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Success of Dental Implants Towards Diabetes Mellitus Patients – A Review

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ABSTRACT

In recent times, the rising global prevalence of diabetes has emerged as a notable societal worry. Among individuals with diabetes, persistent hyperglycemia over the long term has the potential to impact the human body system. Diabetes has been recognized for its negative impact on oral rehabilitation. specifically affecting the process and outcomes of dental implant procedures. Since 1990, there have been extensive studies conducted and published concerning osseointegration and the outlook for dental implants among individuals with diabetes. Diabetes on dental implant success has been comprehensively examined in this research, and variables that might enhance osseointegration. Research indicates that dental implants can remain viable in diabetic patients. Implant failure rates are significant, according to research on diabetic animals and the literature. Even in individuals with moderately uncontrolled diabetes, most clinical investigations show that the dental implants failure is statistically negligible. The clinical outcomes of implants in diabetic patients seems to be comparable to that of those without diabetes when appropriate treatment planning, preventative measures, and post-operative care are taken.

Keywords: *Dental implants, Diabetes mellitus, Implant survival*

1. INTRODUCTION

Diabetes Mellitus (DM) is an escalating global issue, affecting more than 400 million individuals worldwide. DM impacts people of all ages, genders, and regions, ranking among the leading causes of death and illness globally. Further, the American Diabetes Association (ADA) states that Glycated Haemoglobin (HbA1c) levels exceeding 6.5% signify diabetes mellitus (DM), HbA1c range of 5.7% to 6.4% is considered indicative of pre-diabetes (pre-DM) and levels below 5.6% suggest a non-diabetic status. DM is a metabolic disorder with diverse causes. Key indicators of diabetes mellitus consist of increased urinary frequency, persistent thirst, and a noticeable drop in body weight. In DM, the body has elevated blood glucose levels, referred to as hyperglycaemia, and experiences disruptions in the metabolic fate of carbohydrates, proteins, and fats in the body due to insufficient insulin secretion. Over time, DM can impact multiple organs, leading to serious health complications categorized into microvascular and macro vascular types. These complications are given in Table 1. Table 1 Complications of DM

Sl.No.	Microvascular	Macrovascular
1.	Neuropathy	Cardiovascular diseases
2.	Nephropathy	Cerebrovascular disease
3.	Retinopathy	Periodontal diseases
4.	-	Peripheral vascular diseases

According to Table I, periodontal disease ranks as the sixth complication linked with DM.[1] In individuals with diabetes, fundamental alterations in the periodontium include tissue breakdown and the development of calcified deposits surrounding the small blood vessels within the gingiva. These pathological changes contribute to significant attachment loss, marked alveolar bone destruction, rise in bleeding upon probing, and greater mobile tooth, which may eventually result in tooth loss. Recently, dental implants have garnered widespread recognition as a successful means of replacing missing teeth, offering patients improved functionality and aesthetic benefits. Prosthodontic rehabilitation efforts are notably impacted by DM. Moreover, the dental implant process poses certain risks for diabetic patients due to complications linked to gingival and alveolar bone issues. Although DM is often viewed as a negative outcome for dental implant therapy, meticulous case assessment and carefully planned treatment approaches play pivotal roles in ensuring successful outcomes for dental implants.

As a result, there has been a significant increase in both clinical and research interest in assessing the success and reliability of dental implants. They are now widely considered a viable treatment option for patients with diabetes mellitus (DM). This heightened focus has encouraged additional investigations into how dental implants perform in diabetic populations. Still, systemic factors such as diabetes can affect both the effectiveness and durability of implant therapy affecting the success of dental implant procedures. This review examines into the intricate interplay between DM and dental implants. To analyse the scientific studies to pinpoint factors contributing to favourable outcomes and potential obstacles that could lead to failures within this specific patient demographic.

2. METHODOLOGY

A structured method was used to collect and assess evidence concerning implant treatment outcomes in patients with varying levels of glycaemic control. The review was structured using the PICO (Population, Intervention, Comparison, Outcome) framework. In this context, the population consists of diabetic patients, the intervention refers to dental implant placement, the comparison group includes non-diabetic individuals, and the outcome assessed is the rate of successful dental implant integration. A typical narrative of relevant research was also used to provide an outline of possible advantages of implant techniques as well as the hazards associated with hyperglycemia on bone metabolism, which are crucial to implant success. The next section describes the search strategies.

Search Strategies

A search was conducted in the MEDLINE (PubMED) database up to and including June 2023 and February 2024 to find articles published in dental literature. The search strategy utilized was: (dental implants OR oral implants) AND (diabetes OR diabetic). The search was restricted to “human” studies. The following terms were included in the search strategies: dental implants AND diabetes mellitus, trans gingival implant AND diabetes Mellitus, maxillary augmentation AND diabetes mellitus, mandibular augmentation AND diabetes mellitus, dental implant AND prediabetes, trans gingival implant AND prediabetes, full mouth implants AND diabetic patients, dental implant AND success rate, and diabetes mellitus AND nondiabetic millions.

Data collection

The collected data comprised of various study attributes, including the author's name, study year, research design, patient count, baseline features, implant count, participants' average age, type of implant system employed, and implant material used. "The reviewed articles all included implant performance results, indicating both successful and unsuccessful cases. The specific criteria for study selection are shown in Table 2.

Table 2. Criteria for Participant Selection

INCLUSION	EXCLUSION
Older than 18-year-old patients	Patients younger than 18 years of age.
Included study types ranged from cross-sectional and cohort studies to case series, along with retrospective and prospective clinical investigations, both observational and interventional in nature.	Case reports that involve fewer than ten patients. In vitro research studies, technical reports, and animal studies were excluded.
Clinical human studies that provided data on implant outcomes in both diabetic and non-diabetic individuals who underwent dental implant rehabilitation.	Research articles with an observation period under six months or published in languages other than English were not considered.
Commercially pure titanium implants.	Research that failed to report the quantity of implants placed.

3. CLASSIFICATION OF DM

High blood glucose levels are a common trait shared by all types of DM. Nonetheless, the causes, background, pathogenesis, and treatment approaches differ among diabetes classifications. Each type of DM should exhibit distinct and unique characteristics. Insulin resistance is linked to disruptions in lipid and protein metabolism, along with abnormalities in minerals and electrolytes.[3]

Table 4 Classifications of DM

TYPE – 1	TYPE -2
The condition is also referred to as juvenile onset diabetes or insulin-dependent diabetes.	This is also called adult-onset diabetes or non-insulin-dependent diabetes.
It arises from autoimmune destruction of β-cells, which usually stops them from making insulin completely.	It develops from a progressive reduction in insulin production by β-cells, frequently occurring in the context of insulin resistance.
The process resulted in lower levels of bone mineral density and osteogenesis, along with heightened bone resorption activity.	Despite the rise in bone mineral density, the likelihood of bone fractures remained high.

This type of DM usually appears early in an individual's life.	It is the predominant type of diabetes mellitus, frequently linked to lifestyle variables like obesity, sedentary behavior, and hereditary susceptibility.
Management includes need continuous insulin treatment to sustain life.	Management includes lifestyle modifications, oral anti-diabetic medications, and in some cases insulin therap.[3,4]

4. DM AND PERIODONTAL DISEASE

There is a strong and well-documented link between diabetes mellitus (DM) and periodontal health complications. Individuals diagnosed with DM face nearly a threefold increase in the likelihood of developing gum-related disorders compared to non-diabetics. This heightened vulnerability is significantly influenced by the level of blood sugar regulation. Findings from the Third National Health and Nutrition Examination Survey (NHANES III) reveal that adults with HbA1c values exceeding 9% experience a substantially greater incidence of advanced periodontal issues.[4]

DM compromises the immune response, rendering individuals more susceptible to infections, particularly those affecting the tissues surrounding the teeth. Among Pima Indians with type 2 DM, the occurrence and frequency of periodontitis were found to be higher compared to those without DM, indicating a threefold rise in the risk of periodontitis.[5] While much research has concentrated on identifying type 2 DM as a cause to periodontitis, historically, both conditions have commonly manifested during their 40s and 50s. A study revealed that around Ten percent of children under 18 years of age with insulin dependent diabetes mellitus exhibited more pronounced periodontal attachment loss and bone degradation similar to control groups, despite similar plaque levels.[6] Dentists have long recognized the importance of figuring out that their patients have diabetes, understanding the correlation between various oral conditions such as dry mouth (xerostomia), oral fungal infections (candidiasis), and periodontitis with diabetes.

5. DENTAL IMPLANTS FOR DIABETIC PATIENTS

Implants offer optimal support for dental prostheses in edentulous patients. A key determinant of dental implant success is osseointegration, which can be influenced by impaired vascular supply and altered bone metabolism in diabetic patients. Various systemic factors can hinder the success of dental implant treatments, with DM being the most. While DM is considered a relative contraindication, it is not an absolute one. In this context, we will find out how long tooth implants last in people with diabetes. Once the implant is placed, the most critical event is achieving effective Osseo integration.

However, recent studies indicate that successful osseo integration can be achieved with proper diabetes management and careful surgical techniques. Approaches like optimizing glycaemic control, preoperative bone quality assessments, and advanced implant surface technologies shown to improve Osseointegration outcomes in diabetic patients. Progress in dental implant procedures has led to increased research on their success rates in individuals with DM. Despite challenges such as retarded wound healing and a higher susceptibility to infections, numerous studies report favourable outcomes for diabetic patients undergoing dental implant treatments.

DM AND OSSEOINTEFRATION

“The process of osseointegration makes a direct structural and functional link between healthy, live bone and the surface of load-bearing devices.” This process encompasses both osseous healing and bone remodelling, which are crucial for ensuring implant stability and survival without inflammation.[7] In a retrospective case-control study involving 257 individuals—121 with DM and 136 without—an HbA1c level below 8% defined well-controlled diabetes. During the osseointegration period, implant failure occurred in 17 cases (4.5%) within the diabetic cohort and 16 cases (4.4%) in the non-diabetic group. [8] When considering immediate or early placement of prosthetic restorations, it is essential to ensure that the implants demonstrate sufficient primary stability, achieve successful integration with the surrounding bone, and maintain healthy peri-implant tissues. In one retrospective study involving 108 diabetic individuals, the survival rate of immediately loaded implants was found to be equivalent to that of implants loaded after a three-month healing period. Remarkably, both groups achieved a 100% survival rate. In a clinical study, diabetic participants based on their HbA1c levels: one ranging from 6.1% to 8% and the other from 8.1% to 10%. These groups were compared with a non-diabetic control group exhibiting HbA1c levels below 6%. As anticipated, implant survival was observed in 100% of individuals within the control group and the moderate glycaemic group (6.1–8%). However, in the higher HbA1c group (8.1–10%), the implant survival rate dropped slightly to 95.4%. [9,10] Regarding individuals with prediabetes, another study reported that osseointegration and implant healing outcomes.[11]

DM AND IMPLANT SURVIVAL

The parameters on the relationship between diabetes and implant survival show variability. Six studies revealed that diabetes did not adversely affect outcomes, demonstrating a 100% survival rate for diabetic patients. There is no significant difference between DM and non-DM patients. Stephen F. Balshi et al(2007),[12] Turkyilmaz(2010),[13] Emad Agamy(2016),[14] Antonio

Aguilar Salvatierra et al(2016),[15] Raluca Ialia Juncar et al(2019),[16] Henry J.A. Meijer et al(2020).[17]

Investigator/year of the study	Inferences
Harold F et al/2000 [18]	The mortality rates for shorter implants were statistically lower than those for longer implants. It was also found that implants with a diameter of 3+ mm were less solid and had lower mortality rates than 4+ mm. However, there wasn't a big change in the amount of crystal bone loss between the two implant sizes from when they were put in to when they were taken out.
Farzad et al/2002 [19]	After a year, they found that the 38 implant-supported bridges they gave to 25 diabetes patients (136 implants) worked 94.1% of the time. They concluded that people with diabetes who get tooth implants do not have a higher failure rate than non-daibetic.
Peled et al/2003[20]	The study's findings show that 41 people with well-controlled type 2 diabetes were given 141 devices to hold their overdentures in place. One year after loading, 97.3% of the times it worked, and 94.1% of the times it worked five years after loading.
Balshi et al/ 2007[21]	18 implants were put in a diabetic 71-year-old patient, and then a screw-retained fixed replacement was put in right away. After 2.5 years, they said that all of the implants were still working.
Tawil et al/2008[22]	Forty-five people with controlled type 2 diabetes and 45 people who did not have diabetes each got 255 implants. After being followed up on for 1 to 12 years, 97.2% of people with DM and 98.8% of people without DM were still alive.
Turkyilmaz/2010[23]	After one year, we looked at the outcomes of 23 implants that were put in 10 people with type 2 diabetes that was well controlled. The patients were given fixed tooth implants and overdentures that were held in place with cement or screws. At the follow-up after one year, all the implants had worked.
Oates and Vargas/2012[24]	One hundred people with HbA1c levels above 12% rated success of tooth implants in people with high glucose levels. Controlling blood sugar doesn't make a difference in how quickly someone heals (within a week of surgery).
Gerardo Gomez-Moreno et al/ 2014[25]	There were notable differences in the groups that had bleeding upon probing. As HbA1C levels rose, bleeding upon probing became more common.
Erdogan et al/ 2015[26]	The maxillary anterior and premolar regions were the sites of 22 implants for individuals with type 2 DM and 21 implants for non-DM patients. One or two implants held the fixed restorations that were part of the trial. The success rate for people without diabetes was 100% after one year of follow-up, whereas it was 95% for diabetes.
Antonio Aguilar-Salvatierra et al/2016[27]	Both marginal bone loss and hemorrhage were found to be significantly different across the groups upon probing. A linear relationship between rising HbA1C and peri-implant pocket depth was found, however the results did not reach statistical significance.
Caroline C Eskow et al/ 2017[28]	The success of implant in persons with type 2 DM and poor glycemic control is highlighted by the high survival rates and few problems observed throughout this 2-year follow-up period..
Saeed Al Zahrani et al/ 2018[29]	Peri-implant bone outcomes are significantly compromised in patients with poorly controlled type 2 diabetes compared to those with effective glycaemic regulation. Maintaining an ideal HbA1c level is critical for implant success
Baburajan Kandasamy et al/ 2018[30]	The study concludes that various factors—including tobacco use, bruxism, glycaemic status, and the need for bone augmentation—in determining dental implant success rates.
Olivera R. et al/ 2019[31]	For diabetic patients who maintain proper oral hygiene, the implants can achieve a high success rate with minimal bone loss over five years.
Cui-Xia Li et al/ 2020[32]	The study observed increased implant stability and reduced marginal bone loss around self-assembling nano-modified implants during the early osseointegration phase, specifically in the uncovering-loading stage, in patients with type 2 DM.
Mohammed Ghazi et al/ 2020[33]	Implant survival rates are similar in patients with well-controlled diabetes mellitus and those without the disease.
Henny J. A. Meijer et al/ 2020[34]	Implant failure was more common among patients who had regular-diameter implants placed immediately after molar extraction in the mandible and maxilla. This was seen throughout a one-year follow-up period..
Anton Friedmann et al/2021[35]	Individuals with Type 2 DM may experience benefits as it has the potential to reduce the challenges linked with wound healing.
Tayane da Rocha et al/2021[36]	Risk factors linked to early implant failure included smoking, absence of postoperative antibiotic therapy, procedures involving bone grafting, complications following surgery, and the placement of narrow (≤3.75 mm) or short (≤8.5 mm) implants
Ren Shang et al /2021[37]	Peri-implant indicators, patients with type 2 DM exhibited higher levels of bleeding on probing and peri-implant bone loss, suggesting that elevated blood sugar levels are a significant risk factor for inflammation around dental implants.

Shaojie Shi et al/2021[38]	The radiographic characteristics differed slightly between patients using various hypoglycemic agents during the one-year and 2-year follow-up periods.
Karen Rodriguez Pena et al/2022[39]	A possible connection between SSRI consumption and decreased dental implant longevity was identified, although this should be considered in light of the study's limitations
Sarah Ayele et al/2023[40]	Diabetic individuals increased marginal bone loss over time, with this deterioration being exaggerated in those with type 1 diabetes.

6. SUCCESS AND FAILURE OF DENTAL IMPLANTS IN DIABETIC PATIENTS

Previous meta-analyses and systematic reviews have indicated that diabetic patients experience a survival rate of approximately 95.2% for implants supporting single crowns over ten years.[41] Contrarily, several studies have indicated that single-implant supported crowns placed in posterior regions tend to exhibit reduced survival rates, especially among individuals with periodontitis.[42–47] Pjetursson BE et al. further reported that implants placed adjunct with sinus augmentation techniques demonstrate a survival rate of approximately 92%.[48] Estimates put the cumulative implant longevity in full-arch fixed dental restorations prosthesis at 87.1% after 20 years and 93.3% after 10 years, according to the long-term prognosis.[49] The survival rate of four implants with immediate loading is about 98.1% at five years and 94.8% up to ten years for diabetic patients.[50] Some literature,[51,52] notes increased implant failure rates in the first year following placement. Staedt et al.[53] reported that early implant failure is more common than late failure, with primary risk factors including implant location (mandible or maxilla), patient age, type of prosthetic treatment affecting loading distribution, and survival rate. John W. Olson[54] and colleagues observed that the duration of this condition significantly impacts the success of dental implants, while another study found that well-controlled diabetes does not pose an additional risk compared to non-diabetic individuals.[55] Implant failure rates are greater in long-term diabetes with micro and macro vascular problems, which cause delayed healing surrounding implants.

Table 5: Summary of Study Outcomes on Dental Implant Survival in Patients with Diabetes Mellitus

Investigator & year of the study	Type of study	Type of diabetics	No. of patients/ implants	Duration of study	Survival Rate (%)
Harold F et al/2000[18]	Retrospective	Type 2	663/2887	36 months	92.2
Farzad et al/2002[19]	Retrospective	Type 2	25/136	3 years	94.1
Peled et al/2003[20]	Retrospective	Type 2	41/141	5 years	97.3
Balshi et al/2007[21]	Retrospective	Type 2	1/18	2.5 years	100
Tawil et al /2008[22]	Prospective	Type 2	45/255	12 years	97.2
Turkyilmaz /2010[23]	Prospective	Type 2	10/23	1 year	100
Oates & vargas/2012[24]	Retrospective	Type 2			
Gerardo Gomez-Moreno et al/ 2014[25]	Retrospective	Type 2	67/67	3years	100
Erdogen et al/2015[26]	Prospective	Type 2	10/22	1 year	95
Aguilar-Salvatierra et al/ 2016[27]	Prospective	Type 2	85/85	2years	100
Caroline C Eskow et al/2017[28]	Prospective	Type 2	23/72	2years	96.6
Saeed Al Zahrani et al/ 2018[29]	Prospective	Type 2	67/124	7years	99.1
Baburajan Kandasamy et al/2018[30]	Retrospective	Type 1	200/650	15years	88.8
Raluca-Iulia Juncar et al./2019[31]	Prospective	Type 2	4/16	6 months	100
MohammedGhazi et al/2020[33]	Retrospective	Type 2	121/377	3years	90.18
Henny J. A. Meijer et al/2020[34]	Prospective	Type 2	20/55	1year	100
Cui-Xia Li et al/2020[32]	Prospective	Type 2	25/50	4years	96
Anton Friedmann et al/2021[35]	Prospective	Type 2	32/48	1 year	100
Tayane da Rocha et al/2021[36]	Retrospective	Type 2	594/2537	7 years	95
Ren Shang et al/2021[37]	Retrospective	Type 2	415/500	1 year	100
Shaojie Shi et al/2021[38]	Retrospective	Type 2	150/308	1 year	100
Karen Rodriguez Pena et al/2022[39]	Retrospective	Type 2	170/573	13 months	96
Sarah Ayele et al/2023[40]	Retrospective	Type 1 (21) Type 2 (69)	90/349	1 year	100

Implementation of Targeted Strategies to Improve Dental Implant Success in Individuals with Diabetes

DM patients need to maintain reasonable glycaemic control both before and after surgery to achieve successful Osseo integration. Maintaining stable blood glucose levels has been shown to improve osteoblast activity and minimize bone loss in periodontal patients with well-controlled diabetes, in contrast to those with poor glycaemic control.[56] Amino guanidine has been shown to mitigate the adverse effects of diabetes on Osseo integration. Furthermore, a theory put out by Bai et al. proposes that systemic administration of insulin-regulated cytokine produced by adipose tissue might potentially improve the Osseo integration process in diabetic patients by exhibiting potent anti-inflammatory properties and increasing bone density through the stimulation of osteoblasts and inhibition of osteoclasts.

In diabetic patients, dental implant success rates have been found to improve with the administration of prophylactic antibiotics and consistent use of 0.12% chlorhexidine mouth rinse. Additional strategies to enhance implant outcomes in diabetic patients include optimizing implant surface characteristics—such as applying bioactive coatings—and utilizing implants with greater length and diameter.[57,58]

Table 6: Recommended Antibiotic Regimens for Prophylaxi

Sl. No.	Antibiotic	Adult Dosage	Pediatric Dosage
1	Amoxicillin	500 mg orally every 8 hours	25–50 mg/kg/day, divided every 8 hours
2	Amoxicillin + Clavulanic Acid	500 mg + 125 mg orally every 12 hours	25–45 mg/kg/day, divided into doses every 12 hours
3	Cephalexin or Cefadroxil	250–1000 mg orally every 6 hours	25–100 mg/kg/day in divided doses every 6–8 hours
4	Clarithromycin / Azithromycin	250–500 mg once daily	5–20 mg/kg once daily

7. DISCUSSION

Research on animals with and without diabetes has shown that the processes of bone matrix production and mineralization are quite similar. However, even in controlled diabetic subjects, Bone-to-Implant Contact (BIC) is often lower. Numerous studies have detailed the mechanisms by which diabetes negatively impacts wound healing and the true connection (Osseo integration) between bone and implant surfaces. Nonetheless, studies conducted on humans,[59] particularly those with type-2 diabetes, have observed minimal impact on BIC, leading to effective osseointegration of dental implants has shown favorable outcomes in patients with controlled diabetes. However, various experimental researches conducted on animal models such as rats and rabbits have demonstrated differences in bone structure and composition, higher metabolic activity, faster bone healing, rapid skeletal remodeling, and increased bone turnover. These physiological distinctions may contribute to the inconsistencies observed between animal studies and human clinical outcomes. The variation in the development of diabetes in experimental animals compared to humans may also account for the differences in BIC. Supporting this explanation, an experimental study on obese diabetic rats found no difference in BIC between obese diabetic rats and normal rats.

Several clinical investigations[60] have demonstrated that dental implant outcomes in diabetic individuals are generally on par with those in non-diabetic counterparts. Persistent hyperglycaemia can lead to microvascular complications, thereby elevating the likelihood of implant failure during both early healing and long-term maintenance phases. Poor glycaemic control over the past 2–3 months—can significantly influence implant outcomes in individuals with uncontrolled diabetes. An HbA1c level ranging from 6 to 8 indicates well-controlled diabetes, while levels from 8.1 to 10 signify moderately controlled diabetes. Levels exceeding 10 suggest poorly controlled diabetes. Elevated HbA1c levels, particularly in the presence of microvascular complications, can adversely affect the dental implants outcomes. However, not any one reviewed studies included patients with severely uncontrolled diabetes, suggesting that surgeons typically avoid placing dental implants in individuals with poorly controlled glycemic levels due to the perceived risks of implant failure. Even moderately controlled diabetes, if persistent for over ten years, trigger complications that may adversely affect tissue health. In diabetic patients, the success and survival rates of dental implants can be improved by carefully considering these aspects during rehabilitation, as compromised conditions and suboptimal restorative parameters can undermine the success. Consequently, many aspects related to rehabilitation and DM can impact the survival of dental implants in diabetic patients.[61]

Table 7 Diabetic and Rehabilitative factors

DIABETIC FACTORS	REHABILITATIVE FACTORS
Types and duration of diabetes	Sort of repair, permanent or temporary, duration.
Diabetic condition i.e HbA1c level	Implant location, maxillary / mandible.
Approach of managing hyperglycemia by means of dietary changes, insulin injections, or oral supplementation.	Duration for osseointegration and functional loading.

8. CONCLUSION

Postponing implant implantation treatments until diabetes is properly managed is recommended for patients with poorly

controlled diabetes. To further understand the impact of diabetes on dental implant success, larger-scale prospective clinical trials with both diabetic and non-diabetic people are required. It is critical to choose appropriate patients, especially those with type 2 diabetes mellitus, to increase the success rate of dental implants. They can help dental implants last longer by keeping their HbA1C levels in check and by practicing excellent oral hygiene.

Dental implants have emerged as a pivotal development in the treatment of oral conditions among individuals with diabetes mellitus. Healthcare providers caring for diabetic patients must have a thorough understanding of the interplay between periodontal disease, dental implants, and diabetes. Dental implant performance in diabetic patients can be optimized by clinicians through tailored treatment strategies by using evidence-based procedures, creating individualized treatment programs, and continuously monitoring the patients. Dental implant therapy plays a significant role in the comprehensive management of diabetes, offering benefits that extend beyond oral health to overall well-being and quality of life. Several authors, emphasize the importance of integrating evidence-based findings to enhance patient outcomes in this domain

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