

## Comparison of Post Extraction Healing in Diabetic Patients with two different Blood Glucose Levels - A Case Control Study

Research Article

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### Abstract

Diabetes mellitus is a metabolic disorder characterised by an inability to regulate blood glucose level due to insulin deficiency or resistance. In dentistry, diabetics are considered to have increased healing problems related to dental extractions, periodontal surgery and wearing ill-fitting dentures. Therefore, management and treatment of diabetic patients undergoing oral surgical procedures are more difficult. Delayed angiogenesis, decrease in blood flow, compromised innate immunity, decrease in the production of growth factor and psychological stress have been reported as factors causing delay in the healing of extraction sockets in diabetic patients. So the aim of the study is to compare the post extraction healing in diabetic patients with two different glucose levels. It is a university setting retrospective study. The details of the 86,000 patient records were reviewed and analyzed, out of which 112 diabetic patients who had undergone extraction between June 2019 to March 2020 were included in this study after fulfilling inclusion and exclusion criteria. Age, gender, number of extractions, teeth number, blood glucose level [ $<200/>200$ ] mg/dl, were included and evaluated. These data were entered in SPSS. The data was analysed through chi square test. It was observed that there is a significant difference between post extraction healing and blood glucose levels among the diabetic patients. Within the limitations, patients with RBS level greater than 200 mg/dl had slower healing rate compared to patients with RBS level less than 200mg/dl. So this study will help the fellow dentists to be cautious in performing dental extractions in uncontrolled diabetic patients.

**Keywords:** Blood Glucose Level; Extraction Socket; Insulin Dependent Diabetes; Non Insulin Dependent Diabetes.

### Introduction

Diabetes mellitus is a metabolic disorder characterised by an inability of the body to regulate blood glucose level due to insulin deficiency or resistance [19]. Type I diabetes or insulin dependent diabetes is characterised by deficiency of insulin production and Type II diabetes or non insulin dependent diabetes is characterised by relative insulin deficiency and tissue insulin resistance [16].

It is also characterised by abnormal carbohydrate, lipid and protein metabolism. As a result, this leads to hyperglycemia that causes microvascular complications and a variety of clinical neuropathic complications [2, 20]. Studies have reported that half of the diabetic patients require surgery while the remaining two thirds of

the patients who require surgery experience some complications relating to infection [6, 30].

The most common dental complications experienced by diabetic patients are due to extraction, periodontal surgeries and ill fitting dentures [5, 10]. Some well known oral surgical complications include poor regeneration of soft tissues and delay in osseous tissue healing [3, 24]. Diabetes is associated with increased skeletal complications such as lowering the bone mineral density and increasing the risk of bone fracture [51]. There is high level risk for osteopenia, osteoporosis, poor osseous healing, and impaired bone regeneration [41].

Mozatti M. et al reported, a delay in wound healing of oral ulcers

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and extraction sockets in diabetic patients is due to inactive or static blood flow, low growth factors and antibodies production, questionable immunity, poor angiogenesis and psychological stress [27]. This study purely concentrates on diabetic patients with two different blood glucose levels i.e. patients with Blood Glucose Level <200mg/dl and patients with Blood Glucose Level >200mg/dl and the rate of healing of the extraction socket.

Therefore, management and treatment of diabetic patients undergoing oral surgical procedures are more difficult. Delayed angiogenesis, decrease in blood flow, compromised innate immunity, decrease in the production of growth factor and psychological stress have been reported as factors causing delay in the healing of oral ulcers [3, 32]. In most cases, diabetes makes the patient susceptible to oral and dental problems and complications, including various soft tissue injuries and inflammatory conditions [26, 28]. Previously our team has a rich experience in working on various research projects across multiple disciplines [18, 21, 47, 14, 38, 17, 46, 12, 9, 34, 55, 33, 45, 15, 52]. In this study, we are intended to compare the rate of healing of post extraction sockets among type 1 diabetes patients between two different blood glucose levels.

## Materials And Methods

### Study setting

This study is a university setting, conducted in Saveetha Dental college, Predominantly, the pros of the study include flexibility and less time consumption. The cons of the study is limited to certain populations. 112 Diabetic patients were included in this study. Approval was obtained from the Institutional Ethical Committee [IEC]. The ethical approval number for the present study is SDC/SIHEC/2020/DIASDATA/0619-0320. Two examiners were involved in the study.

### Sampling

The details of the 86,000 patient records were reviewed and analyzed, out of which 112 diabetic patients who had undergone extraction between June 2019 to March 2020 were included in this study. Cross verification of data for error was done by presence of additional reviewers and by photographic evaluation. Simple random sampling was done to minimise the sampling bias. It was

generalised to the south Indian population.

### Data collection/tabulation

Records of all patients who had diabetics and underwent extraction were collected from initial to last in the chronological order. The data verification was done based on age, sex, Blood Glucose Level, number of extraction sites and postop review of extracted site for healing were recorded and the data were tabulated. The data was entered in the excel sheet in a methodical manner and was imported to SPSS. Incomplete or censored data was excluded from the study.

### Analysis

IBM SPSS 2.0 software, was used for data analysis Independent variables include age, gender and dependent variable include no of extraction, RBS analysis. Descriptive and inferential statistics were used. Descriptive statistics includes the frequency of distribution of age, sex and inferential statistics includes the chisquare test.

## Results

On analysing the age group, 46 patients who were greater than 60 years had undergone extraction out of which 61.4% of them had satisfactory healing, 77.8% of the patients belonging to the age group of 51-60 years had satisfactory healing while 85.19% of patients who come under 41-50 years have satisfactory healing. From this we can observe that healing occurs at a faster rate in younger diabetic patients when compared to older patients. It is observed that the rate of healing is slower as the age increases in diabetic patient group population. As we can see in the graph, as the age increases, the rate of healing decreases, the bar chart shows gradual increase in the number of unsatisfactory healing with increase in age, It is evident that there is no significant difference between age and rate of healing since there is only diminutive difference in the healing range and age groups. Not statistically significant as Chi square value is 3.530 and p value 0.317 [P>0.05] [Figure 1].

The relation between gender and healing of socket is given in [ Figure 2]. Out of 63 males, 66.67% of them showed satisfactory healing likewise out of 42 females, 85.17% showed satisfactory

**Figure 1: The bar chart showing association of age and healing of socket. ( x axis ; age group, y axis : count/rate of healing ).As we can see in the graph, patients aged greater than 60 years who had undergone extraction , 29.5% of them had satisfactory healing, 20 % of them belonging to the age group of 51-60 years had satisfactory healing while 21.9 % of patients who come under 41-50 years have satisfactory healing.It is evident that there is no significant difference between age and rate of healing since there is only diminutive difference in the healing range and age groups. Not statistically significant as Chi square value is 3.530 and p value 0.317 [P>0.05]**

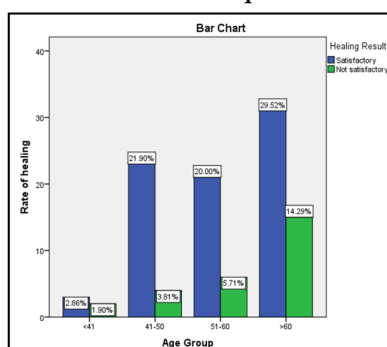


Figure 2. Bar chart showing association of gender and healing of the socket. X axis represents Gender group and Y axis represents the healing rate. Out of 60% of males, 40% of them showed satisfactory healing and out of 40% of females 34.29% showed satisfactory healing. From this we can contemplate that females have a higher healing rate than males. There is a significant difference between gender and healing in diabetic patients which is also statistically significant. p Value 0.029. and chi square value was 4.786 [p<0.05].

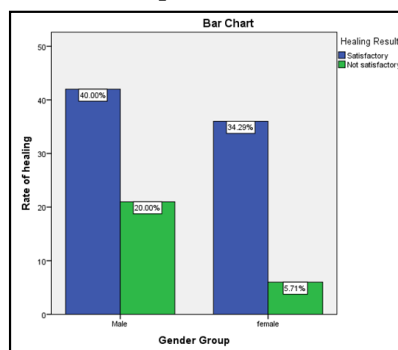


Figure 3. Bar chart represents association between random blood sugar and healing of extraction, we can observe that RBS < 200 mg/dl had comparatively higher healing than RBS > 200mg/dl. X axis represents the RBS level group and Y axis rate of healing count. 65.71% of patients whose Blood Glucose Level is less than 200 mg/dl had satisfactory healing while only 8.57% of patients with Blood Glucose level greater than 200 mg/dl showed satisfactory healing. There is a significant difference between healing of extraction socket and Blood Glucose Level observed in this study as the parameters observed were statistically significant p=0.000 and chi square was 19.05 [p<0.05].

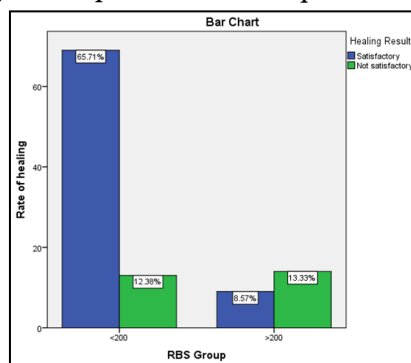


Table 1: The reveals correlation between number of extraction sites and rate of healing. There is no significant difference observed between these two parameters. This finding is not statistically significant as p value 0.594 [p >0.050].

No of Ex- traction Group	Healing Result		Total	Chi square value	P value
	Satisfactory	Not satisfactory			
<6	68	21	89	1.896	0.594
7-12	6	4	10		
13-18	3	1	4		
19-24	1	1	2		
Total	78	27	105		

healing. From this we can contemplate that females have a higher healing rate than males. There is a significant difference observed in our study between gender and healing in diabetic patients as the finding is statistically significant p<0.05.

[Table 1] revealed correlation between number of extraction sites and rate of healing. There is no significant difference observed between the number of extraction sites and rate of healing because the finding is not statistically significant p value >0.050.

The relationship between the Blood Glucose Level and healing, 84.15% of patients whose Blood Glucose Level is less than 200 mg/dl had satisfactory healing while only 39% of patients with Blood Glucose level greater than 200 mg/dl showed satisfactory healing. There is a significant difference between healing and

Blood Glucose Level observed in this study as the parameter observed is statistically significant [p<0.05] [ Figure 3].

### Discussion

The hyperglycemia in diabetic patients can pave way to reduce leukocyte count and have deleterious effects on vascular epithelium and healing potential [2]. Stratton et al , reported each 1% decrease in HbA1C level leads to 37% decrease in micro vascular complications [P<0.001] [49]. Because of micro vascular and macro vascular changes and immune deficiency in diabetes, risk of infection will increase.

In this study, we can contemplate that there is significant association between the blood glucose level and the rate of healing of

extraction socket P value [ $<0.05$ ]. Also it is observed that females had a higher healing rate compared to males and the rate of healing decreases with increase in age.

Infections is the major risk factor for uncontrolled diabetic patients [43, 35], the underlying cause of uncontrollable diabetes is still not clear. There are few possible explanations that can resolve these doubts.

- a) Insufficient insulin levels can slower the rate of healing [5, 1]
- b) Healing of tooth sockets requires repair and regeneration of tissues, this is controlled and regulated by specific molecules like TGF- B, VEGF, BMP, PGF [9]. Uncontrollable diabetes, the healing is prolonged due to delayed onset of cell proliferation and osteoblastic differentiation [56, 46].
- c) Poor blood circulation is commonly seen in uncontrollable diabetic patients. This leads to delay in delivery of nutrients and oxygenated blood to the surgical site resulting in slower healing rate [4, 29].
- d) When fasting blood glucose level  $> 240$  mg/dl, the body starts metabolizing fat at a higher rate, converting fatty acids to ketone [7, 38]. High ketone levels cause diabetic ketoacidosis leading the blood to become acidic. These ketone bodies interfere in the healing process inhibiting the secretion of nitric oxide and macrophages [31, 50, 36].

Our present study showed that diabetic patients had normal healing in both different blood group levels but the healing occurs at a slower pace in patients with Blood Glucose Level  $>200$  mg/dl compared to patients with Blood Glucose Level  $<200$  mg/dl. This result is in consistent with the study conducted by Huang et al, where he determined differences in wound healing in Type II diabetic patients and reported that healing is normal after the tooth extraction [1].

The study conducted by Jarbassiet al, have also reported that diabetic patients with high Blood Glucose Level showed lack of healing at the end of 7th day, however there was no abnormalities or complications seen in the patients [2]. However we cannot completely neglect the risk of complications of post extraction in diabetic patients. Devlin et al ,reported that blood clot in uncontrolled diabetic patients are weaker leading to more chance of alveolar destruction [11, 52] Our institution is passionate about high quality evidence based research and has excelled in various fields [53, 37, 40, 39, 48, 13, 25, 44, 42, 8, 54].

## Conclusion

In this study we can contemplate that healing of the extraction socket occurs at a slower pace in patients with Blood Glucose Level  $>200$ mg/dl compared to patients with Blood Glucose Level  $<200$ mg/dl. However there were no complications in post extractions were noted. However a surgeon needs to always be aware of postoperative complications in extraction sockets healing such as alveolar osteitis [dry socket], cellulitis, gangrenous osteitis, suppurative osteitis and osteomyelitis and more importantly mucormycosis which may be fatal if not intervened immediately.

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