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CLINICAL EVALUATION OF THE TOOTH LOSS IN PERIODONTAL DISEASE IN DIABETIC PATIENTS

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Abstract
Help in detecting diabetes may come from an unlikely source like a dentist as an allied health team, as it is rightly said 'oral cavity is the mirror of the body system'. They may diagnose undetected cases of diabetes and may refer to a physician for further evaluation and treatment. Research studies have found a link between periodontal (gum) disease and diabetes. Symptoms of the disease often appear in the mouth, while almost one-third of people with diabetes have severe periodontal disease. This is believed to be a result of the diabetic patient's greater susceptibility to developing infections. Conversely, severe periodontal disease may increase the risk of developing diabetes, and may make it more difficult to manage blood sugar levels. However, studies have found that patients who receive treatment for periodontal disease may be able to control the condition with less insulin. Dentists often detect symptoms of diabetes during routine oral health examinations. Foamy saliva, unusually dry and irritated tissue, poor periodontal conditions inside the mouth are tell-tale signs of the condition. And, diabetic patients often lose more teeth compared to patients without the disease. Proper and effective management of patients with diabetes requires that the practice evaluate all aspects of patient interaction. Systems need to be customized so that all procedures and patient communication scripts are implemented consistently to meet the distinct needs of patients with diabetes. Hence based on above findings the present study was planned for clinical evaluation of the tooth loss in periodontal disease in diabetic patients.
The present study was planned in Department of Public Health Dentistry, Buddha Institute of Dental Sciences, Patna ,Bihar for a period of six months from January 2019 to June 2019. Total 40 patients were evaluated during this period . Out of that 20 cases are of Diabetic patients were enrolled in first group and another second group consist of 20 control patients without any diseases.
The data generated from the present study concludes that there is significant difference in teeth loss amongst diabetics and non-diabetics. People with diabetes should be aware about the periodontal complications associated with it and should go for regular dental visits. Therefore it is the need of the hour to educate the dentists, general physicians and specialists about the association of systemic diseases with oral health and vice versa as many of the systemic diseases may be prevented and improved by improving oral hygiene.
Keywords: Tooth Loss, Periodontal Disease, Diabetic Patients, etc.

Introduction

Periodontal disease, also known as gum disease, is a set of inflammatory conditions affecting the tissues surrounding the teeth. In its early stage, called gingivitis, the gums become swollen, red, and may bleed. In its more serious form, called periodontitis, the gums can pull away from the tooth, bone can be lost, and the teeth may loosen or fall out. Bad breath may also occur. Periodontal disease is generally due to bacteria in the mouth infecting the tissue around the teeth. Risk factors include smoking, diabetes, HIV/AIDS, family history, and certain medications. Diagnosis is by inspecting the gum tissue around the teeth both visually and with a probe and X-rays looking for bone loss around the teeth. [1]

Treatment involves good oral hygiene and regular professional teeth cleaning. Recommended oral hygiene include daily brushing and flossing. In certain cases antibiotics or dental surgery may be recommended. Globally 538 million people were estimated to be affected in 2015. In the United States nearly half of those over the age of 30 are affected to some degree, and about 70% of those over 65 have the condition. Males are affected more often than females. [2] Periodontitis is an inflammation of the periodontium, i.e., the tissues that support the teeth. The periodontium consists of four tissues: gingiva, or gum tissue, cementum, or outer layer of the roots of teeth, alveolar bone, or the bony sockets into which the teeth are anchored and periodontal ligaments

(PDLs), which are the connective tissue fibers that run between the cementum and the alveolar bone.

The primary cause of gingivitis is poor or ineffective oral hygiene, which leads to the accumulation of a mycotic and bacterial matrix at the gum line, called dental plaque. Other contributors are poor nutrition and underlying medical issues such as diabetes. Diabetics must be meticulous with their homecare to control periodontal disease. New finger prick tests have been approved by the Food and Drug Administration in the US, and are being used in dental offices to identify and screen people for possible contributory causes of gum disease, such as diabetes. In some people, gingivitis progresses to periodontitis – with the destruction of the gingival fibers, the gum tissues separate from the tooth and deepened sulcus, called a periodontal pocket. Subgingival microorganisms (those that exist under the gum line) colonize the periodontal pockets and cause further inflammation in the gum tissues and progressive bone loss. Examples of secondary causes are those things that, by definition, cause microbic plaque accumulation, such as restoration overhangs and root proximity.

Smoking is another factor that increases the occurrence of periodontitis, directly or indirectly, and may interfere with or adversely affect its treatment. It is arguably the most important environmental risk factor for periodontitis. Research has shown that smokers have more bone loss, attachment loss and tooth loss compared to non-smokers. The reason for this is that smoking has several effects on the immune response including: Decreased wound healing; Suppresses antibody production; It reduces neutrophilic phagocytosis [3] Ehlers–Danlos syndrome is a periodontitis risk factor and so is the Papillon–Lefèvre syndrome also known as palmoplantar keratoderma.

If left undisturbed, microbial plaque calcifies to form calculus, which is commonly called tartar. Calculus above and below the gum line must be removed completely by the dental hygienist or dentist to treat gingivitis and periodontitis. Although the primary cause of both gingivitis and periodontitis is the microbial plaque that adheres to the tooth surfaces, there are many other modifying factors. A very strong risk factor is one's genetic susceptibility. Several conditions and diseases, including Down syndrome, diabetes, and other diseases that affect one's resistance to infection, also increase susceptibility to periodontitis.

Another factor that makes periodontitis a difficult disease to study is that human host response can also affect the alveolar bone resorption. Host response to the bacterial-mycotic insult is mainly determined by genetics; however, immune development may play some role in susceptibility. According to some researchers periodontitis may be associated with higher stress. Periodontitis occurs more often in people from the lower end of the socioeconomic scale than people from the upper end of the socioeconomic scale. [4]

Genetics appear to play a role in determining the risk for periodontitis. It is believed genetics could explain why some people with good plaque control have advanced periodontitis, whilst some others with poor oral hygiene are free from the disease. Genetic factors which could modify the risk of a person developing periodontitis include:

- Defects of Phagocytosis: person may have hypo-responsive phagocytes.
- Hyper-production of interleukins, prostaglandins and cytokines. This results in a massively exaggerated immune response.
- Interleukin 1 (IL-1) gene polymorphism: people with this polymorphism produce more IL-1, and subsequently are more at risk of developing chronic periodontitis.

Diabetes appears to exacerbates the onset, progression, and severity of periodontitis.[Although the majority of research has focused on type 2 diabetes, type 1 diabetes appears to have an identical effect on the risk for periodontitis. The extent of the increased risk of periodontitis is dependent on the level of glycaemic control. Therefore, in well managed diabetes there seems to be a small effect of diabetes on the risk for periodontitis. However, the risk increases exponentially as glycaemic control worsens. Overall, the increased risk of periodontitis in diabetics is estimated to be between two and three times higher. So far, the mechanisms underlying the link are not fully understood, but it is known to involve aspects of inflammation, immune functioning, neutrophil activity, and cytokine biology. [5]

As dental plaque or biofilm accumulates on the teeth near and below the gums that is some dysbiosis of the normal oral microbiome. As of 2017 it was not certain what species were most responsible for

causing harm, but gram-negative anaerobic bacteria, spirochetes, and viruses have been suggested; in individual people it is sometimes clear that one or more species is driving disease. Research in 2004 indicated three species gram negative anaerobic species: Actinobacillus actinomycetemcomitans, Porphyromonas gingivalis, Bacteroides forsythus and Eikenella corrodens. [6]

Plaque may be soft and uncalcified, hard and calcified, or both; for plaques that are on teeth the calcium comes from saliva; for plaques below the gumline, it comes from blood via oozing of inflamed gums. The damage to teeth and gums comes from the immune system as it attempts to destroy the microbes that are disrupting the normal symbiosis between the oral tissues and the oral microbe community. As in other tissues, Langerhans cells in the epithelium take up antigens from the microbes, and present them to the immune system, leading to movement of white blood cells into the affected tissues. This process in turn activates osteoclasts which begin to destroy bone, and it activates matrix metalloproteinases that destroy ligaments. So, in summary, it is bacteria which initiate the disease, but key destructive events are brought about by the exaggerated response from the host's immune system. [6]

Diabetes mellitus is a chronic metabolic disorder can harm the eyes, nerves, kidneys, heart and many other bodily organs. It also badly affects the gums and other mouth tissues. Diabetes that is not properly controlled can lead to periodontal (gum) diseases in both young and old people. Periodontal diseases are infections of the gums and bone that hold the teeth in place. Most people think of gum disease, or periodontal disease, as an infection localised in the oral cavity with tissue destruction confined to the mouth. However, a lot of research provides evidence that there is a link between oral infections, such as periodontal disease, to whole body damage. The strongest evidence of the link relates to diabetes and periodontal disease. Periodontitis has been referred to as the sixth complication of diabetes. People with diabetes have a higher than normal risk of periodontal diseases. On the other hand, gum disease can often be the first sign of diabetes. So, diabetes and gum disease are strongly connected.

Periodontal diseases are caused by dental plaque (colorless soft sticky film of saliva, food particles and bacteria which forms on your teeth). The bacteria present in the plaque produce toxic substances that cause inflammation of gums. If the plaque is not removed regularly, it hardens to form dental calculus or tartar [hard, rough and usually yellow or brown in colour]. The hard surface of the calculus makes it even easier to trap more dental plaque. The sustained deposition of plaque leads to swelling of gums and destruction of surrounding bone and other tissues supporting the teeth. Soon, a hole or pocket develops between the tooth and the gums. Severe periodontitis can lead to loss of tooth.

Although the vicious cycle starts with the accumulation of plaque [most common cause of periodontal disease], a number of other factors can contribute to or aggravate the condition. These include: tobacco use, drugs, hormonal changes, nutritional deficiency, illnesses, stress and diabetes.

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.

Individuals with diabetes are prone to many infections, including gum infections. But the relationship between diabetes and periodontal disease doesn't end there. Once periodontal disease is established in a diabetic patient, glycemic control or blood sugar level of diabetes is complicated. Chronic Periodontitis impairs the body's ability to utilise insulin [insulin resistance]. Insulin resistance makes it difficult to achieve and sustain optimal glycemic control resulting in hyperglycemia. Poor glycemic control causes increased susceptibility to re-infection and more severe periodontal disease. That is why the relationship between diabetes and periodontal disease is sometimes referred to as a two-way path. Severe periodontal disease makes chewing painful or difficult, leading the diabetic individuals to select foods that are easier to chew but that may be dietetically inappropriate. Thus prevention and control of periodontal disease just like optimal glycemic control is essential in the medical management of diabetes. [7]

Help in detecting diabetes may come from an unlikely source like a dentist as an allied health team, as it is rightly said 'oral cavity is the mirror of the body system'. They may diagnose undetected cases of diabetes and may refer to a physician for further evaluation and treatment. Research studies have found a link between periodontal (gum) disease and diabetes. Symptoms of the disease often appear in the mouth, while almost one-third of people with diabetes have severe periodontal disease. This is believed to be a result of the diabetic patient's greater susceptibility to developing infections. Conversely, severe periodontal disease may increase the risk of developing diabetes, and may make it more difficult to manage blood sugar levels. However, studies have found that patients who receive treatment for periodontal disease may be able to control the condition with less insulin. Dentists often detect symptoms of diabetes during routine oral health examinations. Foamy saliva, unusually dry and irritated tissue, poor periodontal conditions inside the mouth are tell-tale signs of the condition. And, diabetic patients often lose more teeth compared to patients without the disease. Proper and effective management of patients with diabetes requires that the practice evaluate all aspects of patient interaction. Systems need to be customized so that all procedures and patient communication scripts are implemented consistently to meet the distinct needs of patients with diabetes. [8-10] Hence based on above findings the present study was planned for clinical evaluation of the tooth loss in periodontal disease in diabetic patients.

Methodology:

The present study was planned in Department of Public Health Dentistry, Buddha Institute of Dental Sciences, Patna, Bihar, India, for a period of six months from January 2019 to June 2019. Total 40 patients were evaluated during this period in the present study. Out of that 20 cases are of Diabetic patients were enrolled in first group and another second group consist of 20 control patients without any diseases.

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: Cases of Diabetic patients

Exclusion Criteria: Cases diagnosed with another complication and not willing to participate in the study.

Results & Discussion:

Diabetes is one of the important risk factors for periodontal disease. Diabetic patients get their teeth extracted due to periodontal problems. In a study conducted by Ogunbodede et al. [11] , the female: male ratio was positive, indicating more number of females are involved as compared to males. In a similar study conducted by Chinenye et al. [12], the male to female ratio of diabetic subjects in their study was 2:1. But in various other studies, the male to female ratio was 1:1. [13-16] As per the WHO criteria, if fasting blood glucose is between 100 mg/dl-125 mg/dl, it is regarded as pre diabetic stage. If it is above 126 mg/dl is diabetes mellitus. A post prandial blood glucose levels below 140 mg/dl is considered normal. Levels above 200 mg/dl is indicative of type 2 diabetes mellitus. In a study

conducted by Ochao et al, at Columbia there were 47.4% diabetic subjects who had increased number of missing teeth and suffered from gingival disease in the past. [17] As per the World Health organization, teeth extraction below the age of 34 is generally due to caries and extractions above the age of 34 are mostly due to periodontal reasons. In a study conducted in the Irish population, as age and duration of diabetes increase, the number of teeth extracted also increases. [18]

In this study, the periodontal health of diabetics was studied versus a control of patients attending a specialized periodontal department. However a positive association in the results between the test and control group in this study may support that, diabetic patients are at high risk for periodontitis. This is because diabetic patients were not compared with healthy controls, but with patients attending for periodontal treatment. This fact indicates that, the control patients suffered a periodontal problem which enforces them to seek treatment, while the test group did not complain of any periodontal problem. All participants had been to dentist before, but had visited mostly for extraction of teeth which support the suggestion that diabetics' tendency towards edentulism is high.

The mechanisms of diabetes correlation with periodontitis primarily involves vascular changes, then neutrophilic dysfunction, impaired collagen synthesis and genetic predisposition. It is known that diabetes induces vascular changes in all tissues, including capillairies 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. [19]

According to oliver et al [19] ,Diabetics who maintained reasonably good metabolic control had not lost more teeth or experienced more periodontal attachment loss than nondiabetics, although they had more periodontal pockets. Poorly-controlled diabetics with extensive calculus on their teeth had more periodontitis and tooth loss than well-controlled diabetics or nondiabetics. Long-duration diabetics were also at greater risk for periodontitis. Another study by terrovan et al showed periodontal pockets decreased with good glycemic control.. J Indian Soc Periodontol. 2010 Oct;14 (4):207-12. [20] Diabetes and periodontitis Lee et al [21] showed that Intensive oral hygiene care can persistently improve oral inflammation status and could slow periodontal deterioration. It is concluded that inadequate metabolic control, dental hygiene, and long standing diabetes can increase the risk of periodontitis as well as tooth loss. On the other hand, diabetics who regularly control their disease and oral health through self-care and regular dental and professional care, have a lower risk of tooth loss.

A survey conducted in Northern India by Singh et al. [22] regarding the taking of case history by 700 private dental practitioners before starting dental treatment showed that 71 % of the practitioners took the case history orally while 23 % took the history in a record and only 19.2 % maintained the record. It is reported by Zarb GA et al. [23] that both new and returning patients require complete history taking and dentists must be aware of the patient's general health and conditions that might influence the choice of the treatment and help avoid complications. The findings of the above survey are however contrary to this. It is emphasized that history-taking and patient record maintenance should not be overlooked by the clinician and be integrated in day-to-day clinical practice.

Table 1: Comparison of Clinical Findings

Groups	Diabetic Patients	Normal Patients
Sex		
Males	13	11
Females	7	9
Age Group:		
21 - 30 years	3	2
31 – 40 years	6	4
41 – 50 years	5	8
Above 51 years	3	6

Table 2: Periodontal status

Groups	Diabetic Patients	Normal Patients
Presence of painful Gums	18	8
Presence of Gingival swelling	14	5
Extraction of teeth because of periodontal reasons	6	2

Table 3: No. of missing Tooths

Group	Diabetic Patients	Normal Patients
No. of Missing Tooth		
21 - 30 years	2 – 3	1 – 2
31 – 40 years	2 – 5	2 - 3
41 – 50 years	3 – 7	2 - 4
Above 51 years	5 – 10	3 - 6

Cerda et al. [24] and Firatli et al. [25] had concluded that the duration of diabetes was a significant factor for the severity of periodontal disease. Emrich et al. [26] stated that the diabetic status was significantly and strongly related to both prevalence and severity of periodontal disease. From the present study also, it can be speculated that poorer the control and longer the duration of diabetes, the greater will be the prevalence and severity of periodontal disease. Karjalainen and Knuuttila [27] had suggested that hyperglycemia impairs overall cell function, as insulin is required for glucose to enter cells to provide a source of energy. It also decreases PMN cell chemotaxis, phagocytosis and intracellular killing of bacteria. The ability of glycosylated hemoglobin to carry oxygen would be impaired, thereby decreasing tissue oxygenation. Hyperglycemia induces blood flow abnormalities including increased blood viscosity, reduced erythrocyte deformability, and increased platelet aggregation, which further enhance tissue hypoxia. All these factors result in increased periodontal destruction.

In cases of increased blood glucose levels, periodontal tissue is unable to carry its reparative function leading to formation of periodontal pockets and eventually loss of tooth. Patients with diabetes should get their blood sugar levels regularly checked and they should also visit dentist for regular oral health evaluation so that teeth loss due to periodontal disease can be avoided. [28]

The susceptibility to periodontal disease is the most common oral complication of diabetes [29]. Although primarily related to the presence of dental plaque, periodontitis appears to be related to several pathological events associated with diabetes [30–32]. There is evidence that management of periodontal infections in patients with poorly controlled diabetes may actually help improve glycemic control [33]. Tooth loss is an inevitable result of periodontal disease [34, 35]. A study by Kapp reported that the number of missing teeth was significantly higher in patients with DM than the controls, although the suggested reason was the lack of oral health awareness and inadequate metabolic control [36]. Furthermore, because poorly controlled diabetes leads to significant morbidity and mortality, dentists can counsel their patients about improving glucose regulation, maintaining oral and nutritional health, performing daily glucose monitoring tests and seeing medical professionals for routine care [11]. Hence, type 2 diabetes and tooth loss act as chronic morbidity factors affecting the overall general health of the elderly.

Conclusion:

The data generated from the present study concludes that there is significant difference in teeth loss amongst diabetics and non-diabetics. People with diabetes should be aware about the periodontal complications associated with it and should go for regular dental visits. Therefore it is the need of the hour to educate the dentists, general physicians and specialists about the association of systemic diseases with oral health and vice versa as many of the systemic diseases may be prevented and improved by improving oral hygiene.

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