Comparative Analysis of Different Variables on Complications of Local Anesthesia in Dentistry

Syed Hassan Ali Shah[1], Karim Ullah[2], Zubair Ahmad[2], Maya Malik[3]
[1]Demonstrator Anesthesia, Premier Institute of Health and Management Sciences, Peshawar, Pakistan.
[2]Anesthesia Department, Northwest General Hospital and Research Center Peshawar, Pakistan.
[3]Anesthesia Department, Peshawar General Hospital, Peshawar, Pakistan.
Corresponding Author*: Syed Hassan Ali Shah (hassanofficial1211@gmail.com)

ABSTRACT
Background: With continuous progress in medicine and treatments, anesthetists will more often have to treat risk patients in dental surgeries. Therefore there is a need to compare the rate of incidence of complications with risk factors so we can minimize the drug-related complications in patients undergoing dental anesthesia. The study aimed was to evaluate the incidence rate of local anesthetic complications in dentistry and also to analyze the effect of different risk factors on the incidence of local anesthetic complications.
Methods: It was an observational cross-sectional study conducted at the Maxillofacial Department in Sardar Begum Dental College and Hospital. Once the patient signed a consent form, Performa was used to collect patient data. The patients were given lidocaine 2% with 1:100,000 epinephrine by either infiltration or inferior alveolar nerve block (IANB) injection or by both techniques to induce anesthesia, then underwent different dental procedures. We focused on six complications and six different risk factors regarding the total population in our study Performa.
Results: Our study included 207 dental patients in total, of which 45% were men and 55% were women. The overall complications observed during the study were 11.5% of patients receiving dental local anesthesia in which non-risk factor patients were 6.7% and risk factor patients were 4.8%.
Conclusion: The current study reports a high incidence of dental local anesthetic complications, including bleeding, tachycardia, and salivation. In addition, this study also reports the high incidence of bleeding and tachycardia in diabetic and hypertensive patients. Hence study recommends that dentists should take medical history before each procedure to reduce risk of complications associated with dental anesthesia.
Keywords: Local anesthesia, Complications, Dental procedures, Risk factors.

HOW TO CITE: Shah SHA, Ullah K, Ahmad Z, Malik M. Comparative Analysis of Different Variables on Complications of Local Anesthesia in Dentistry. National Journal of Life and Health Sciences. 2024 Sept; 3(2), 76-79.
DOI: https://doi.org/10.62746/njlhs.v3n2.56
Date of Submission: 29/03/2024 Date of Revision: 25/05/2024 Date of Acceptance: 28/08/2024

INTRODUCTION

One possible benefit of local infiltration anesthesia is that it can be administered with so-called unmonitored anesthesia; however, most centers like to use sedation as a component of a monitored anesthesia care technique to improve patient and surgeon acceptance. Even though it's inexpensive, easy to use, and safe.[1] Local anesthetics block the inflow of sodium ions to stop neural conduction. Typically, this happens after they diffuse through the neural membrane and enter the exoplasm, where they block sodium channels from becoming active or "open"[2] Dental science has benefited greatly from the invention of local anesthetic in 1844. There have been numerous new anesthetics developed since then. Drugs used most frequently in dentistry are local anesthetics. Approximately 50,000,000 are administered annually, based on conservative estimates[3] In dentistry, local anesthetics are the safest and most efficient medications for the prevention and treatment of pain. They are the cornerstone of pain control techniques. For most patients, however, the most uncomfortable and terrifying aspect of their dental visit is administering these medications. Of all the tools used to administer local anesthetics, the needle is the one that causes the most anxiety.[4]

The most often utilized amide-based local anesthetics in clinical dentistry are prilocaine, mepivacaine, articaine, lidocaine, and bupivacaine. Local anesthetics, which are relatively insoluble, unstable, and weakly basic, contain buffering hydrochloric acid (HCl) to stabilize the amide's ph. Vasoconstrictors like felypressin and epinephrine are frequently added to compensate for vasodilation, reduce blood flow at the injection site, and lengthen the duration of the local anesthetic effect because amides cause vasodilation, which reduces the efficacy of the local anesthesia.[5] Locally and methodically evaluating complications related to local anesthetics is possible. Psychogenic reactions, systemic toxicity, methemoglobinemia, and allergies are often reported as common systemic reactions. Injection-related pain, needle fractures, prolonged anesthesia, a variety of sensory disorders, lack of effect, infection, hematoma, gingival lesions, soft tissue injury, and ophthalmological complications are cited as common local complications.[6]

Research Article
ISSN: 3006-5852 & ISSN: 3006-5844

Freitag (1966) reported a 7% incidence of complications related to dental anesthesia (21 cases out of 299), and Persson (369) reviewed 2960 cases and found a 2.5% incidence of side effects related to dental anesthesia.[7] Although frequently disregarded, the dentist's contribution to the entire healthcare team is crucial when it comes to hypertension screening. In order to reduce morbidity and mortality, dental professionals can thus be extremely important in the screening process for undiagnosed hypertension and subsequent referral to a medical professional.[8]

Clinical procedures should be carefully evaluated in dentistry to reduce the risks involved in finishing dental procedures on patients with cardiovascular disease. Controlling pain is essential for minimizing brief episodes that could lead to adverse cardiovascular consequences, especially in patients with anxiety disorders.[9] Approximately two-thirds of pregnant women in Australia do not seek medical advice, even when a dental problem arises, according to George and colleagues in a 2012 review on perceptions of dental procedures during pregnancy. Hence, dental care is often a reason for concern both among women and their health care providers.[10] Following dental local anesthetic injections, there have been reports of altered glucose plasma levels.[11] There are three cases of diabetes that go undiagnosed for every four cases that are known to exist. Oral lesions are frequently an early sign of diabetes; a dentist may save a life by identifying diabetes that was previously undetected.[12] Due to the presence of contaminated instruments, blood, and saliva, there is the highest risk of cross-infection between patients, dentists, and surgical assistants.[13]

The aim of this research was to better understand and explore the relationship between different risk factors and the outcome of local anesthetic-related complications during dental procedures. The results of this investigation offer a thorough examination and contrast of these factors, offering significant perspectives to the dentistry domain.

MATERIALS AND METHOD

An observational cross-sectional study was carried out at the Maxillofacial Department in Sardar Begum Dental College and Hospital Peshawar, Pakistan, from August 2022 to January 2023. A total of 207 males and females were enrolled in the study and presented for their dental procedures by a non-probability convenient sampling technique. Elective dental treatments, a participant's age between 18 and 60, pregnancy, heart disease, and diabetes were the inclusion criteria for the study's subjects. Conversely, patients with recent oral injuries as well as pediatric and geriatric patients were excluded according to certain criteria. The sample size was calculated with an unlimited population, a confidence interval of 95%, and a margin of error of 5% with 16% of prevalence.

The data collection procedure was conducted after approval from the ethical committee of the institute and also with the permission of the head of the department of Sardar Begum Dental Hospital. A consent form was signed first by the patient and then information was collected with the help of Performa. The first part of the Performa consisted of demographical data including the patient's age, gender, and procedure however second part included a list of six risk factors (cardiac patients, hypertension, pregnancy, infections, respiratory and diabetic patients) which were asked pre-procedure and also six complications (bleeding, tachycardia, salivation, localized edema, paralysis, and allergic reactions) which were observed intra as well as post-procedure. Information on dosages and technique types utilized for each patient was included in the final section of the Performa that addressed anesthesia considerations employed throughout the procedure.

SPSS software version 26 was used in the study for data entry, analysis, and interpretation. In addition, one sample t-test was used to detect the variation between different variables, also a linear regression analysis was used to describe and predict one quantitative variable from another.

RESULTS

Out of 207 participants who were enrolled in the study, 45% were male and 55% were female. The male-to-female ratio was similar with slight female dominance (Table 1).

Table 1: Gender-based representation of demo-graphical data.

Demographical Consideration	
Gender	Percentage
Male	45%
Female	55%

The results of complications that were observed in the study in descending order and the frequency as well as percentage of each complication is mentioned in the table in which bleeding has a higher incidence rate and three of the complications did not occur during the study but were mentioned (Table 2).

Table 2: Incidence of Complications

Complications	Total No	Percentage
Bleeding	10	4.83%
Tachycardia	8	3.86%
Salivation	6	2.89%
Allergic Reactions	0	0.00%
Localize Edema	0	0.00%
Paralysis	0	0.00%

A significant association between gender and complications of dental local anesthesia with a higher incidence of complication in females than males (Table 3). The result of complications that occurred in risk factor patients. Bleeding was observed in hypertensive and diabetic patients, cardiac patients and hypertensive patients experienced tachycardia while salivation was only seen in patients with infections. On the other hand, no complications were

noted in pregnant women and respiratory disease patients (Table 4).

Table 3: Gender-based incidence of complications

Complications	Paralysis	Localized Edema	Allergic Reaction	Salivation	Tachycardia	Bleeding
Male	0	0	0	2	3	4
Female	0	0	0	4	5	6

Table 4: Risk Factors based incidence of Complications

Parameter	Cardiac Patients	Hypertension	Infection	Diabetic Patients	Pregnancy	Respiratory Disease
Bleeding	0	2	0	2	0	0
Tachycardia	1	3	0	0	0	0
Salivation	0	0	2	0	0	0
Allergic Reaction	0	0	0	0	0	0
Localized Edema	0	0	0	0	0	0
Paralysis	0	0	0	0	0	0

DISCUSSION:

According to the results above, about 26% of the total sample size of patients had one or more concomitant diseases in their medical histories which were enrolled as Risk Factor Patients in which the percentage of males was higher than females (65% Males, 35% Females). The overall Complications observed during the study were 11.5% of patients receiving local dental anesthesia in which non-risk factor patients were 6.7% and risk factor patients were 4.8% respectively. According to gender-related complications, the overall percentage was higher in females about 7.2% than in males about 4.3%. Based on prior research that we have studied, the percentage of complications was found to be 3.5% in patients without risk factors and 5.7% in patients with risk factors who received local dental anesthesia.[7] By comparing the current study with the previous study, as can be seen above, there was a difference: in the previous study, the percentage of complications was slightly higher in patients with risk factors, but in patients without risk factors, the percentage of complications was not as high in the current study.

This profile of risk factor patients and the incidence of complications associated with dental anesthesia underlying the necessity for taking an adequate medical history before the dental procedure is by far the simplest and most efficient method for the detection of risk factors. However, taking medical history is not part of the daily routine. According to a study, only 12.9% of 541 dentists surveyed always get a medical history before treatment, and 14.5% stated that they had never taken a patient's medical history.[7] Hence we recommend that dentists should take a medical history before the procedure to reduce or even prevent complications associated with dental anesthesia because it enables the dentist to apply differentiated anesthesia that meets the special requirements of the patients. Hence same considerations were followed and proper history for each patient was taken before the treatment to protect them from complications and make their treatment under special anesthesia protocol in the current study. The study narrowed its focus to particular complications, so missing other important consequences related to local anesthetic complications associated with risk factors in dentistry may be study limitations.

CONCLUSION

The current study demonstrates the incidence of dental local anesthetic complications and these complications include bleeding, tachycardia, and salivation. In addition, this study also reports an association of complications with risk factor patients in which the incidence of bleeding and tachycardia was high in hypertensive patients.

CONFLICT OF INTEREST:

None

FUNDING SOURCES:

None

REFERENCES

1. White PF. Optimizing Anesthesia for Inguinal Herniorrhaphy: General, Regional, or Local Anesthesia? Anesthesia & Analgesia. 2001;93(6):1367-9.
2. Becker DE, Reed KL. Essentials of local anesthetic pharmacology. Anesthesia progress. 2006;53(3):98-109.
3. Kaufman E, Galili D, Garfunkel AA. Intraligamentary anesthesia: a clinical study. The Journal of Prosthetic Dentistry. 1983;49(3):337-9.
4. Kumar S. Newer delivery systems for local anesthesia in dentistry. J Pharm Sci Res. 2015;7(5):252-5.
5. Tom K, Aps J. Intraosseous anesthesia as a primary technique for local anesthesia in dentistry. Clin Res Infect Dis. 2015;2(1):1012.
6. Yalcin BK. Complications associated with local anesthesia in oral and maxillofacial surgery. Topics in local anesthetics. 2019:151.
7. DaublÃ M, MÃ¼ller R, Lipp M. The incidence of complications associated with local anesthesia in dentistry. Anesthesia progress. 1997;44(4):132.

Research Article
ISSN: 3006-5852 & ISSN: 3006-5844

8. Southerland JH, Gill DG, Gangula PR, Halpern LR, Cardona CY, Mouton CP. Dental management in patients with hypertension: challenges and solutions. Clinical, cosmetic and investigational dentistry. 2016:111-20.
9. Guimaraes CC, Motta RHL, de Cássia Bergamaschi C, de Oliveira Araújo J, de Andrade NK, Figueiró MF, et al. Local anaesthetics combined with vasoconstrictors in patients with cardiovascular disease undergoing dental procedures: systematic review and meta-analysis protocol. BMJ open. 2017;7(11):e014611.
10. Hagai A, Diav-Citrin O, Shechtman S, Ornoy A. Pregnancy outcome after in utero exposure to local anesthetics as part of dental treatment: A prospective comparative cohort study. The Journal of the American Dental Association. 2015;146(8):572-80.
11. Tily FE, Ajman ST. Glycemic effect of administration of epinephrine-containing local anaesthesia in patients undergoing dental extraction, a comparison between healthy and diabetic patients. International dental journal. 2007;57(2):77-83.
12. Burket LW, Sindoni Jr A. Diabetes and the dental patient. The Journal of the American Dental Association. 1959;58(2):81-5.
13. Georgescu CE, Skaug N, Patrascu I. Cross infection in dentistry. Romanian Biotechnological Letters. 2002;7:861-8.