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Role of HBA1C levels and Anti Diabetic Medication on Crown/root ratio of Maxillary/ Mandibular Abutment Teeth and on Residual Mandibular bone Height among young Saudi University Diabetic and non Diabetic Students in King Khalid University, Kingdom of Saudi Arabia

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Abstract

The advancement in science and technology is indispensible to mankind but the very boon to mankind has become a bane due to the fact that man has become addicted to modern gadgets and his life has changed. This drastic change in life style has led to many life style diseases namely diabetes, hypertension, cardiovascular diseases to name a few. One of the most common types of life style related diseases is diabetes mellitus. The incidence of diabetes mellitus especially Type 2 diabetes mellitus i.e. Non insulin dependent diabetes mellitus (NIDDM) is of epidemic proportions. Insulin dependent diabetes mellitus (IDDM) is also on the rise. Diabetes mellitus has a potential resorptive effect on dental alveolar bone because of the fact that periodontitis is a common manifestation in this disease. Loss of tooth is a sequelae of periodontitis. Hence diabetic patients require frequent requirement for prosthodontics treatment for replacement of missing teeth. Various antidiabetic drugs have also come into routine use by both IDDM and NIDDM patients. This present study will bring to light the influence of glycosylated haemoglobin (HbA1c) levels and antidiabetic usage on crown root ratios of abutment for fixed prosthodontic treatment. The study also will throw a light on residual mandibular alveolar bone height which could be used for implant placement.

Keywords: Crown root ratio, Abutment teeth, Mandibular bone height, Diabetes mellitus, Antidiabetic drugs.

Introduction

The advancement in science and technology is indispensible to mankind but the very boon to mankind has become a bane due to the fact that man has become addicted to modern gadgets and his life has changed. This drastic change in life style has led to many life style diseases namely diabetes, hypertension, cardiovascular diseases to name a few[1,2]. These diseases are called life style related diseases. These diseases have a potential restorative effect on dental alveolar bone because of the fact that periodontitis is a common manifestation in all these diseases[2-4]. Loss of teeth is common sequelae of periodontitis. One of the most common types of life style related diseases is diabetes mellitus. The incidence of diabetes mellitus (DM) especially Type 2 DM i.e. Non insulin dependent diabetes mellitus (NIDDM) is of epidemic proportions. Insulin dependent diabetes mellitus (IDDM) is also on the rise. NIDDM is mainly due to life style habits such as increased processed food intake and decreased physical activity**.** The boundaries between IDDM and NIDDM is becoming very thin as insulin usage has become more common in NIDDM[5-7]. Various antidiabetic drugs have also come into routine use by both IDDM and NIDDM patients throughout the world and especially in Saudi Arabia. Saudi Arabia is a country where agricultural produce is negligible. Hence they have to depend agricultural imports mostly in the form processed foods. These readily available processed foods have high caloric value and poor in fibre. To add to this Saudis engage in physical activity to a very minor level as most of the work is done by expatriates. The availability of cheap petroleum products also have made them to rely on motor vehicles rather on simple walking to even to smaller distances. As a result prevalence of diabetes is at an alarming rate among Saudi population.

The onset of diabetes mellitus starts at a very early age even among university level students. HbA1c has been the gold standard to know the glycaemic control of the patients. The present study will bring to light the influence of glycosylated haemoglobin (HbA1c) and the various antidiabetic drugs usage on crown root ratios of abutment for fixed prosthodontic treatment among young university diabetic and non-diabetic students. The study also will throw a light on residual mandibular alveolar bone height which could be used for implant placement.

Objectives of the Study: Include the following: To know osteoprotective role of diabetic medications, to know the

crown/root ratios in healthy Saudi population, to compare crown/root ratios of healthy Saudi population and diabetes patients and to know the mean residual mandibular bone height in normal patients and in diabetes patients so that we come to know the average bone height for implant.

Sample Size: Patients with age group ranging from 15 to 40 were chosen for the study. During the study a total of 100 diabetic male/female patients were included as cases and 80 healthy male /female patients were included as controls.

Inclusion Criteria: Include the following: Healthy Saudi male/female patients (free of systemic disease and periodontitis) who need fixed prosthodontic treatment, Diabetic Saudi male/female patients who need fixed prosthodontic treatment, Patients with good oral hygiene and Patients who are willing to consent for obtaining blood samples and radiographs.

Exclusion Criteria: Include the following: Patients with very poor oral hygiene, Patients with smoking habit and Patients who had undergone recent periodontal or surgical procedures adjacent to the abutment teeth.

Materials and Methods

The study involves Questionnaire Survey and Radiographic Measurements.

Questionnaire Survey: Detailed questionnaire regarding medical history, physical activity, diet intake, medications and duration of diabetes status were obtained through the questionnaire (Annexure-1).

Radiographic Measurements: Panoramic radiographs were made using digital orthopantogram machine. Panoramic radiographs are analysed using the clinic view software and values are recorded in the worksheet (Annexure-2) by 2 examiners to avoid examiner bias and average value of both the examiners is taken into consideration**.**

Measurements: Made include: Crown root ratio and residual alveolar mandibular bone height.

Crown Root Ratio (C/R): C/R=Mean of A /B and A' /B'.

Measurements of residual alveolar mandibular bone height (RAMBH): Total height of RAMBH: Height measured from crest of alveolar ridge to inferior border of mandible. i. Total available RAMBH for implant placement: Height measured from crest of alveolar bone to superior margin of inferior alveolar canal.

Results and Discussion

Data obtained from questionnaire and clinical records reveals that the most common antidiabetic drugs used in saudi arabia are as follows: Insulin (Lispro, Actrapid, Isophane), Biguanides (Metformin) and Sulphonylureas (Glimepride, Glipizide, Glicizide).

Statistics: The statistics will include descriptive statistics and logistic regression tests using SPSS Software**.**

Discussion: From the questionnaire it was found that 65 % of diabetic subjects did not do any physical activity, 25% of diabetics did moderate physical activity and only 10 % of diabetics did good amount of physical activity. Questionnaire also reveals that only 30 % of diabetic patients resort to foods with high fibre content whereas rest of others rely on some form of processed foods.

Radiographic measurements were subjected to statistical analysis and the following inferences were arrived at. The mean (SD) of crown ratios of maxillary, mandibular anterior/posterior teeth are illustrated in Table-1. Spearman's correlation coefficient test was done to find the correlation between the various variables and it was found that C/R ratio of maxillary anterior and insulin usage has a positive correlation ($r=0.455$, $p<0.001$) as seen in Figure-1. Positive correlation was also found between C/R ratio of maxillary anteriors and high HbA1c values ($r=0.276$, $p<0.05$) as seen in Figure-2. Correlation was found between C/R ratio of mandibular anteriors and insulin usage ($r=0.219$, $p<0.05$) as seen in Figure-3. Correlation was found between C/R ratio of maxillary posteriors and insulin usage ($r=0.260$, $p<0.05$) illustrated in Figure-4. Negative correlation was found between C/R ratio of mandibular posteriors and sulphonylureas usage ($r= - 0.198$, $p<0.05$) as seen in Figure-5.

The mean Residual Mandibular Alveolar Bone Height (RMABH) in diabetics across the age groups is illustrated in Figure-6. The mean (SD) RMABH in Diabetics is 13.82(1.9) whereas mean (SD) RMABH is 15.5(2.58) illustrated in Table-2.

Table-1
Posterior Teeth in Diabetics and Non-Diabetics

Crown Root Ratios	Number of Patients	Mean	Std. Deviation
C/R Ratio of Maxillary Anteriors in Diabetics	100	.9294	.29171
C/R Ratio of Maxillary Posteriors in Diabetics	100	1.0558	.33245
C/R Ratio of Mandibular Anteriors in Diabetics	100	1.0040	.38412
C/R Ratio of Mandibular Posteriors in Diabetics	100	1.1510	.37751
C/R Ratio of Maxillary Anteriors in Non Diabetics	80	.5739	.17769
C/R Ratio of Maxillary Posteriors in Non-Diabetics	80	.6474	.18442
C/R Ratio of Mandibular Anteriors in Non-Diabetics	80	.6855	.19181
C/R Ratio Of Manibular Posteriors In Non -Diabetics	80	.7391	.17190

Table-2
C/R Mandibular Bone Height in Diabetics and Non-Diabetics

Mandibular bone height	Number of patients	Mean	Std. Deviation
Mandibular Bone Height in Diabetics	100	13.8250	1.92324
Mandibular bone height in nondiabetics	80	15.5000	2.58035

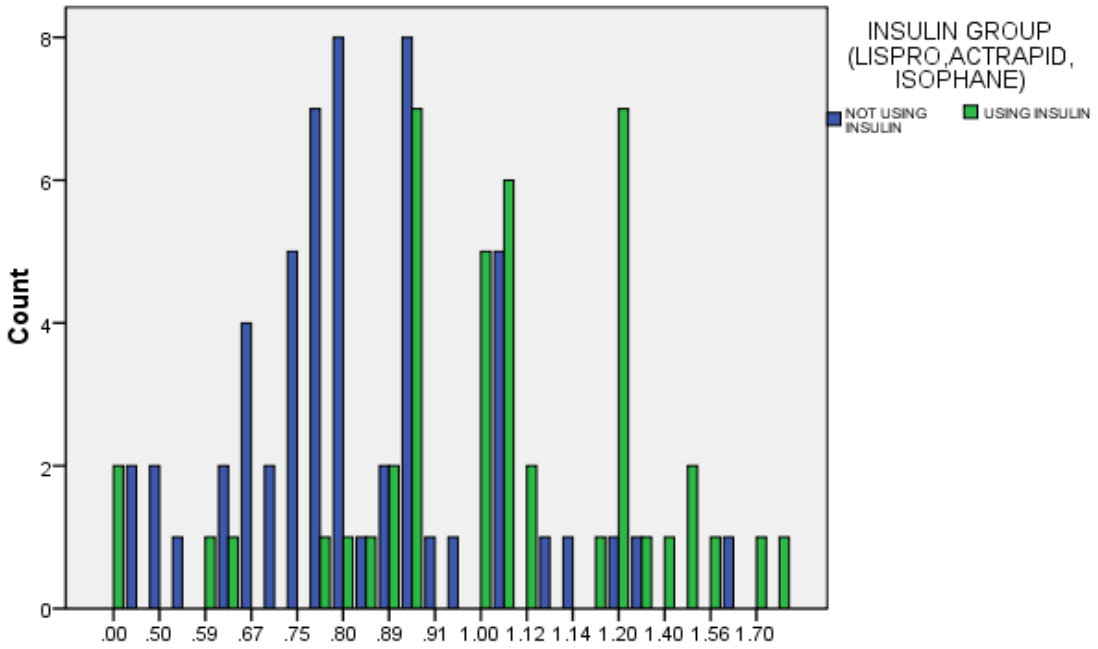

Figure-1
C/R ratio of maxillary anterior (Vs) insulin usage in diabetics

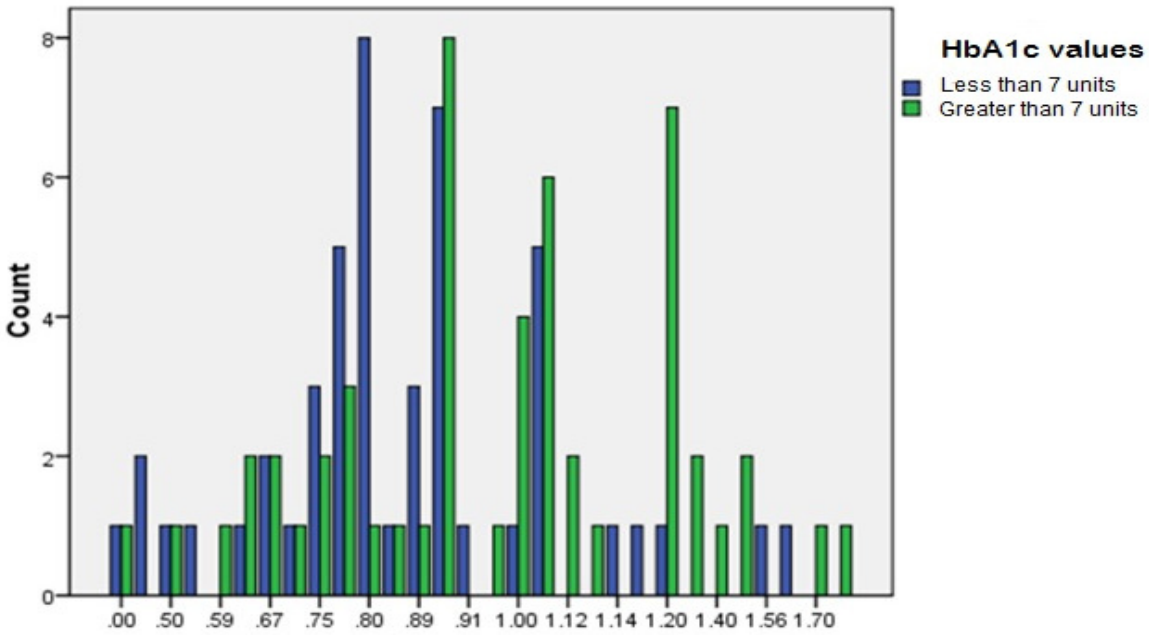

Figure-2
C/R Ratio of Maxillary Anteriors in Diabetics (Vs) Hba1c values

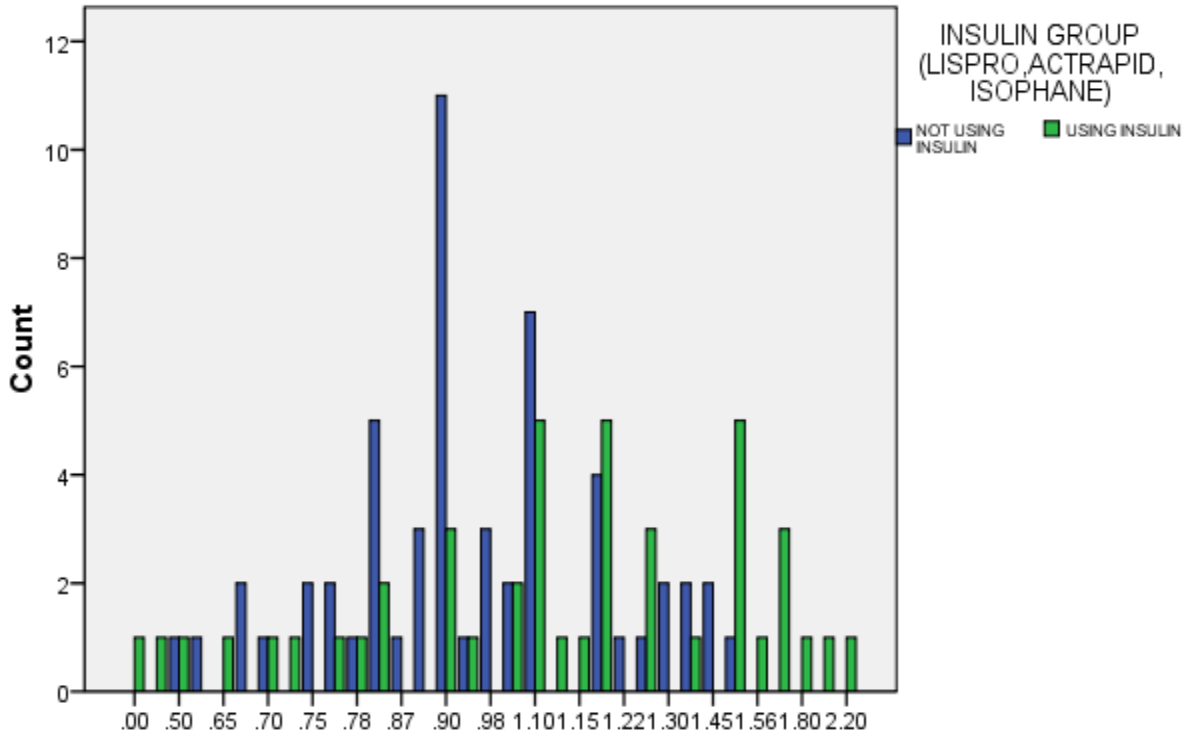

Figure-3
C/R ratio of maxillary posteriors in diabetics (Vs) insulin group (lispro, actrapid, isophane)

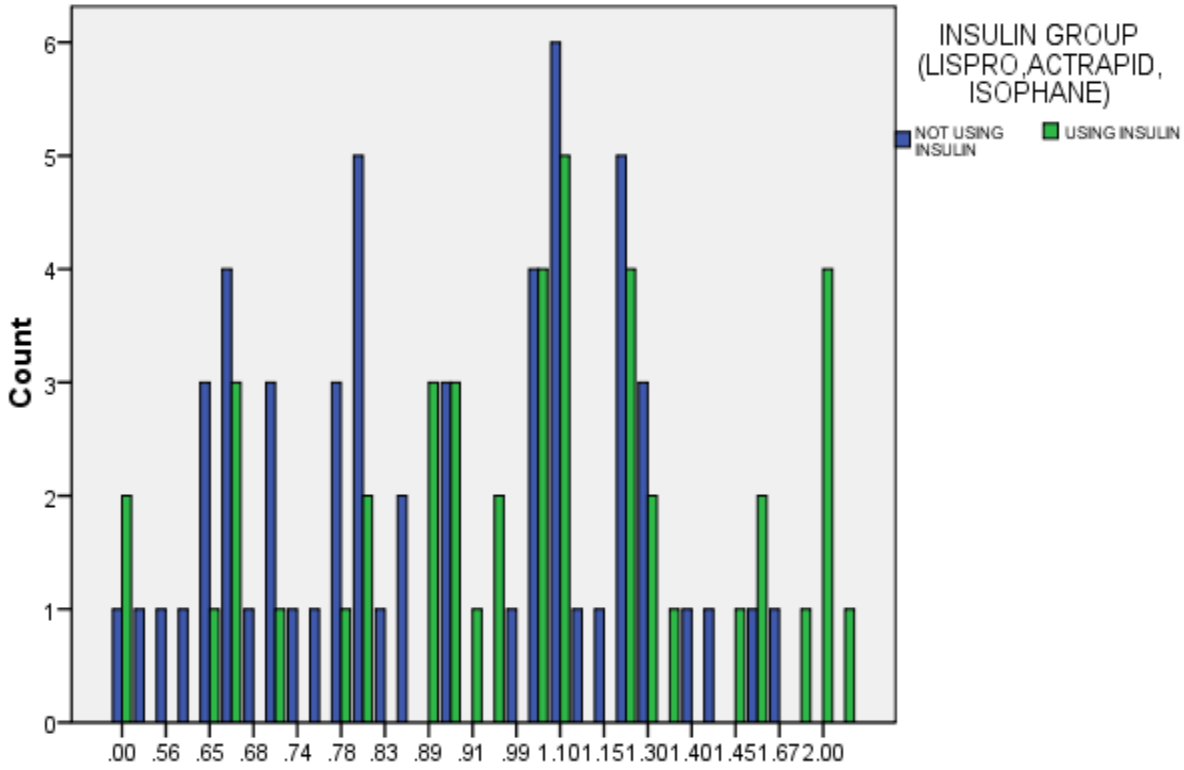

Figure-4
C/R Ratio of Mandibular Anteriors in Diabetics (Vs) Insulin Group (Lispro, Actrapid, Isophane)

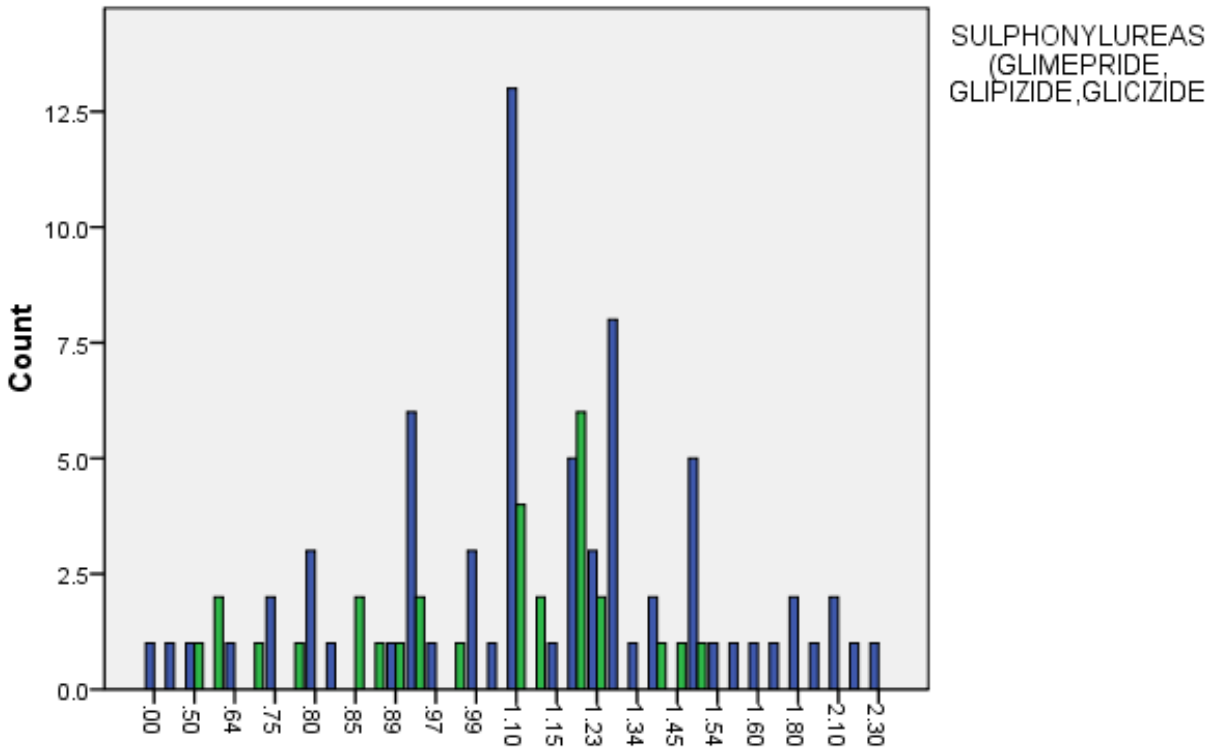

Figure-5
C/R ratio of mandibular posteriors in diabetics (Vs) sulphonylureas group (Glimepride, Glipizide, Glicizide)

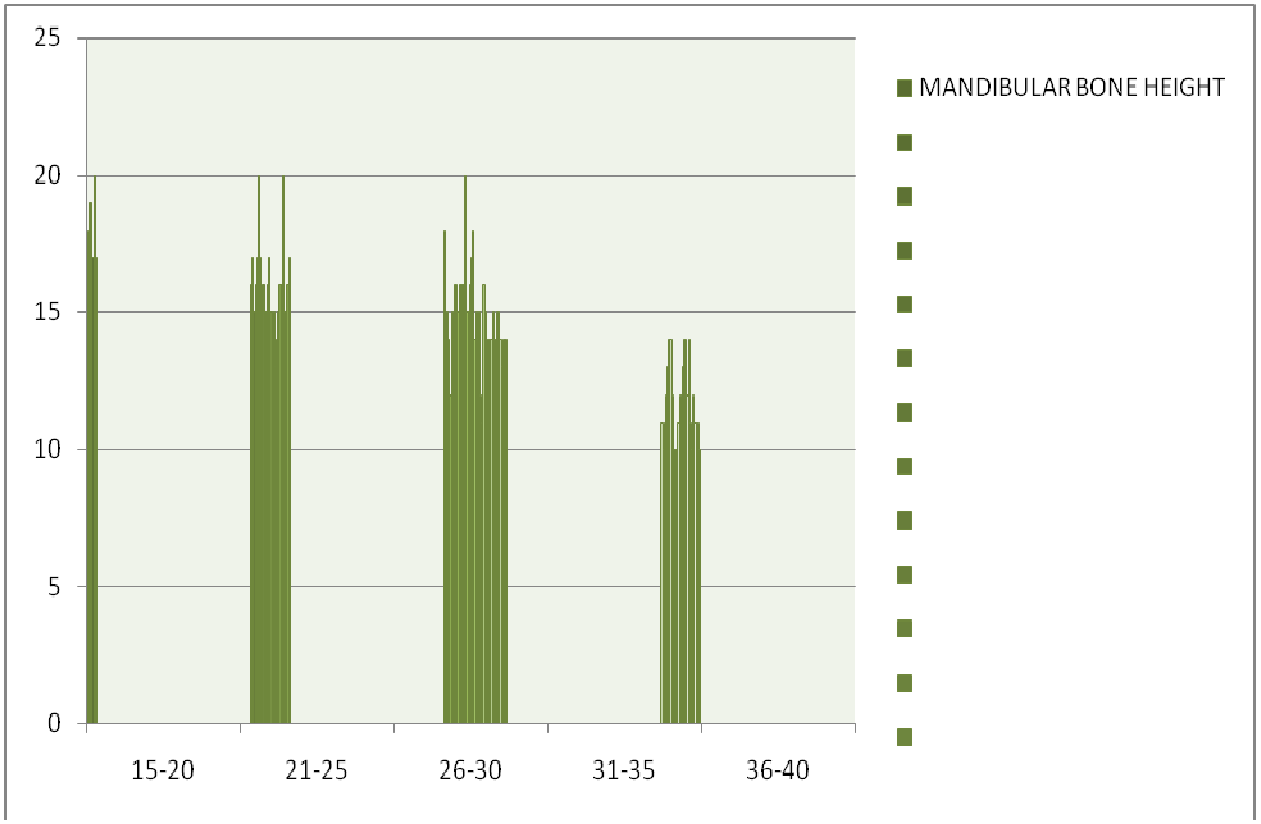

Figure-6
Mean Residual Mandibular Alveolar Bone Height (RMABH) in diabetics across the age groups

Annexure-1
Questionnaire

File number : Contact number :
Patient name : Age : Sex:
DIABETIC : _____ NON-DIABETIC:_____
Drugs taken (if diabetic):
1) _____Dose_____
2) _____Dose_____
3) _____Dose_____
Period of diabetic:_____
Fasting blood glucose level:_____
Postprandial blood glucose level:_____
Hba1c level(if available):_____
Physical activity:
a) Score 0—nil physical activity
b) Score 1—moderate physical activity
c) Score 2—good physical activity.
Diet intake:
a) Score 0—predominatly junk foods
b) Score 1—junk foods and fibre rich diet
c) Score 2—high fibre rich diet

Annexure-2
Radiographic Worksheet

Abutment tooth Number	**Crown Height (mm)**				**Root Height (mm)**				**C/R Ratio**			
Examiners 1 and 2	**Exam1**		**Exam2**		**Exam1**		**Exam2**		**Exam1**		**Exam2**	
Mesial/Distal measurement on Radiographs	**M**	**D**	**M**	**D**	**M**	**D**	**M**	**D**	**M**	**D**	**M**	**D**

Missing tooth number	**Anterior/Posterior**	**Height of mandibular Bone in edentulous segment**		**Healing in extracted Socket**	
		Exam1	**Exam2**	**Exam1**	**Exam2**

Conclusion

From the present study it was found that only patients who use sulphonylureas have a mild osteoprotective effect as evident from the C/R ratios. Whereas patients who use insulin, biguanides, insulin together with biguanides show no significant reduction of C/R ratios. It was also found that when HbA1c values were more than 7 i.e. uncontrolled diabetes mellitus higher C/R ratios were evident especially in maxillary anterior teeth. Significant residual mandibular bone loss was present in diabetic patients between age groups 15 to 40. Further interventional studies are needed to confirm the osteoprotective effect of various antidiabetic drugs.

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