

Dental Implant Success in Saudi Diabetic Patients; Review of Published Clinical Studies.

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Abstract

Background: Dental implant has become very popular lately in Saudi Arabia . the long term success rate of the dental implants has reached almost more than 95% . Diabetes mellitus is characterised by delayed wound healing but little consideration in relation to the placement of dental implants . the prevalence of diabetes in Saudi Arabia reaches up to 23%. We aim to review the reported success of implants in diabetic Saudi patients .

Method; databases were searched through web of science and in the PubMed in the period until November 2018 using different combinations of key words (diabetes and dental implants in Saudi Arabia , dental implants success in Saudi diabetics , failure of dental implants in Saudi diabetics). All clinical studies published from Saudi Arabia were included .

Results: 11 studies selected from different cities around the Kingdom . All of which suggested that proper control of diabetes and optimal oral hygiene supports success of dental implant .

Conclusion and recommendations; success rate of dental implants in diabetic patients could be similar to non diabetics if the diabetes is controlled prior to implant . We recommend referring all diabetic patients to diabetologist to achieve ideal HbA1c prior to implant , further studies are needed to decide optimal HbA1C level and for how long it should be sustained before and after implant procedure .

Key words: dental implants , diabetes .

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I. Background

Diabetes mellitus is one of the world's major chronic health problems (12) . Globally in 2013, it is estimated that almost 382 million people suffer from diabetes with a prevalence of 8.3% (13) .the overall prevalence of DM in KSA is 23.7%. Diabetes mellitus is more prevalent among Saudis living in urban areas than rural and male study participants (14) . diabetes is responsible for numerous oral complications. It has been associated with xerostomia, increased levels of salivary glucose, swelling of the parotid gland, and the increased incidence of caries. Adult diabetics also experience a 2.8 to 3.4 times higher risk of developing periodontitis than nondiabetics. It has been mentioned that diabetic patients seem to be more prone to infection and that healing after surgery is slower. In addition 4,5 High circulating levels of glucose inhibit peripheral leukocyte chemotaxis and provide a nutrient-rich environment for bacterial or fungal replication (15) . Currently, dental implants are increasing in use for replacing missing teeth. According to the American Implant Association, a dental implant is a titanium screw used to support one or more missing teeth (16) . The significant metabolic disorder in DM could affect the normal physiological process of healing mechanisms. (17) . However, dental implant placement needs an ultimate level of integration into the jawbone to achieve successful results and to avoid the complications in medically compromised patients, in particular diabetic patients (18) .Today, dental implants are one of the restorative methods to replace missing teeth. Improvements in implant design, surface characteristics, and surgical protocols made implants a secure and highly predictable procedure with a mean survival rate of 94.6 % and a mean success rate of 89.7 % after more than 10 years (19) . At the same time recent Improvements in medical care have created a higher percentage of senior patients suffering from an increased incidence of chronic illnesses, such as diabetes mellitus and metabolic bone disease, which may influence success rates of dental implants.(20) . HOWEVER it appears that more recent studies of implant success with better defined parameters of glycemic control support the use of dental implants for patients with diabetes mellitus, independent of glycemic status (21). Dental implant procedures for patients with diabetes mellitus should be performed only by professionals experienced with the management of the disease (22). Dental implant has become very popular lately in Saudi Arabia . In general the long term success rate of the dental implants has reached almost more than 95% . Evidence-based dentistry has suggested various medical

considerations for diabetic patients to achieve successful bone healing around the dental implant and to overcome the complications of high blood glucose levels (23). As diabetic patients are more prone to dental infection due to a dysfunction in their immune system, they may be more prone to bone infection around the dental implant. There is, perhaps, some evidence that the influence of antibiotics in medically compromised patients, such as diabetic subjects, is effective in decreasing dental infection (24). Prophylactic antibiotics are among the most important factors to accelerate the healing process around the implant by decreasing the risk of infection, thereby significantly increasing the dental implant success rate. Moreover, studies suggest that mouthwash could be used as an antiseptic agent before and after dental implant therapy (25). It is recommended to measure the HbA1c (Glycosylated Hemoglobin Assay) prior dental implant placement procedure (26). Studies clearly show that well-controlled diabetic patients that is reflected by pre-implant HbA1c, have less peri-implantitis and better implant survival rate. (27). Current work is aimed to review the reported success of implants in the diabetic Saudi patients published in different literatures and the possible factors that contributed to the implant success in this group of patients. To our knowledge this is the first review that studied several published data regarding implant success in diabetic patients from Saudi Arabia.

II. Method

PubMed, Embase, National Guideline Clearinghouse, Guidelines International Network, and MIDLINE Databases were searched for relevant literature. The following search terms were used: dental implants AND diabetes in Saudi Arabia, peri-implantitis AND diabetes in Saudi Arabia, Periimplantitis AND Diabetes in Saudi Arabia, dental implants success in Saudi diabetics, failure of dental implants in Saudi diabetics. Identified articles that were selected from the Electronic search were further studied and if a its references list included another article of same interest, it was also included. Study inclusion criteria included: English language, retrospective and prospective clinical trials, observational studies, cross-sectional studies, cohort studies, and case series all should be from Saudi Arabia. Exclusion criteria: in vitro studies, animal studies, case reports with less than 10 patients, and publications of studies done outside Saudi Arabia.

III. Results and Discussion

Table 1 summarises the papers found. 9 studies (2,3,4,5,6,7,9) were from Riyadh area which is the Saudi Arabia capital city that has the largest Saudi population and the best dental centres. One study was from Jeddah (1) and one from Alkhairj city (8). Total number of study subjects throughout all the 11 studies were 713. 473 were diabetic patients while 240 were healthy controls. All diabetic patients were diagnosed as type 2 DM. Patient age ranged from 40-62 years. The duration of the studies ranged from 1-7 years. 7 out of the 11 studies reported using antibiotics as a prophylaxis before surgery and Amoxil, clindamycin or Augmentin were used. The level of HbA1c prior to implant was ranging from 4.5%-10.3%. The length of implants used ranged from 3.3 – 16 mm (10-14 mm was the most used length). 9 out of the 11 studies reported similar outcome of dental implant between diabetics and healthy individuals. One study by Saeed AL ZHRANI et al suggested that there is a significant PIBL (pre-implant bone loss) around non-submerged single-tooth implant supported restorations in T2DM as compared to NT2DM patients. Another study by Mohammed Alrabiah et al reported that the Clinical and radiographic peri-implant parameters were worse and levels of AGEs in PISF were increased in individuals with prediabetes and T2DM. He postulated that the AGEs may play an important role in peri-implant inflammation in prediabetes and T2DM. These 2 studies are in agreement with most of the studies (28,29, 30,31) that observed slightly high percentage of early failure of implants in diabetics compared to late failure. Some reports indicated increased failure rate within first year of placement of implant. (30, 32, 33). The rest of the 9 other studies reported similar success rate of dental implant when comparing T2DM patients to healthy controls. This observation was in agreement with the other reference studies reported published retrospective and prospective studies data, retrieved through various sources after 2004 that reported success rate of dental implants in diabetic patients in range of 85.5-100% and were comparable to the non-diabetic patients. Hassan Abdulwassie et al in the current review stated that Dental implants can be used successfully in patients who are diabetic provided that blood sugar levels are under control. Most of the studies were of opinion that success rate in well/fairly controlled diabetics was either equal or insignificantly lower than normal individuals (34, 35). Duration of diabetes significantly affected the success of dental implant, observed in one study (31) and the lower success of implant in patients with diabetes of longer duration may be due to higher chance of micro-vascular complications which consequently lead to delayed healing around implants and hence higher early failure. As regards to factors that influence implant survival, our review showed that the Platform-switched implants can remain clinically and radiographically stable in patients with T2DM in a manner similar to non-diabetic individuals (Mohammad D Alamri et al), there is an evidence to support the use of short implants in controlled diabetic patients (Mohammad D Alamri et al) in contrast to other studies that reported higher implant length and width has been shown to improve success rate of implant in diabetic patient (36, 7, 38).

Oral hygiene maintenance reduces hyperglycaemia and peri-implant inflammatory parameters around immediately loaded dental implants placed in type 2 diabetic patients and Mechanical debridement with adjunct antimicrobial photodynamic therapy is more effective in the treatment of peri-implant inflammation in T2DM patients (Mohammad D. Al Amri et al) . Prophylactic antibiotics have shown to be effective for success of dental implants in diabetic patients in many studies and we observed that 7 of the current studies reviewed used antibiotics while in the remaining 5 studies it was not clear .

IV. Conclusion and Recommendations

success rate of dental implants in diabetic patients could be similar to non diabetics if the diabetes is controlled prior to implant . We recommend referring all diabetic patients to diabetologist to achieve ideal HbA1c prior to implant procedure . There are few studies addressing dental implant success in Saudi Arabia and further studies are needed to decide optimal HbA1C level and for how long it should be maintained before and after implant procedure . Data From private clinics are lacking and should also be included in the future studies .

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Table 1 ; summary of the included studies ;

No	Author / year	Source	Study design / duration	No of subjects	Mean Age/sex	Type of DM	Antibiotics prior to surgery	Accepted HbA1C prior to surgery	Length of the implant	Conclusion
1	Mohammed Alrabiahetal 2018	Jeddah	Retrospective Case Control /6y	90 (30 DM , 30 preDM, 30 control)	50.7-54.1	T2DM	?	6.1-10.3	?	Clinical and radiographic peri-implant parameters were worse and levels of AGEs in PISF were increased in individuals with prediabetes and T2DM. AGEs may play an important role in peri-implant inflammation in prediabetes and T2DM.
2	Hassan Abdulwassietal /2002	Riyadh	Retrospective /5y	25	46.066 /10 M, 15F	T2DM	Amoxicillin	< 7	10-15mm	Dental implants can be used successfully in patients who are diabetic provided that blood sugar levels are under control
3	Mohammad D Alamrietal 2017	Riyadh	Retrospective Case Control /2y	45 (23 cases and 22 controls)	39-46/ M	Type 2	Amoxicillin or clindamycin	< 8	10-14	Platform-switched implants can remain clinically and radiographically stable in patients with T2DM in a manner similar to non-diabetic individuals
4	Mohammad D Alamrietal 2016	Riyadh	Prospective Case control /3y	87 (45 cases and 42 controls)	40-42.6 / M	Type 2	Amoxicillin	< 8.5	6-11	The evidence from this clinical study supports the use of short implants in controlled diabetic patients and suggests further investigation.
5	Mohammad D Alamrieta 2016	Riyadh	Prospective Case control chart review /2y	108 (55 cases and 53 controls)	40-42.6 / M	Type 2	Amoxicillin Or clindamycin	4.5-5.4	3,3-14	clinical and radiographic status was comparable around IL and CL implants placed in patients with T2DM up to 24 months of follow-up.
6	T.abduljabbaret al	Riyadh	Cross sectional	52 (27 cases	40.6 -	T2DM	?	Mean FBS(8	10-14	There is no influence of implant location on

	/2017		Retrospective	and 22 control es)	42.5			0-88.1)		clinical or radiograph parameters around dental implants in patients with or without DM
7	Mohammad D Alamri et al 2016	Riyadh	Prospective / 1y	24 (12 cases and 12 control s)	?	Pre T2D M	Amoxicillin Or clindamycin	5.6-6.7	10-16	.
8	Deepti Raghav et al	Al-Kharj	Prospective / 1y	27 males (15 cases and 12 control s) 27 females (15 cases and 12 control s)	60-62	T2D M	?	?	?	In both diabetic and nondiabetic patients, similar microbial, salivary marker, and clinic radiological patterns were seen Diabetic patients who maintain their body's metabolic rate show similar success rate of dental implants as seen in nondiabetic patients
9	Mohammad D. Al Amri et al 2016	Riyadh	Prospective / 2y	91	45-59	T2D M	amoxicillin	4.1-9.7	10-14	Oral hygiene maintenance reduces hyperglycaemia and peri-implant inflammatory parameters around immediately loaded dental implants placed in type 2 diabetic patients.
10	Mohammad D. Al Amri et al 2016	Riyadh	Prospective / 1y	67 36 M 31 F	51-62	T2D M	?	6.1-9.2	?	Mechanical debridement with adjunct antimicrobial photodynamic therapy is more effective in the treatment of peri-implant inflammation in T2DM patients .
11	Saeed AL ZHRANI et al 2018	Riyadh	Observation /7y	70 35 cases (24M-11F) 35 control s (22M-13 F)	46-63	T2D M	Augment in	4.7-8.2	10-12	significant PIBL (pre implant bone loss) around non-submerged single-tooth implant supported restorations in T2DM as compared to NT2DM patients,

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