of the most prevalent diseases in the world.

There is a trend towards increased symptomatic periradicular disease in patients with diabetes who established insulin as well as flare ups in all patients with patients with diabetes. They should be treated with effective antimicrobial root canal regimens, particularly in cases with preoperative lesions [3].

Diabetics who present for endodontic treatment, particularly those with periradicular pathosis may have increased preoperative symptoms and should be treated with effective antimicrobial root canal regimens. Cases with preoperative periradicular pathosis are less possible to be determined successful two years or longer postoperatively, if the patient reports a history of diabetes^[4].

Bender et al reported that inflammatory periapical reactions are greater in diabetic states, and the increased local inflammation causes an intensification of diabetes with a rise in blood glucose, placing the patient in an uncontrolled diabetic state. This often requires an increase in insulin dosage or therapeutic adjustment. Removal of the inflammatory state usually creates a need for a lesser amount of insulin for diabetic control. Thus, it becomes axiomatic to remove all infections including those of the dental pulps. [5]

Therefore, the aim of this study was to perform a critical review of the literature that has investigated the association between type II diabetes and periapical healing followed by endodontic therapy.

Methadology

This systematic review is conducted in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines and the Joanna Briggs Institute critical appraisal checklist for systematic reviews

Types of studies

Prospective studies and retrospective studies published over a period of 15 years were included in this review

Types of interventions

Root canal therapy.

Types of outcome measures

To analyse the effect of gender, age on periapical healing in type II diabetes mellitus and non-diabetes patients.

Literature search and screening strategy

An initial electronic search of two databases including PUBMED and GOOGLE SCHOLAR using the search terms (alone or in combination) diabetes mellitusOR Type II diabetes mellitus AND Non surgical treatment OR root canal therapy AND Periapical healing OR periapical diseases OR periapical periodontitis were carried out. All relevant titles, abstracts published in English over the past 15 years (2003- 2018) were identified and retrieved by the first two authors. Out of 1424 results obtained, a total of 26 full text articles were obtained.

The inclusion criteria are

- Articles in English or those that have detailed summary in English were included.
- Studies published between January 2003 to December 2018 were included
- Invivo studies were included
- Studies comparing diabetes and non-diabetes were included.
- Studies involving both male and females were included.
- Studies in which glycemic control was assessed were included.
- Age group of 20-85 years were considered
- Studies with apical periodontitis with lesion size of <1mm-3 mm were included
- Studies establishing the outcome of root canal treatment and recording data on healing of lesion in diabetes and non diabetes patients.

The exclusion criteria are

Included

- Reviews , case reports, abstracts, letters to editors or editorials ,animal studies were excluded
- Invitro studies were excluded
- Patient below age of 20 years were excluded
- Studies with lesion size more than 3mm were excluded.
- Studies on healing of periapical granuloma, periapical cyst were excluded.

Only 6 articles (table 1) were qualified and 15 articles were excluded.8 articles were excluded as they were animal studies and 5 articles were excluded as they showed only the association between diabetes mellitus and apical periodontitis. 2 articles were excluded as it was a review article. Eventually, six records were selected to be included in this review and sought for qualitative synthesis in this systematic review

Diagram 1: Flow Diagram

Records identified through database searching (n = 1424)

Records screened according to title and selected (n = 1424)

Records identified after duplicate removal (n = 26)

Records screened (n = 26)

Full-text articles assessed

for eligibility

(n = 6)

Studies included in

qualitative synthesis

(n = 6)

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Full-text articles excluded

with reasons (n =15)

Systematic review

Animal studies

Studies only showed

prevalence between

diabetes mellitus and

apical periodontitis

articles

Table 1: Selected studies

sl.no	Author	Location where study was done	year	study design	sample size	SETTING	population	intervation/ exposure	outcome	remarks
1	Britto et al	florida	2003	cross sectional study	50	dental college	diabetic and non diabetic patients	root canal therapy	Type 2 diabetes is associated with an increased risk of ill response by the periradicular tissues to odontogenic pathogens	there is positive relationship between diabetes mellitus and healing of periapical tissues
2	Fouad et al	Farmington.	2003	retrospective study	540	dental college	diabetic and non diabetic patients	root canal therapy	teeth in non-diabetic patients had a higher likehood of success than with teeth in type 2 diabetic patients	diabetes interfere with healing in patients with treated endodontic infections
3	Sanchez et al	Barcelona, Spain.	2013	cross sectional study	83	dental college	diabetic and non diabetic patients	root canal therapy	radiolucent periapical lesions are seen in type 2 diabetic patients	there is a relationship between glycemic control and periapical inflammation in diabetic patients
4	Ferreira et al	Coimbra. Portugal.	2015	retrospective study(longitudi nal study)	32	dental college	diabetic and non diabetic patients	root canal therapy	success of endodontic treatment is compromised in patients with type II diabetes mellitus	in diabetes mellitus the endodontic treatment outcomes were less successful compared to non- diabetes patients
5	Rudranaik et al	Hassan, India	2017	prospective study	80	dental college	diabetic and non diabetic patients	root canal therapy	type2 diabetes had chronic and larger sized lesions when compared to control subjects	clinical and radiographic healing outcome was delayed in diabetic patients
6	Arya et al	Rohtak, India	2017	prospective study	60	dental college	diabetic and non diabetic patients	root canal therapy	less periapical healing in type 2 diabetes patients compared to non diabetic patients	diabetes mellitus may have a negetive impact on outcome of endodontic treatment in terms of periapical healing

Results

A total of six articles published from 2003 to 2018 were included in this review (TABLE 1). Individual factors for analysis were selected are gender, age and effect of controlled diabetes and uncontrolled diabetes. For each factor under investigation, the outcomes from each of the three methodologies in analysis are reported in their particular section.

Gender

From the five studies it was analysed that there was no significant association between gender in the periapical healing after endodontic therapy in diabetes patients and non- diabetes patients. But one study showed that men with type 2 diabetes mellitus had delayed periapical healing compared to females.

Table 2: studies on influence of gender on periapical healing after endodontic therapy in type 2 and non-diabetic patients

Sl.no	Author	Sample size	conclusion
1	Britto et al	50	Even though Incidence was more in men,there was no significant difference was between the genders.
2	Arya et al	60	No significant difference between genders
3	Rudranaik et al	80	No significant difference between genders
4	Fouad et al	540	No significant difference between genders
5	Sanchez et al	83	No significant difference between genders

Age

From the Six studies that was analysed three showed a significant difference in the influence of age on periapical healing in diabetes patients and non-diabetes after non surgical endodontic therapy. Three of the studies showed that there was no significant difference of age on periapical healing after endodontic therapy in type 2 and non-diabetic patients

Table 3: studies on influence of age on periapical healing after endodontic therapy in type 2 and non-diabetic patients

SL.NO	Author	Sample size	Conclusion
1	Sanchez et al	83	No significant difference
2	Rudranaik et al	80	No significant difference
3	Fouad et al	540	significant difference was found
			among different age group
4	Arya et al	60	significant difference was found
			among different age group
5	Britto et al	50	No significant difference
6	Ferreira et al	32	significant difference was found
			among different age group

Glycemic control

From the two studies it was analysed that, one of the studies showed that there was significant difference of controlled and poorly controlled diabetes on periapical healing after endodontic treatment. Other study showed that there was no significant difference in controlled and uncontrolled diabetes on periapical healing after endodontic therapy.

Table 4: studies on influence of controlled and uncontrolled diabetes on periapical healing after endodontic therapy

Sl.No.	author	Sample size	conclusion
1	Rudranaik et al	80	Significant difference was found between controlled and poorly controlled diabetes patients
2	Arya et al	60	No significant difference

Discussion

From the six articles found suitable in the inclusion criteria the articles were broadly classified into different variables or factors affecting the periapical healing after non surgical endodontic treatment like gender, age and effect of controlled diabetes and uncontrolled diabetes.

It was found that five studies have been done to evaluate the influence of gender on periapical healing in diabetes mellitus. In general it can be concluded that men with type 2 diabetes mellitus had delayed periapical healing compared to females. It was found that men with type 2 diabetes had an increased number of periradicular radiolucencies—both men with NSE with lesions and men with NSE without lesions. However, the finding that type 2 diabetes is associated with an increased rate of inflammatory resorption of the alveolar bone in untreated teeth or in treated teeth is of clinical significance. Because only teeth with adequate root canal treatment were included in the study, the factor of ill treatment resulting in an endodontic failure was reduced, but not completely eliminated. This finding focuses on type 2 diabetes as the main etiologic factor in endodontic failure. The finding that men with type 2 diabetes had endodontic failure more frequently than did women with type 2 diabetes might be attributed to the overall better general medical care and treatment of women. [9]

It was found that six studies have been done to evaluate the influence of age on periapical healing after root canal therapy in type 2 diabetes patients. In general it can be concluded that the age is related to the healing of the periapical tissues in type 2 diabetes mellitus patients. According to research on the global prevalence of DM in developing countries, the majority of people with type 2 diabetes are in the 45- to 64-year age range. [14] The risk age for type 2 diabetes is estimated to be above 45-years .This might help explain the higher mean age observed in the diabetic group. [7-8] López-López et al in their 50-patient study, described that adult patients with type-2 diabetes are significantly more susceptible to apical periodontitis and the need for radicular endodontic treatment. The treatment outcome was better in older age groups. [16]

Two studies have been done to evaluate the effect of controlled diabetes and uncontrolled diabetes. Diabetics

with poor glycemic control have a higher rate of asymptomatic tooth infection. Diabetes mellitus subjects had chronic and exacerbating lesions with significantly larger lesions (p=0.029). 100 % clinical healing result in diabetic group was seen in two months. [15] Poor controlled diabetics showed failure compared to fair and good controlled. The endodontic treatment of infected teeth aims at elimination of bacteria from the root canal, thereby providing a favourable environment for healing. Several clinical studies report a success rate of endodontic therapy ranging from 87.4% to 94.5%. [17] In a study the smaller lesions showed successful healing outcome within six months, however the success rate of 70% (14 out of 20 patients) over a period of one year was observed in ≥3mm sized lesions. Friedman et al. in their review found that the success rate of teeth with apical periodontitis after initial treatment or retreatment was 74% to 86%. Diabetic subjects with good and fair glucose control showed better healing than poor controlled diabetic subjects. Cheraskin and Ringsdort showed radiographic healing of periapical lesion following root canal treatment in a low glucose group were reduced by an average of 74% compared with a reduction of only 48% for a high glucose group. The lower success rates in diabetic patients could probably be due to impaired healing capacity and increased susceptibility to infection .[11]

The most important finding of study by arya et al is despite the increase in HbA1c levels was the improvement of PAI scores (90% and 100% in diabetic and nondiabetic patients, respectively) after endodontic treatment. These findings suggest that RCT is effective in retaining teeth even in poorly controlled type 2 diabetic patients. ^[6]. Interestingly, very few studies have investigated the role of diabetes in the outcome of endodontic treatment. Diabetes is mentioned as a factor in the case selection, ^[12] but an evaluation of the clinical outcomes and comparisons of microbial flora in the roots of patients with diabetes versus subjects without diabetes are rare. As a result, no clear protocols are currently present for antibiotic coverage in endodontic flare-ups in patients with uncontrolled diabetes or in subjects without diabetes. ^[17]

Conclusion

Diabetes crucially affects oral tissues, influencing inflammatory mediators as well as metabolic changes of pulpal tissues. In addition, when pathology arises, diabetes increases the development of infections, intensifying necrosis and its consequences on pulpal, as well as on periradicular tissues. Diabetes mellitus may have a negative influence on the outcome of endodontic treatment in terms of periapical healing. In type 2 diabetes mellitus patients non surgical endodontic treatment did not improve HBA1c levels. The periapical lesions in patients with poor diabetic control indicated failure. The clinical and

radiographic healing outcome of endodontic therapy was delayed in diabetic patients. Type 2 diabetes is related with an amplified risk of ill response by the periradicular tissues to odontogenic pathogens.

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