

ORIGINAL ARTICLE

USEFULNESS OF EPINEPHRINE IN LOCAL ANAESTHESIA FOR MONITORING HEMODYNAMIC PARAMETERS OF TYPE 2 DIABETIC PATIENTS UNDERGOING TOOTH EXTRACTION: A PROSPECTIVE STUDY

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ABSTRACT:

Background: Lidocaine is one of the commonly used local anaesthetic solutions for dental procedures. Effect of epinephrine on the blood glucose concentration is a topic of controversy. Hence; we planned this study to investigate the effect of epinephrine containing local anaesthetic solutions on the blood glucose levels and hemodynamic parameters of the diabetic patients undergoing oral surgical procedures and further compare these findings in diabetic patients who received non- epinephrine containing anaesthetic solutions.

Materials & methods: The present randomized study included assessment of the Type 2 diabetic patients who required extraction of minimum of one posterior tooth due to caries, mobility or any other minor pathologic reason as decided on the basis of radiographic and clinical diagnosis. All the patients were randomly divided into two study groups. Group 1 comprised of those diabetic patients who received plain solution of 2 percent lidocaine as local anaesthetic solution while Group 2 included diabetic patients who received 2 percent lidocaine with epinephrine at a concentration of 1: 100000. Automated sphygmomanometer was used for measurement of systolic and diastolic blood pressure (BP) at different time intervals. Assessment of all the results was done by SPSS software. **Results:** Non-significant results were obtained while comparing the mean blood glucose concentration in between the two study groups at initial baseline period and during the procedural period. **Conclusion:** Epinephrine when delivered with lidocaine has no significant effect on the glycaemia state and the hemodynamic parameters of the diabetic patients.

Key words: Diabetic, Epinephrine, Lidocaine

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INTRODUCTION

Pain control forms one of the most important and indispensable part of the field of dentistry. For carrying out various major and minor surgical procedures in the oro-facial regions, local anaesthetic solutions are routinely used. List of local anaesthetics solutions employed these days in the field of dentistry is very long. All these different anaesthetic solutions have their advantages and disadvantages.¹ Lignocaine is one of the commonly used local anaesthetic solutions and is also routinely used by various researchers for making comparison with newer generations of local anaesthetic solutions.² Minimal toxicity and minimal adverse effects are few reasons responsible for its high usage in dental clinics. Various constituents are added to it for increasing the efficacy of the anaesthetic solutions. One such group of agents are the vasoconstrictors, namely the epinephrine.³ Topic of

controversy is regarding the effect of epinephrine on the blood glucose concentration. With the increase in prevalence of various metabolic diseases in the present world, incidence of Diabetes Mellitus (DM) is also rising with time, predominantly the type 2 DM.⁴ Whereas one side, type 1 DM is characterized by predominant lack of insulin production, in type 2 DM, physiologic effect of insulin is insufficient. Various target organs are potentially affected by persistent hyperglycaemia in DM, with various micro-vascular abnormalities resulting in serious oral manifestations.⁵ Type 2 DM patients are associated with increased prevalence of periodontal diseases and other oral pathologies. Therefore, the DM patients are frequently subjected to oral surgical procedure under local anaesthesia.⁶ However; there is still paucity of data regarding the effect of local anaesthetic solution and its different components on the blood glucose levels of the type 2 DM patients. Hence;

we planned this study to investigate the effect of epinephrine containing local anaesthetic solutions on the blood glucose levels and hemodynamic parameters of the diabetic patients undergoing oral surgical procedures and further compare these findings in diabetic patients who received non-epinephrine containing anaesthetic solutions.

MATERIALS & METHODS

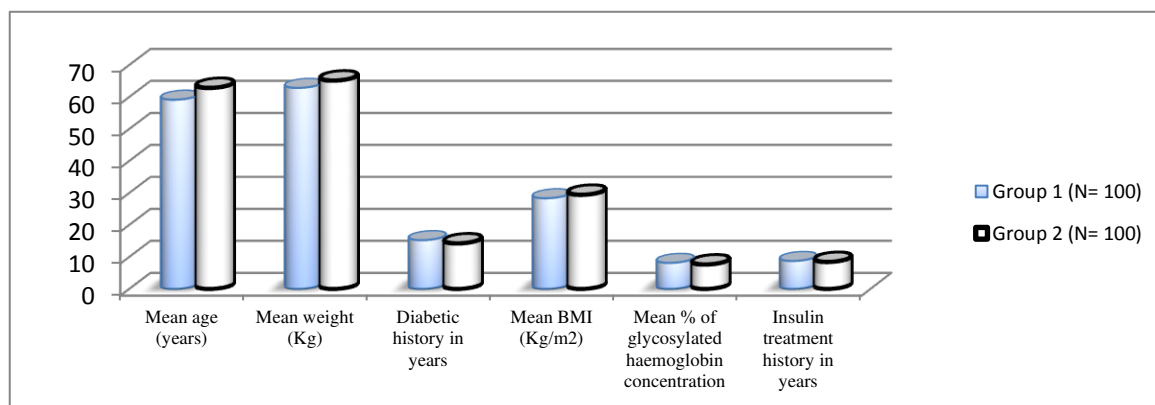
The present randomized study was conducted in the dental wing of the tertiary health care centre and included assessment of the Type 2 diabetic patients who reported from September 2014 to September 2016. Ethical approval was taken from the ethical committee of the centre and written consent was obtained from all the patients after explaining in details the entire research protocol. All the diabetic patients were included in the present study that were medicinal therapy for diabetes either through insulin or through other pharmacological agents and had controlled diabetes and required extraction of minimum of one posterior teeth due to caries, mobility or any other minor pathologic reason as decided on the basis of radiographic and clinical diagnosis. Dexcom Continuous Glucose Monitoring system (CGMS, Dexcom) was used for the assessment of the levels of blood glucose at different points of time. At every five minutes interval, monitoring of the blood glucose levels could be done with the help of this glucose monitoring device. Installation of the device in the morning was done followed by carrying out of the surgical procedure in after 24 hours by the same clinician. All the patients were randomly divided into two study groups. Group 1 comprised of those diabetic patients who received plain solution of 2 percent lidocaine as local anaesthetic solution while Group 2 included diabetic patients who received 2 percent lidocaine with epinephrine at a concentration of 1:100000. Standard Malamed's technique was used for delivering the same volume of anaesthetic solution through a syringe.⁷ After one hour of the surgical procedure; the monitor for assessing the value of blood glucose was removed and data were recorded. First value recorded was designated as Time 0 (initial recorded values), Time 1 referred to the time an hour before the

commencement of surgery, Time 2 referred to the time of 6 minutes before the surgical procedure, Time 3 referred to the time after delivering of the local anaesthetic injection, Time 4 referred to the time of ending of the surgical procedure while Time 5 referred to the time of one and half hour after the surgery. Time period from Time 0 to Time 1 was taken as baseline period while time period from Time 1 to Time 4 was taken as procedural time. Automated sphygmomanometer was used for measurement of systolic and diastolic blood pressure (BP) at different time intervals. Post-operatively, amoxicillin plus clavulanic acid (500+ 125 mg) 8 hourly for 5 days was given to control post-operative infection. Assessment of all the results was done by SPSS software. Student t test, one way ANOVA and chi-square was used for comparing the data in between the two study groups. P-value of less than 0.05 was taken as significant.

RESULTS

Mean age of the patients in group 1 and group 2 was found to be 59.1 years and 62.8 years respectively. Diabetic history of 15.2 years was observed in group 1 patients while in group 2, diabetic history of 14.2 years was observed (**Table 1**). Non-significant difference was obtained while comparing the mean Body mass index, mean glycosylated haemoglobin concentration and treatment history by insulin in between the two study groups (**Graph 1**). Mean glucose concentrations in group 1 patients at baseline period was found to be 161 mg/dL while during the procedural period, the mean glucose concentrations in the blood was found to be 154 mg/dL (**Graph 2**). Non-significant results were obtained while comparing the mean blood glucose concentration in between the two study groups at initial baseline period and during the procedural period (**Table 2**). Variation in the mean blood glucose concentration in both the study groups at different points of time is highlighted in **Graph 3**. **Graph 4** and **Graph 5** shows the mean diastolic and mean systolic blood pressure in both the study groups at different points of time. At Time 5, mean systolic blood pressure among group 1 and group 2 patients was found to be 149 and 138 mm of mercury.

Graph 1: Demographic details of the patients in both the study groups



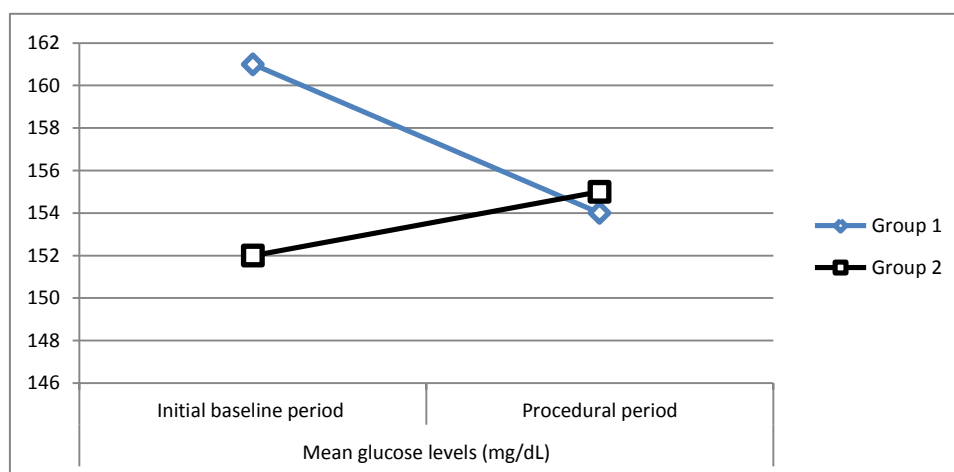
BMI: Body Mass Index

Table 1: Statistical analysis for comparison of demographic details of the patients

Clinical parameter	Group 1 (N= 100)	Group 2 (N= 100)	p-value
Mean age (years)	59.1	62.8	0.51
Mean weight (Kg)	62.8	65.1	0.57
Diabetic history in years	15.2	14.2	0.71
Mean BMI (Kg/m ²)	28.3	29.4	0.48
Mean % of glycosylated haemoglobin concentration	8.1	7.6	0.58
Insulin treatment history in years	8.7	8.4	0.37

BMI: Body mass index

Graph 2: Mean blood glucose concentration at baseline initial time and during the procedure

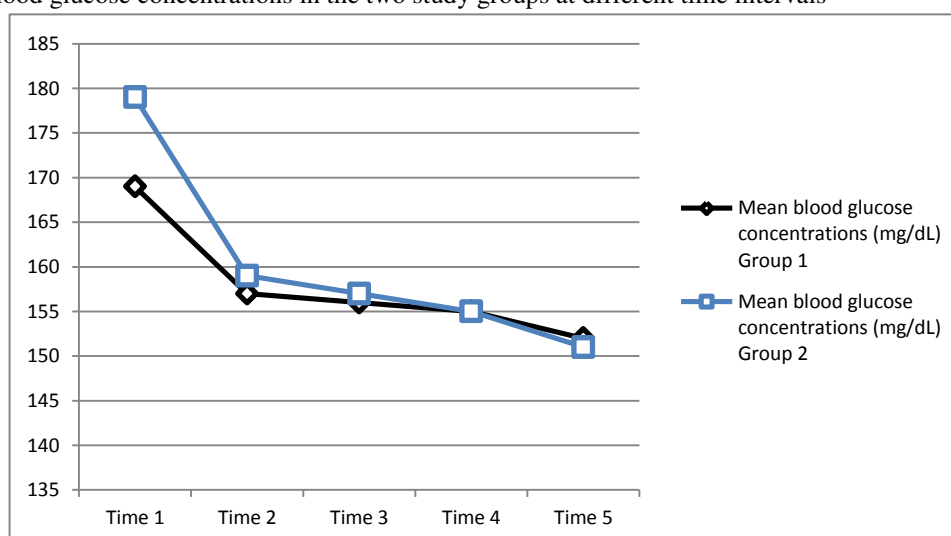


Mean glucose concentration in mg/dL

Table 2: Statistical analysis for Mean blood glucose concentration in between study groups at different time intervals

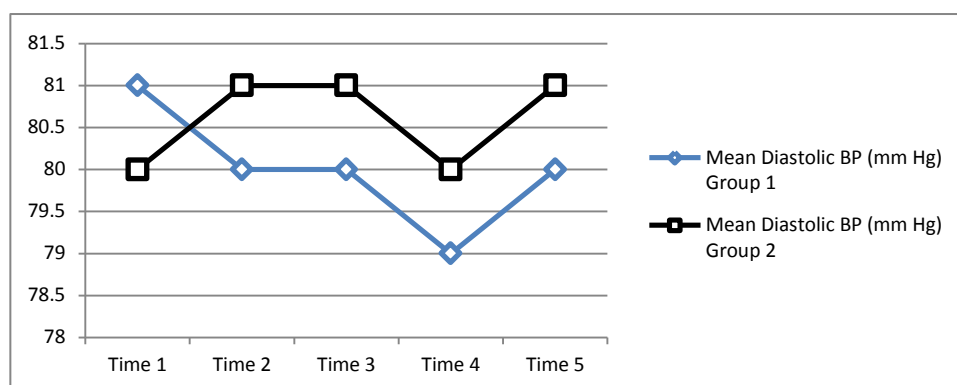
Parameter	Mean glucose levels (mg/dL)		p-value
	Initial baseline period	Procedural period	
Group 1	161	154	0.75
Group 2	152	155	0.63

Graph 3: Mean blood glucose concentrations in the two study groups at different time intervals

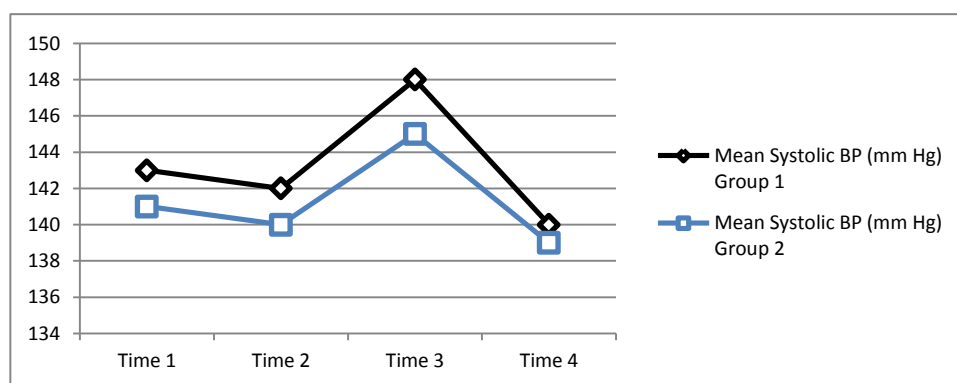


Mean glucose concentration in mg/dL

Graph 4: Mean Diastolic Blood pressure in patients of both the groups at various time intervals



Graph 5: Mean Systolic Blood pressure in patients of both the groups at various time intervals



DISCUSSION

One of the chief problems responsible for bringing patients to the clinicians is pain of varying intensity. For controlling the intra-operative pain, local anaesthetic solutions are routinely employed by the dentists.⁸ For carrying out various minor and major surgical procedures, use of local anaesthesia is mandatory for the oral surgeons and clinicians. One of the commonly employed agents for producing local anaesthesia is lidocaine with or without epinephrine.⁹ Hence; we planned this study to comparatively evaluate the effect of non-epinephrine lidocaine and epinephrine containing lidocaine on diabetic patients undergoing various oral surgical procedures.

In the present study, no significant differences were observed on comparing the demographic details of the patients (**Graph 1, Table 1**). We also didn't observe any also observe any significant difference on comparing the mean blood glucose concentrations in the patients of the two study groups (**p-value > 0.05**) (**Graph 2, Table 2**). Tily et al compared the effect of administration of epinephrine-containing local anaesthesia on the blood glucose levels in healthy and diabetic patients. They assessed 30 diabetic patients and 30 healthy controls and observed non-significant difference in the mean blood glucose levels at pre-operative and post-operative time when compared in between healthy and diabetic groups. They also didn't observe any significant correlation between the change in the mean blood glucose levels and the number of carpules use. They concluded that in

diabetic patients, it is safe to use epinephrine containing local anaesthetic solutions.¹⁰

Mestre Aspa et al compared the heart rate and oxygen saturation levels in patients who underwent third molar extractions with three different local anaesthetic agents containing same concentration of epinephrine. They randomly divided patients into three study groups depending upon the type of local anaesthetic solution administered. They observed that variation was shown only for the heart rate among the patients regardless of the type of local anaesthetic solution used. From the results, they concluded that stress and anxiety are the common factors that can cause significant variations of the certain parameters at certain moments during extraction of third molars.¹¹ Variation in the results of various above mentioned studies in relation to our study can be due to alterations occurring in the demographic and clinical details of the patients and time and difference in the method employed in various studies for the assessment of the blood glucose levels at various time intervals. However; continuous monitoring of blood glucose levels at different time intervals adds to advantage of our study over previous studies.

In both the study groups, mean blood glucose levels showed a significant downfall over a period of time in the patients of both the groups (**Graph 3**). Over the period of time, significant falls in the levels of mean blood glucose were observed in the present study. Very few studies in the past to the best of our knowledge in the past have utilized these parameters.¹² We didn't

observe any significant difference in between the two study groups in relation to Diastolic BP and systolic BP (**Graph 4, Graph 5**). Our results were in correlation with the results of previous studies who also observed similar findings.^{12, 13} Patil et al assessed the efficiency of an admixture of lidocaine with clonidine in relation to the various anaesthetic and hemodynamic parameters in comparison with lidocaine-epinephrine solution. They analyzed 50 patients with moderate hypertension who underwent upper third molar extraction. They didn't observe any significant difference between the two agents in relation to the duration of onset of action, intensity of anaesthesia or other hemodynamic properties. From the results, they concluded that in patients with hypertension undergoing intraoral block anaesthesia, Clonidine could be a useful and safe alternative.¹⁴ Brkovic et al evaluated the effect of lidocaine with clonidine or epinephrine on hemodynamic parameters in patients undergoing maxillary third molar surgeries. They observed that in all the patients of both the study groups, similar variations were observed in relation to hemodynamic parameters. From the results, they concluded that for intraoral infiltration anaesthesia, lidocaine and clonidine combination seems to be a safer and equally effective alternate for lidocaine and epinephrine combination.¹⁵ Garutti et al compared the effect of lidocaine with and without epinephrine in patients receiving thoracic paravertebral block. They prospectively evaluated 50 patients who were planned for pulmonary resection surgery. They divided their patients broadly into two study groups; patients of one group received lidocaine while in other groups, the patients received lidocaine in combination with epinephrine. From the results, they concluded that cardiodepressive effects associated with lidocaine were attenuated with the addition of epinephrine to lidocaine when performing thoracic paravertebral block.¹⁶ Santos-Paul investigated the alterations occurring in the blood glucose levels and various hemodynamic parameters occurring in type 2 diabetic patients and patients with coronary diseases undergoing extractions under local anaesthesia with and without epinephrine. They prospectively analyzed 70 patients but didn't observe any significant alterations in the mean blood glucose levels at different time intervals in between the various study groups.¹²

CONCLUSION

Under the light of above results, the authors conclude that epinephrine when delivered with lidocaine has no significant effect on the glycaemia state and the hemodynamic parameters of the diabetic patients undergoing oral surgical procedures in comparison with non-epinephrine containing lidocaine. However, future studies are recommended for assessing the effect of various other solutions on the metabolic system of diabetic patients.

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