

A STUDY ON ASSOCIATION OF TOOTH LOSS & PERIODONTAL DISEASE IN PATIENTS SUFFERING FROM DIABETES FROM BIHAR REGION

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Abstract

Diabetes is one of the common diseases of modern times and one of the most common systemic disorder that is connected to periodontal disease. Periodontal diseases are bacterially induced chronic inflammatory diseases affecting the tissues surrounding and supporting the teeth. The lesion begins as gingivitis, an inflammation of the gingival tissues only, and may progress to periodontitis, where destruction of connective tissue attachment and alveolar bone can eventually lead to tooth loss. Hence based on above reported findings the present study was planned for study of prevalence of tooth Loss in Patients Suffering from Diabetes from Bihar Region.

The present study was planned in Department of Dentistry, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar. Total 100 cases were enrolled in the present study. In the enrolled patients 50 cases were Diabetic and 50 were non-diabetic cases.

The data generated from the present study concludes that periodontal disease increases in diabetes group than in control group. Thus, a diabetic patient should always see that he/she maintains his/her oral hygiene by following proper tooth brushing habits. Diabetics should take care to see that they get their teeth restored as early as possible, if decayed. They should follow the instructions given by the physician or the dietician for the intake of non-cariogenic diet. The prevention of periodontal breakdown in diabetic patients is mostly based on the education of the individual. Thus, patients should be informed about the importance of oral health for diabetics, and they should be taught that the main symptom of periodontal disease is gingival bleeding.

Keywords: Tooth Loss, Diabetes, periodontal disease, bihar, etc

Introduction

Diabetes is a very deceptive disease with some surprising statistics. It affects approximately 25.8 million people, according to the Centre for Disease Control and Prevention, and one-third of people with diabetes have severe periodontal (gum) disease. Periodontal disease in diabetic patients can ultimately result in the loss of one or more teeth. In fact, the American Dental Association published a recent study that linked one in five cases of total tooth loss to diabetes.

Like diabetes, periodontal disease can be sneaky and develop slowly without a lot of warning. As detailed by the National Institute of Dental and Craniofacial Research, gum disease starts when bacteria in mouth forms a sticky plaque biofilm that adheres to teeth, especially around the gum line. If not removed regularly

and thoroughly, the bacteria in the plaque creates toxins that cause inflammation of gums. Symptoms of this first stage of gum disease, called gingivitis, are red, swollen and bleeding gums.

If untreated, gingivitis progresses into periodontitis. As more plaque forms on teeth, at the gum line and under gums, it eventually hardens into tartar. This causes gums to pull away from teeth and form loose pockets. The bacterial toxins create an infection within the pockets that starts to destroy the bone and ligaments surrounding teeth. Without bone and strong connective tissue to support teeth, they will begin to loosen, and may eventually lead to loss of tooth.

Periodontal disease is the most common dental disease affecting those living with diabetes, affecting nearly 22% of those diagnosed. Especially with increasing age, poor

blood sugar control increases the risk for gum problems. In fact, people with diabetes are at a higher risk for gum problems because of poor blood sugar control. As with all infections, serious gum disease may cause blood sugar to rise. This makes diabetes harder to control because more susceptible to infections and are less able to fight the bacteria invading the gums.

Periodontal (gum) disease is chronic inflammatory disease of the tissues surrounding and supporting the teeth. It is a major cause of tooth loss in adults. In periodontitis, unremoved plaque hardens into calculus (tartar), gums gradually begin to pull away from the teeth, and pockets form between the teeth and gums. However, people often do not know they have periodontal disease because it is usually painless.

A recent study came out looking at a 40-year trend of diabetes and periodontal disease. They collected data from nine waves of National Health and Nutrition Examination Survey conducted from 1971 through 2012. The study collected 37,609 dentate individuals aged 25 or older who received an oral examination. The results of the study show that diabetes was consistently higher among non-Hispanic blacks and Mexican Americans than among non-Hispanic whites ($P < 0.001$). The study found that tooth loss is associated with diabetes. A trend was identified that the number of teeth lost greatly increased after the age of 60 among the three racial ethnic groups. The rate of tooth loss increased more with age among non-Hispanic blacks than among non-Hispanic whites and Mexican Americans. Non-hispanic blacks with diabetes suffered the greatest rate of tooth loss among the ethnic groups.

Given the study's results, there is a need to improve dental hygiene and increase awareness of the risk among patients with diabetes. The study identified specific groups and age targets that are more prone to tooth loss, which can be used as target initiatives to improving self-care. By having targeted initiatives toward patients who are older and non-Hispanic blacks to increase their knowledge on diabetes and proper dental hygiene, the risk of tooth loss can be reduced.

Overall, the study indicates that greater tooth loss has been associated with diabetes. Non-hispanic blacks with diabetes are the highest risk of tooth loss and have the highest increase in tooth loss as they age. Healthcare providers should be informed of the associated risk and education on necessary dental care and tooth retention should be promoted to patients. [1]

The cornerstone of successful periodontal treatment starts with establishing excellent oral hygiene. This includes twice-daily brushing with daily flossing. Also, the

use of an interdental brush is helpful if space between the teeth allows. For smaller spaces, products such as narrow picks with soft rubber bristles provide excellent manual cleaning. Persons with dexterity problems, such as arthritis, may find oral hygiene to be difficult and may require more frequent professional care and/or the use of a powered toothbrush. Persons with periodontitis must realize it is a chronic inflammatory disease and a lifelong regimen of excellent hygiene and professional maintenance care with a dentist/hygienist or periodontist is required to maintain affected teeth.

Removal of microbial plaque and calculus is necessary to establish periodontal health. The first step in the treatment of periodontitis involves nonsurgical cleaning below the gumline with a procedure called "root surface instrumentation" or "RSI", this causes a mechanical disturbance to the bacterial biofilm below the gumline. This procedure involves the use of specialized curettes to mechanically remove plaque and calculus from below the gumline, and may require multiple visits and local anesthesia to adequately complete. In addition to initial RSI, it may also be necessary to adjust the occlusion (bite) to prevent excessive force on teeth that have reduced bone support. Also, it may be necessary to complete any other dental needs, such as replacement of rough, plaque-retentive restorations, closure of open contacts between teeth, and any other requirements diagnosed at the initial evaluation. It is important to note that RSI is different to scaling and root planing: RSI only removes the calculus, while scaling and root planing removes the calculus as well as underlying softened dentine, which leaves behind a smooth and glassy surface, which is not a requisite for periodontal healing. Therefore, RSI is now advocated over root planing.[2]

Nonsurgical scaling and root planing are usually successful if the periodontal pockets are shallower than 4–5 mm (0.16–0.20 in). [3] The dentist or hygienist must perform a re-evaluation four to six weeks after the initial scaling and root planing, to determine if the person's oral hygiene has improved and inflammation has regressed. Probing should be avoided then, and an analysis by gingival index should determine the presence or absence of inflammation. The monthly reevaluation of periodontal therapy should involve periodontal charting as a better indication of the success of treatment, and to see if other courses of treatment can be identified. Pocket depths of greater than 5–6 mm (0.20–0.24 in) which remain after initial therapy, with bleeding upon probing, indicate continued active disease and will very likely lead to further bone loss over time. This is especially true in molar tooth sites where furcations (areas between the roots) have been exposed.

If nonsurgical therapy is found to have been unsuccessful in managing signs of disease activity, periodontal surgery may be needed to stop progressive bone loss and regenerate lost bone where possible. Many surgical approaches are used in the treatment of advanced periodontitis, including open flap debridement and osseous surgery, as well as guided tissue regeneration and bone grafting. The goal of periodontal surgery is access for definitive calculus removal and surgical management of bony irregularities which have resulted from the disease process to reduce pockets as much as possible. Long-term studies have shown, in moderate to advanced periodontitis, surgically treated cases often have less further breakdown over time and, when coupled with a regular post-treatment maintenance regimen, are successful in nearly halting tooth loss in nearly 85% of diagnosed people. [4]

Local drug deliveries in periodontology has gained acceptance and popularity compared to systemic drugs due to decreased risk in development of resistant flora and other side effects. A meta analysis of local tetracycline found improvement. Local application of statin may be useful. [5]

Once successful periodontal treatment has been completed, with or without surgery, an ongoing regimen of "periodontal maintenance" is required. This involves regular checkups and detailed cleanings every three months to prevent repopulation of periodontitis-causing microorganisms, and to closely monitor affected teeth so early treatment can be rendered if the disease recurs. Usually, periodontal disease exists due to poor plaque control, therefore if the brushing techniques are not modified, a periodontal recurrence is probable.

Most alternative "at-home" gum disease treatments involve injecting antimicrobial solutions, such as hydrogen peroxide, into periodontal pockets via slender applicators or oral irrigators. This process disrupts anaerobic micro-organism colonies and is effective at reducing infections and inflammation when used daily. A number of other products, functionally equivalent to hydrogen peroxide, are commercially available, but at substantially higher cost. However, such treatments do not address calculus formations, and so are short-lived, as anaerobic microbial colonies quickly regenerate in and around calculus.

Doxycycline may be given alongside the primary therapy of scaling (see § initial therapy). Doxycycline has been shown to improve indicators of disease progression (namely probing depth and attachment level). Its mechanism of action involves inhibition of matrix metalloproteinases (such as collagenase), which degrade

the teeth's supporting tissues (periodontium) under inflammatory conditions. To avoid killing beneficial oral microbes, only small doses of doxycycline (20 mg) are used.[6]

Dentists and dental hygienists measure periodontal disease using a device called a periodontal probe. This thin "measuring stick" is gently placed into the space between the gums and the teeth, and slipped below the gumline. If the probe can slip more than 3 mm (0.12 in) below the gumline, the person is said to have a gingival pocket if no migration of the epithelial attachment has occurred or a periodontal pocket if apical migration has occurred. This is somewhat of a misnomer, as any depth is, in essence, a pocket, which in turn is defined by its depth, i.e., a 2-mm pocket or a 6-mm pocket. However, pockets are generally accepted as self-cleansable (at home, by the person, with a toothbrush) if they are 3 mm or less in depth. This is important because if a pocket is deeper than 3 mm around the tooth, at-home care will not be sufficient to cleanse the pocket, and professional care should be sought. When the pocket depths reach 6 to 7 mm (0.24 to 0.28 in) in depth, the hand instruments and ultrasonic scalers used by the dental professionals may not reach deeply enough into the pocket to clean out the microbial plaque that causes gingival inflammation. In such a situation, the bone or the gums around that tooth should be surgically altered or it will always have inflammation which will likely result in more bone loss around that tooth. An additional way to stop the inflammation would be for the person to receive subgingival antibiotics (such as minocycline) or undergo some form of gingival surgery to access the depths of the pockets and perhaps even change the pocket depths so they become 3 mm or less in depth and can once again be properly cleaned by the person at home with his or her toothbrush.

If people have 7-mm or deeper pockets around their teeth, then they would likely risk eventual tooth loss over the years. If this periodontal condition is not identified and people remain unaware of the progressive nature of the disease, then years later, they may be surprised that some teeth will gradually become loose and may need to be extracted, sometimes due to a severe infection or even pain.

According to the Sri Lankan tea laborer study, in the absence of any oral hygiene activity, approximately 10% will suffer from severe periodontal disease with rapid loss of attachment (>2 mm/year). About 80% will suffer from moderate loss (1–2 mm/year) and the remaining 10% will not suffer any loss. [7]

Diabetes is one of the common diseases of modern times and one of the most common systemic disorder that is connected to periodontal disease¹ Periodontal diseases are bacterially induced chronic inflammatory diseases affecting the tissues surrounding and supporting the teeth. The lesion begins as gingivitis, an inflammation of the gingival tissues only, and may progress to periodontitis, where destruction of connective tissue attachment and alveolar bone can eventually lead to tooth loss. Hence based on above reported findings the present study was planned for study of prevalence of Tooth Loss in Patients Suffered from Diabetes from Bihar Region.

Methodology:

The present study was planned in Department of Dentistry, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar. Total 100 cases were enrolled in the present study. In the enrolled patients 50 cases were Diabetic cases and 50 cases were non-diabetic cases.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: T2DM patients with age between 18 years and 65 years.

Exclusion Criteria: Smokers and those consuming chewable tobacco. Subjects with less than 20 teeth were excluded. This was to ensure that patients had sufficient teeth on which to assess periodontal health. Systemic conditions affecting periodontal tissues other than T2DM like haemolytic anaemia, HIV infection, etc. Medications with side effects shown to affect periodontal tissues like anticonvulsants (Phenytoin, phenobarbitone, valproate), calcium channel blockers (amlodipine, verapamil), and immunosuppressants (Cyclosporine). Pregnant subjects.

Results & Discussion:

Individuals with poorly controlled diabetes have also been found to be more susceptible to oral infections including the [8] periodontitis being its 6 complication. It has been reported that subjects with diabetes have a greater prevalence and severity of periodontal disease compared with subjects without diabetes in all age [9] groups.

In these subjects, diabetes also increases the progression [10] of bone loss and attachment loss over time. There have been various studies which have demonstrated a bidirectional relationship between periodontal disease

[11-13] and diabetes. The relationship between oral diseases and type 2 diabetes has become a recent focus of attention among health care professionals because of substantial evidence supporting the role of diabetes and poor glycemic control as important risk factors for [14] periodontal disease. Furthermore, it appears that periodontal diseases can contribute to poorer glycemic control in people with diabetes and that treating periodontal infections could have a beneficial effect on [15] glycemic control in either type 1 or type 2 diabetes. Additionally, there is growing evidence that clinical practitioners should incorporate education concerning the risk of periodontal disease into the management regimens of their patients with diabetes.

It is also important to communicate with physicians and others involved in diabetes care about the importance of referring patients [16] with diabetes for thorough oral health evaluations. Thus, medical practitioners should also possess basic dental knowledge to uncover signs and symptoms of dental diseases from patients, to provide appropriate treatment or advice to these patients and to act as public health [17] educators.

According to many researches, there were no statistically significant differences in the frequency of dental caries between diabetic and healthy persons. [18] Tooth loss is an inevitable result of periodontal disease, so it remains a problem that is difficult to control. [19] Prevalence of periodontal disease increases with age. Destructive features are more common among diabetics. The studies of Bacic et al [3] showed the number of extracted teeth to be significantly greater in the group of diabetics than in the control group. Also, the prevalence of periodontal disease and the need of dental treatment among the diabetics are significantly higher. According to the World Health Organization (WHO) criteria, by the age of 34, teeth are usually extracted for caries, and later because of periodontal disease. [20]

Table 1: Comparison of Clinical Findings

Cases of	Diabetic Patients	Non-Diabetic Patients
Total No. of Cases	50	50
Males	32	34
Females	8	16
Age Group:		
25 -35 years	7	5
35 – 45 years	15	21
45 – 55 years	18	16
Above 55 years	10	8

Table 2: Periodontal status

Cases of	Diabetic Patients	Non-Diabetic Patients
Presence of painful Gums	12	4
Presence of Gingival swelling	28	5
Extraction of teeth because of periodontal reasons	18	3

Table 3: No. of missing Teeth

Cases of	Diabetic Patients	Control Patients
No. of Missing Tooth		
25 -35 years	2 – 3	1 – 2
35 – 45 years	4 – 5	2 - 3
45 – 55 years	7 – 8	3 - 4
Above 55 years	8 – 11	4 - 6

Sheridan et al. found that the presence of plaque, calculus, pocket formation, increased tooth mobility and tooth loss occurred with greater frequency in patients with decreased glucose tolerance. [21]

Orbak et al. suggest that type 1 DM plays a significant role for dentition and oral health in children and adolescents. The children with type 1 DM are more likely to experience infections in connective tissues than children without type 1 DM. This is due to the fact that for children with type 1 DM, infection leads to loss of teeth. [22]

Twetman et al. demonstrated that diabetes with poor metabolic control developed three times more lesions during the study period than those with better metabolic control which was in accordance with our study, where increased blood sugar levels caused increased SM counts and were statistically significant ($P < 0.05$). [23]

Miko et al. found from their study that poor glycaemic control and the early onset of DM may increase the risk of dental caries, but appropriate oral hygiene together with satisfactory metabolic control may prevent the development of dental caries in adolescents with type 1 DM. According to their study, studied individuals had fewer decayed and more filled teeth. [24]

Sri Kenneth et al. found from their study that decreased salivary pH and an increased incidence of dental caries was observed in participants with uncontrolled diabetes as compared to control group. [25]

The mechanisms of diabetes correlation with periodontitis primarily involve vascular changes, then neutrophilic dysfunction, impaired collagen synthesis and genetic predisposition. It is known that diabetes induces vascular changes in all tissues, including capillaries of

periodontal structures. Gingival capillaries undergo basal membrane thickening. However other pathologic changes such as membrane disruption, intramembraneous presence of collagen and edematous endothelium may also be observed. These changes have been postulated to impair oxygen expansion, leukocyte migration and immune factor activities, thus contributing to the progression of periodontitis and tooth loss by disordered microcirculation in diabetics. [26]

The reduction in defense mechanisms and the increased susceptibility to infection in diabetic patients especially those with poor glycemic control through accumulation of high levels of advanced glycation end products (AGEs) in periodontium which increase the intensity of the immune inflammatory response to periodontal pathogens and the interaction between AGEs and their receptors on inflammatory cells (monocytes & macrophages) increased production of proinflammatory cytokines such as (Interleukin 1beta), tumor necrosis factor alpha, [27] hence AGEs when deposited on polymorphonuclear leukocytes (PMNs), they inhibit their chemotactic, phagocytic capacities and adherence so permitting the advance gram negative anaerobic bacteria which are more pathogenic in nature (*PorphyromonasGingivalis*, *Campylobacter* species and *AggregatibacterActinomycetemComitans*) will become dominate. [28]

Diabetes with defective neutrophil apoptosis result in increased retention of PMNs within the periodontal tissues which contribute to tissue destruction by non-specific increased release of matrix metalloproteinases (MMPs) and reactive oxygen species providing a further mechanism for increased susceptibility to PD progression, [29] also the collagen that is produced by fibroblast in high glucose environment is susceptible to rapid degradation by MMPs enzymes with decreased collagen turn over(3).A variety of changes have been described in periodontium of diabetic patients, including a tendency toward enlarged gingiva, polypoid gingival proliferations and periodontitis(1), thus they have greater prevalence and extent of periodontal pockets [30] and twice as likely to exhibit clinical attachment loss as non-diabetic patients.

Conclusion:

The data generated from the present study concludes that periodontal diseases increase in diabetes group than in control group. Thus, a diabetic patient should always see that he/she maintains his/her oral hygiene by following proper toothbrushing habits. Diabetics should take care to see that they get their teeth restored as early as possible, if decayed. They should follow the

instructions given by the physician or the dietician for the intake of non-cariogenic diet.

The prevention of periodontal breakdown in diabetic patients is mostly based on the education of the individual. Thus, diabetic patients should be well informed about the importance of oral health and should be encouraged for routine dental check up at regular interval.

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