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The relationship of Blood Glucose level to the outcome of Dental extraction: Prospective study

Dental Science

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ABSTRACT

Objective: The objective of this study is to determine the blood sugar level (BSL) in patient undergoing tooth extraction and evaluate rate of extraction socket healing in relation to BSL.**Methodology:** 30 Patients with known history of Diabetes mellitus & need to undergo tooth extraction will be selected in this prospective observer blind study. Random blood sugar level will be checked preoperatively. All patients will undergo tooth extractions by standard method. Sutures will be placed to just approximate the mucoperiosteal flap. Socket healing will be evaluated using clinical criteria like pain, postoperative bleeding, postoperative infection, dry socket along with the socket width will be measured immediate postoperative and on 7th day postoperative. The difference will be evaluated in relation to preoperative BSL.**Result:** The data was analyzed from 30 subjects. Out of which, 17 patients had BSL level less than 150mg/dl and 13 patients had greater than or equal to 150mg/dl and less than 300 mg/dl. The findings suggested that there is significant relation between the BSL levels of the patient and the socket healing based on all the criteria except infection.**Conclusion:** Here we can easily say based on statistical analysis that all study parameters reject null hypothesis except infection. It means all parameters were significantly associated except infection. Also we can see in all study parameters, the percentage of pain, bleeding, socket healing, infection, and dry socket had more in greater than or equal to 150 and less than 300 BSL group as compared with less than 150 BSL in both the groups that immediately post-operative and after 7th day.

KEYWORDS:

BSL level, tooth extraction, socket healing

Introduction:
Diabetes mellitus is recognized as a serious systemic condition affecting a progressively larger segment of our population[1]. It is a major cause of retinopathy, nephropathy, obesity and poor wound healing [2, 3]. Oral and maxillofacial surgeons are frequently face managing the diabetic patients who may or may not require a preoperative fasting period or may perform as compromised hosts in the perioperative period.

Caries & odontogenic infections are common in diabetes. Diabetic patients routinely report to dentists for tooth pain. Most of the patients are sent for physician consent irrespective to their BSL level. There are no prospective quantitative studies on socket healing in diabetic patients after dental extractions. Also the threshold level of BSL to defer the extraction is still unclear.Therefore the aim of this study will be to determine whether glycemic control influences healing after tooth extractions.

MATERIALS AND METHODS:
The present study was undertaken at exodontia clinics of department of oral and maxillofacial surgery, School of Dental Sciences, Karad, Maharashtra after due approval of institutional ethical committee. All the subjects included in this study were willing for this study and duely filled informed consent was signed by every subject. The data for this survey will be selected from30 Patients with known history of Diabetes mellitus & need to undergo tooth extraction This is a prospective observer blind study.

Pre extraction random blood sugar level will be checked. All patients will undergo tooth extractions by standard method. Sutures will be placed to just approximate the muco-periosteal flap. Clinical criteria like pain, postoperative bleeding, socket width, postoperative infection, dry socket would also be assessed immediately postoperative as well as on the 7th day postoperative.

The data collected was subjected to statistical analysis. All the values were analyzed by chi square test and p value test. These tests were used for evaluation of statistical significance between the BSL levels and the socket healing based on the above mentioned five criteria.

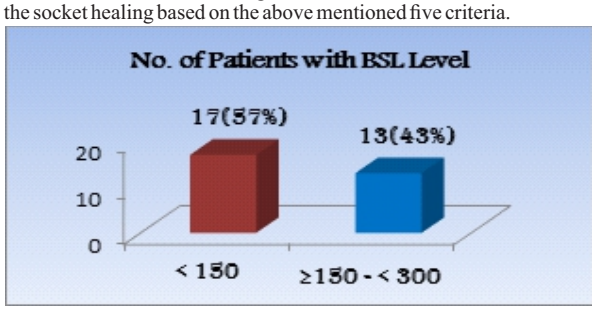

Fig. 1: Distribution of BSL Level among Admitted Patient in Dental Ward.

BSL level	No. of patients	%
< 150	17	57
≥150 - < 300	13	43
Total	30	100

Table 1: Blood Sugar Levels of patients admitted in Dental Ward.
Table.1 and Figure.1 reveals that in among all 30(100%) patient had Blood Sugar Level maximum of them that is 17(57%) had in group of less than 150 BSL and remaining 13(43%) had in group of greater than or equals to 150 and less than 300 BSL.

Pain Level	Pain Score
Mild	< 4
Moderate	4--10
Severe	> 10

Table 2: Pain level and pain score generated by using mean and standard deviation value.
After evaluation of pain level we use chi-square analysis test to find out statistical significance between different study parameters among

study such as Pain immediately post-operative, pain after 7th day, Bleeding immediately, Bleeding after 7th day, Socket Healing after post- operative, Socket Healing after 7th day, infection and dry socket with Blood Sugar Level.

Hypothesis:
H0: There was no statistical association between BSL level and different study parameters mentioned above at 95% level of significance (if P>0.05).
H1: There was statistical association between BSL level and different study parameters mentioned above at 95% level of significance(if P>0.05)

BSL Level	Mild	Moderate	Severe	Chi-Square	P-value
< 150	14	3	0		
≥150 - < 300	3	9	1	9.353	0.0093*

*mark represents significance level (Significant when P<0.05)

Table 3: Correlation between BSL level and Pain Immediately Post-Operative among the Patients.
By table 3, chi-square value 9.353 and p-value 0.0093 that means p<0.05, hence we can conclude that BSL level and pain immediately post-operative among patient undergone extraction was statistically significant.

BSL Level	Mild	Moderate	Severe	Chi-Square	P-value
< 150	16	1	0		
≥150 - < 300	8	5	0	4.887	0.0271*

*mark represents significance level (Significant when P<0.05)

Table. 4: Correlation between BSL level and Pain after 7th day among the Patients.
By table 4, chi-square value 4.887 and p-value 0.0271 that means p<0.05, hence we conclude that BSL level and pain immediately post-operative among patient undergone extraction was statistically significant.

BSL Level	Below 3mm	Above 3mm	Chi-Square	P-value
< 150	0	17		
≥150 - < 300	5	8	7.846	0.0051

*mark represents significance level (Significant when P<0.05)

Table 5: Correlation between BSL level and Socket Healing Immediately Post-Operative among the Patients
By table 5, chi-square value 7.846 and p-value 0.0051that means p<0.05, hence we can conclude that BSL level and socket healing immediately post-operative among patient undergone extraction was statistically significant

BSL Level	Below 3mm	Above 3mm	Chi-Square	P-value
< 150	17	0		
≥150 - < 300	9	4	6.036	0.014

*mark represents significance level (Significant when P<0.05)

Table 6: Correlation between BSL level and Socket Healing after 7th day among the Patients.
By table 6, chi-square value 6.036 and p-value 0.0141that means p<0.05, hence we can conclude that BSL level and socket healing after 7th day among patient undergone extraction was statistically significant.

BSL Level	Present	Absent	Chi-Square	P-value
< 150	12	5		
≥150 - < 300	13	0	4.588	0.0322

*mark represents significance level (Significant when P<0.05)

Table 7: Correlation between BSL level and Bleeding Immediately Post-Operative among the Patients
By table 7, chi-square value 4.588 and p-value 0.0322 that means p<0.05, hence we can conclude that BSL level and bleeding immediately post-operative among patient undergone extraction t was statistically significant.

BSL Level	Present	Absent	Chi-Square	P-value
< 150	0	17		
≥150 - < 300	3	10	4.359	0.0368

*mark represents significance level (Significant when P<0.05)

Table 8: Correlation between BSL level and Bleeding after 7th day among the Patients
By table 8, chi-square value 4.359 and p-value 0.0368 that means p<0.05, hence we can conclude that BSL level and bleeding after 7th day among patient undergone extraction was statistically significant.

BSL Level	Present	Absent	Chi-Square	P-value
< 150	0	17		
≥150 - < 300	2	13	1.353	0.2448

*mark represents significance level (Significant when P<0.05)

Table 9: Correlation between BSL level infection among the Patients.
By table 9, chi-square value 1.353 and p-value 0.2448that means p>0.05, hence we can conclude that BSL level and infection after 7th day among patient undergone extraction was not statistically significant.

BSL Level	Present	Absent	Chi-Square	P-value
< 150	0	17		
≥150 - < 300	3	10	4.359	0.0368

*mark represents significance level (Significant when P<0.05)

Table 10: Correlation between BSL level and dry socket among the Patients.
By table 10, chi-square value 4.359 and p-value 0.0368 that means p<0.05, hence we can conclude that BSL level and dry socket after 7thday among patient undergone extraction was statistically significant.
Conclusion: Here we can easily say from above statistical analysis that all study parameters reject null hypothesis except infection. It means all parameters were significantly associated except infection. Also we can see in all study parameters percentage of pain, bleeding, socket healing, infection, and dry socket had more in greater than or equal to 150mg/dl and less than 300mg/dl BSL group as compared with less than 150mg/dl BSL in both the groups that immediately post-operative and after 7th days.

DISCUSSION

Diabetes is considered as a risk factor for many diseases. The literature is replete with studies emphasizing the importance of strict glycemic control, especially regarding outcomes in patients in the intensive care unit.[4] There have been studies on diabetic and non-diabetic rats which provided histologic evidence of delayed or inadequate wound healing after dental extraction.[5] Management options for diabetes as depicted in Standard textbooks suggest that physician consent should be taken before tooth extraction in case of uncontrolled diabetes. The information about incidence of poor wound healing in patients with high glycemic level is well documented. Proper definition of term 'uncontrolled' is though, poorly defined. Threshold value of BSL to defer the dental treatment and warrant physician consent is still unclear. Very few studies in this regards has been done with no clear conclusion or guidelines. This study will help dentists to determine the level of blood sugar which affects the healing of the socket. This in turn will terminate the need for physician referral for non-indicated cases, & will reduce treatment time for patient. In earlier research, they have considered width of the socket as the only criteria. In this research, clinical criteria like pain, postoperative bleeding, postoperative infection, dry socket would also be assessed on the 7th day postoperative.

In the wound healing chapter in Peterson's principles of oral and Maxillofacial surgery, it is stated, "Numerous studies have demonstrated that the higher incidence of wound infection associated with diabetes has less to do with the patient having diabetes and more to do with hyperglycemia"[6] although this may be true in the general surgery and cardiothoracic literature, the results of our study suggest that these findings cannot be extrapolated to wound healing of extraction sockets.

According to Sharon Aronovich this is the first reported study in which short term healing of an extraction socket was assessed by epithelialization of soft tissue. This was achieved by an objective measurement: the of the extraction socket over a 2 week period[7]. They hypothesized that patients with periodontal disease and associated pocketing had greater collapse of surrounding tissue over the extraction site and that this contributed to what appears as a faster epithelialization rate during the first week after extraction.[7]

The mechanism of hyperglycemia and diabetes on wound healing has been investigated in a diabetic pig model[8, 9]. Serial cross-sectional

biopsy specimens of epithelial wounds were examined over an 18 days period. Epithelial wounds in diabetic pigs exhibited a significant delay in re-epithelialization compared with non-diabetic pigs. The authors also found that epithelial wound healing in diabetic pigs were correlated with a significantly decreased expression of insulin like growth factor 1 in the diabetic wound. In addition, experimentally induced wound (local) hyperglycemia in the non-diabetic pigs did not delay epithelialization[8,9].

In our study, we show the relation between the BSL level and the factors such as pain, socket width, postoperative bleeding immediately postoperative as well as on the 7th day. And postoperative infection and dry socket immediately. BSL levels measured are pre extraction random BSL. The BSL levels selected were all less than 300mg/dl. In our study, we were unable to show the difference in socket healing between well controlled and poorly controlled diabetic patients. We did not control for all medical conditions or medications in our subjects health history. Once the medically compromised patients were excluded, the other variables were deemed irrelevant. Also, the healing of the socket of different BSL levels is independent of the operator because the procedures were done randomly by a number of different students by standard method.

To our knowledge, this is the first reported study in which the socket healing was assessed based on the five factors (pain, socket width, bleeding, infection, dry socket) and its correlation with the BSL levels. Our study has some limitations as well. First, There were no equal number of patients assessed under BSL levels below 150mg/dl(17 patients) and for BSL levels 150-300md/dl(13 patients). Second, the study was not conducted for patients undergoing multiple extractions. Third, we cannot extend the recommendation to patients requiring extraction of impacted tooth. Lastly, no histological factor for epithelialization was considered.

In conclusion, our prospective study showed correlation between the BSL levels and the socket healing. It highlights the need to assess the BSL levels of the patient before undergoing extraction. And this study conducted will be helpful to the clinicians.

Conflict of interest: None.

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