

Assessment of effect of Epinephrine in diabetic patients undergoing third molar extraction

Hemanth Kumar HR¹, Vinuta Hegde^{2,*}, Rakesh Sharma³

¹Assistant Professor, ²Junior Resident, Dept. of Dentistry, Karwar Institute of Medical Sciences, Karwar, ³Clinician, Dept. of Oral Medicine & Radiology, Orocare, Bangalore

***Corresponding Author:**

Email: drvinuthahegde@gmail.com, drvinu07@yahoo.co.in

Abstract

Introduction: The most common endocrine disorders reported worldwide is diabetes and various literature have shown alteration in the plasma glucose levels after use of dental local anaesthetic containing adrenaline which has been a subject of controversy. The study was undertaken to evaluate the effect of epinephrine in healthy and diabetic patient undergoing third molar extraction.

Materials and Method: The present study was done in Department of Dentistry, Karwar Institute of Medical Sciences, Karwar. A total of 150 patients reporting to the hospital for the purpose of third molar extraction were included in the study. Electronic glucometer was used to estimate the blood glucose level in study group before administering Local Anaesthesia (LA), after administering LA and after third molar extraction. Postoperative suturing was done in all patients. The data was tabulated and analysed using SPSS software. The results were compared using student t test.

Result: The mean age of the patients was 36.2 ± 8.9 years. Before and after administration of LA the mean glucose levels in Group I were 107.5 ± 20.2 mg/dl and 108.7 ± 19.2 mg/dl, in Group II it was 195.3 ± 29.1 mg/dl and 197.5 ± 30.5 mg/dl and in Group III it was 170.5 ± 23.1 mg/dl and 168.5 ± 22.7 mg/dl respectively showing no significant difference in glucose level before and after administration of LA. Before and after extraction the mean glucose level in Group I were 107.5 ± 20.2 mg/dl and 105.5 ± 21.3 mg/dl, in Group II 195.3 ± 29.1 mg/dl and 199.9 ± 32.2 mg/dl and in Group III it was 170.5 ± 23.1 mg/dl and 223.7 ± 43.4 mg/dl respectively showing a significant difference in glucose level in Group III patients before and after tooth extraction with p value lesser than 0.05.

Conclusion: It was observed that adrenaline does not exert any significant affect on healthy and diabetic patients but in patients with untreated diabetes the glucose levels tend to rise significantly if local anaesthesia with adrenaline is administered

Keywords: Adrenaline, Diabetes, Extraction, Glucose, Third molar

Introduction

One of the most common endocrine disorder known to affect around 200 million people worldwide is diabetes.⁽¹⁾ According to WHO in the year 2000 its prevalence was 2.8% which is expected to increase to 4.4% by 2030.⁽²⁾ The International Diabetes Federation (IDF) estimates in India the total number of diabetic subjects to be around 40.9 million which is further set to rise to 69.9 million by the year 2025.⁽³⁾ Diabetes is classified into Type 1- Diabetes mellitus where autoimmune destruction of beta cells of pancreas is seen and Type 2- Diabetes mellitus where there is resistance of body cells to insulin. Pain relief is one of the foremost goals before beginning any dental treatment which is provided by the use of local anaesthesia and to prolong the duration of action of local anaesthetics a vasoconstrictor is added which offers various unmatched advantages.⁽⁴⁾ Addition of adrenaline or other catecholamine's provide a prolonged anaesthesia⁽⁵⁾ by decreasing the systemic absorption of the drug and hence decreasing its side effects,⁽⁶⁾ it also provides a bloodless field of surgery.⁽⁷⁾ In the recent times various reports have shown a significant alteration in the plasma glucose level after administration of local anaesthetic containing adrenaline⁽⁴⁾ but none of the studies provide us with conclusive evidence. Thus study was undertaken to

know the effect of epinephrine in healthy and diabetic patient who were set to undergo third molar extraction.

Materials and Method

The present prospective study was undertaken in the Department of Dentistry, Karwar Institute of Medical Sciences, Karwar for a period of 1 year from August 2016 to July 2017 after the approval of institutional ethical committee. Verbal and a written consent was obtained from all the patients in their vernacular language. This study involved a total of 150 patients who reported to the hospital for the purpose of third molar tooth extraction. In the present study 2% lignocaine with Adrenaline (1:200000) was used as a local anesthetic agent.

The study was divided into three groups. In Group I, all the patients with no medical history of diabetes were included. In Group II, diabetic patients who were on anti diabetic drugs were included. Group III included diabetic patients not on any anti diabetic drugs. Patients with head and neck space infection of non odontogenic origin and patients with unknown antibiotic intake before reporting were excluded from the study. Each category comprised of 50 patients each. Patient's complete history with demographic details was recorded. Special emphasis was given to past dental history and medical history. Patients were

advised to have their regular meals before extraction and take their usual course of medications. Electronic glucometer was used to assess the blood glucose levels in patients before administrating LA, after administrating LA and after third molar extraction. The glucose levels were estimated using electronic glucometer. Postoperative suturing was performed in all patients after the extraction. The data was tabulated and analysed using SPSS software. The results were compared using student t test. p value <0.05 was taken as significant.

Results

The study was conducted involving 150 patients. The patients were aged between 25-50 years. The mean

age of the patients was 36.21 ± 8.91 years. The mean glucose levels in healthy controls (Group I) before and after administrating LA which was 107.5 ± 20.2 mg/dl and 108.7 ± 19.2 mg/dl respectively (Table 1). The mean glucose levels amongst diabetic patients on anti-diabetic drugs (Group II) before and after administrating LA was 195.3 ± 29.1 mg/dl and 197.5 ± 30.5 mg/dl respectively (Table 1). Among the diabetic patients not on anti-diabetic (Group III) the mean glucose level before and after administrating LA was 170.5 ± 23.1 mg/dl and 168.5 ± 22.7 mg/dl respectively (Table 1). There was no significant difference in the glucose levels before and after administrating LA in all the three study groups as depicted in Fig. 1.

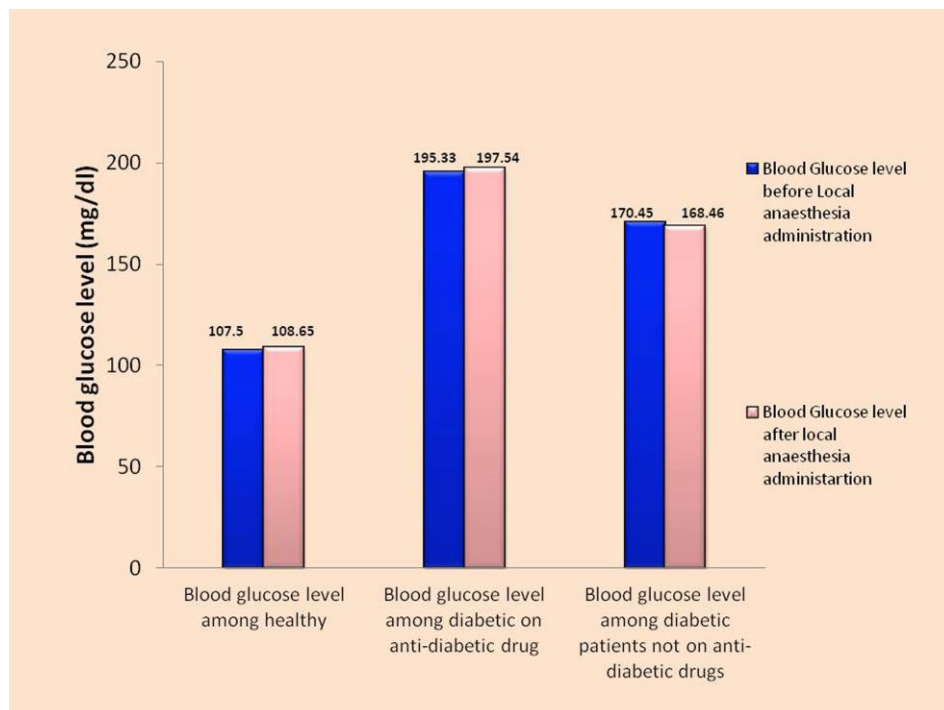


Fig. 1: Blood glucose level before and after administration of local anaesthesia

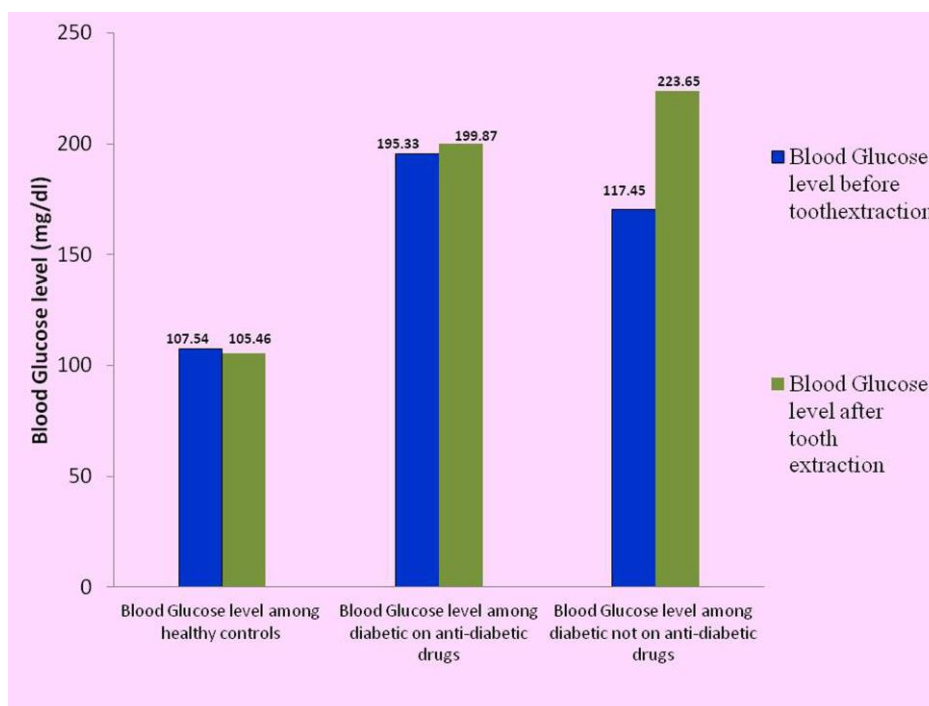
Table 2 shows the mean glucose levels amongst healthy controls (Group I) before and after extraction of third molar which was 107.5 ± 20.2 mg/dl and 105.5 ± 21.3 mg/dl respectively. The mean glucose levels in diabetic patients who were on anti-diabetic drugs (Group II) before and after extraction of third molar was 195.3 ± 29.1 mg/dl and 199.9 ± 32.2 mg/dl respectively (Table 2) and in diabetic patients not on hypoglycaemic agents (Group III) the mean glucose level before and after third molar extraction was 170.5 ± 23.1 mg/dl and 223.7 ± 43.4 mg/dl respectively (Table 2). No significant difference in the glucose level was seen in Group I and Group II before and after extraction of third molar but a significant difference in the glucose level was seen in Group III with p value lesser than 0.05 before and after extraction of third molar as depicted in Fig. 2.

Table 1: Blood Glucose level before and after Local anaesthesia

Group	Glucose levels before LA	Glucose levels after LA	Difference	p value
Group I	107.5 ± 20.2	108.7 ± 19.2	1.2	>0.05
Group II	195.3 ± 29.1	197.5 ± 30.5	2.2	>0.05
Group III	170.5 ± 23.1	168.5 ± 22.7	2.0	>0.05

Table 2: Blood Glucose levels before and after extraction

Group	Glucose level before extraction	Glucose level after extraction	Difference	p value
Group I	107.5±20.2	105.5±21.3	2.0	>0.05
Group II	195.3±29.1	199.9±32.2	4.6	>0.05
Group III	170.5±23.1	223.7±43.4	53.2	<0.05

**Fig. 2: Blood glucose level before and after extraction of third molar**

Discussion

Very few literatures are available showing the effect of local anaesthesia on the hemodynamic response of human body.^(8,9) The overall results showed no significant difference in the glucose levels before and after administering LA as well as after extraction in both Group I and Group II which is similar to study conducted by Tily and Thomas⁽¹⁰⁾ and Khawaja et al.⁽¹¹⁾ Both the studies emphasised that dental local anaesthesia with adrenaline can be safely administered in healthy as well as in diabetic patients who are on hypoglycaemic agents. These authors have observed that glucose levels significantly rises in diabetic patients who are not on any hypoglycaemic agents after the tooth extraction which is in concordance with our study.^(10,11) John and Meehan et al showed a significant rise in glucose level in patients who are diabetic but not on anti-diabetic drugs when epinephrine was given at 10 and 20 minutes compared to base line and to injection of epinephrine free solution.⁽¹²⁾ Thus indicating that hypoglycaemic agents taken by patient mask the affect of adrenaline on glucose levels.

Sherwin et al⁽¹³⁾ has shown that increase in blood glucose levels has been associated with diabetic patients after administration of local anaesthesia with adrenaline. Cryer et al,⁽¹⁴⁾ Ra et al⁽¹⁵⁾ and Vernillo et

al⁽¹⁶⁾ have found out that both endogenous and exogenous catecholamine release affects suppression of the insulin secretion stimulating both glycogenolysis and glyconeogenesis to produce hyperglycaemia. Study by Ad et al⁽¹⁷⁾ showed that addition of adrenaline to LA produces a profound anaesthetic effect, thus reducing the stress on patient and hence reduction in the release of endogenous epinephrine. Study conducted by Mahima goel et al⁽¹⁸⁾ in the year 2016 also observed similar significant increase in glucose levels amongst diabetic patients who were not on hypoglycaemic drugs.

Conclusion

Adrenaline does not exert any significant affect on healthy and diabetic patients. But in patients with untreated or undiagnosed diabetes, the glucose levels tend to rise significantly if local anaesthesia with adrenaline is administered.

References

1. Imani SF, Hashemipour M, Kelishadi R. Lipid profile of children with type in diabetes compared to controls. *ARYA Journal*. 2006;2(1):36-8.
2. Makandar A, Sonagra AD, Shafi N. Study of thyroid function in type 2 diabetic and non-diabetic population.

- International Journal of Medical Science and Public Health*. 2015;4(6):769-72.
3. International Diabetes Federation 2006. Diabetes Atlas. 3rd edition, International Diabetes Federation, Belgium, pp. 387.
 4. Meechan J.G, Robb N.D, Seymour R.A. Pain and anxiety control for the conscious dental patient. Oxford University Press, New York, P29–42.
 5. Keesling G.R, Hinds E.C. Optimal concentrations of epinephrine in Lidocaine solutions. *J Am Dent Assoc* 1963;66:337–340.
 6. Cannell H, Walter H, Beckett A.H, Saunders, A. Circulating levels of lignocaine after peri-oral injections. *Br Dent J* 1975;138:87–93.
 7. Jastak, J.T, Yagiela, J.A. Vasoconstrictors and local anesthesia. A review and rationale for use. *J Am Dent Assoc* 1983;107:623–630.
 8. Meechan JG, Rawlins MD. A comparison of the effect of two different dental local anaesthetic solutions on plasma potassium concentration. *Br Dent J* 1987;163(6):191-3.
 9. Cheraskin E. Use of epinephrine with local anesthesia in hypertensive patients. III. Effect of epinephrine on blood pressure and pulse rate. *J Am Dent Assoc* 1958;57(4):507-19.
 10. Tily F.E, Thomas S. Glycemic effect of administration of epinephrine-containing local anesthesia in patient undergoing dental extraction, a comparison between healthy and diabetic patient. *Int Dent J* 2007;57(2):77–83.
 11. Khawaja NA, Khalil H, Parveen K, Alghamdi AM, Alzahrani RA, Alherbi SM. An influence of adrenaline (1:80,000) containing local anesthesia (2% Xylocaine) on glycemic level of patients undergoing tooth extraction in Riyadh. *Saudi Pharm J* 2014;22(6):545-9.
 12. John G, Meechan. Epinephrine, Magnesium, and dental local anesthetic solutions. *Anesth Prog* 1996;43:99–102.
 13. Sherwin RS, Shamooh H, Hendle R, Sacca L, Eigler L, Walesky M. Epinephrine and the regulation of glucose metabolism effect of diabetes and hormonal interactions. *Metabolism* 1980;29:1146–1154.
 14. Cryer PE. Catecholamines and metabolism. *Am J Physiol* 1984;247:E1–E3.
 15. Rizza RA, Cryer PE, Haymond, MW, Gerich JE. Adrenergic mechanisms for the effects of epinephrine on glucose production and clearance in man. *J Clin Invest* 1980;65:682–689.
 16. Vernillo AT. Dental considerations for the treatment of patients with diabetes mellitus. *Am Dent Assoc* 2003;134:24–33.
 17. Cherrington AD, Fuchs H, Stevenson RW, Williams PE, Alberti KG, Steiner KE. Effect of epinephrine on glycogenolysis and glycogenesis in conscious overnight-fasting dogs. *Am J Physiol* 1984;247:137–144.
 18. Goel M, Nagpal R, Sidhu J, Haranal S D, Kumar A. Clinical Assessment of Impact of Adrenaline on Blood Glucose Levels in Patients Undergoing Dental Extraction. *Journal of International Oral Health* 2016;8(4):498-501.