

# Knowledge of local anesthetics anaphylaxis among dental practitioners in a Nigerian Tertiary Hospital

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## ABSTRACT

**Background:** Anaphylaxis is an acutely presenting life-threatening medical emergency. Studies have shown that dentists feel inadequately able to recognize and treat anaphylaxis. This study aims to determine the level of knowledge of local anesthetic (LA) anaphylaxis among dentists in a Nigerian Teaching Hospital.

**Methods:** This cross-sectional, questionnaire-based study was conducted among dental practitioners at the Dental complex of the University of Benin Teaching Hospital, Nigeria from August 2020 to January 2021. The questionnaire consisted of 21 items divided into four main sections: (1) Demographic characteristics, (2) general knowledge on local anesthetic anaphylaxis, (3) knowledge on signs and symptoms of local anesthetic anaphylaxis, (4) knowledge on treatment of local anesthetic anaphylaxis. Data was analyzed using Statistical Package for Social Sciences version 20.0, IBM, Armonk, NY, USA.

**Results:** The 101 respondents approached agreed to participate in the study. There were more males (64.4%) compared to females. Majority of the respondents were aged 30 -39 years. None of the respondents knew completely all the signs and symptoms of anaphylactic reaction from LA. None of the respondents got the complete drugs to be kept in the office for LA anaphylaxis. Less than half (43.6%) of the respondents knew that epinephrine is the drug of first choice for anaphylactic reactions. Only 50(49.5%) of the respondents knew that the best route for epinephrine administration is intramuscular route.

**Conclusion:** Adequate knowledge on anaphylaxis from local anesthesia is lacking among dental practitioners in our centre.

**Keywords:** Awareness, dental, local anaesthetic, anaphylaxis

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## INTRODUCTION

There is a global increase in the use of local anesthetic by dentists in their daily practice<sup>1</sup>. Though methylparaben, known to cause allergy, was removed from the current local anesthetic, some cases of anaphylaxis are still being reported due to lidocaine<sup>2,3</sup>. The word anaphylaxis comes from the Greek terms "ana" meaning backward and "phylaxis" meaning protection. Since the terminology was introduced by Porter and Richet<sup>3</sup>

in 1902; it has been used to describe the acute systemic reaction caused by the action of vasoactive substances excessively released from mast cells and basophils, as well as from mediators' cascades<sup>4</sup>. Warmth and itching mainly in the axilla and groin area combined with anxiety and panic can be the early visual symptoms. Skin testing and serology such as tryptase levels help in initial diagnosis of anaphylaxis at the clinical level<sup>5</sup>. If it goes unnoticed or untreated, the reaction may

gradually progress into urticaria rash and inflammation of neck and face leading to spasm of the bronchi and laryngeal edema<sup>6</sup>.

Anaphylaxis is an acutely presenting and life-threatening medical emergency<sup>7</sup>. It is characterized by a profound fall in blood pressure, loss of consciousness, respiratory embarrassment, facial and laryngeal edema, and urticaria. It can potentially be precipitated by variety of commonly used or prescribed therapeutic agents that are encountered in dental practice<sup>8</sup>. Dentists must be capable of recognizing and initiating management of anaphylaxis. Despite this, numerous surveys<sup>8,9</sup> in different countries indicate that the majority of dentists are not adequately able to identify and treat anaphylaxis.

Though several studies have been conducted in other countries to evaluate the level of knowledge of dentists in signs and symptoms, and management of anaphylaxis caused by local anesthesia (LA)<sup>10-14</sup>, there appears to be none among dentists in Nigeria. Therefore, this study is aimed at determining the level of knowledge of dentists in a Nigerian teaching hospital regarding the symptoms, signs and management of anaphylaxis

#### MATERIALS AND METHODS

This cross-sectional study design was conducted among dental practitioners at the Dental complex of the University of Benin Teaching Hospital, Nigeria from August 2020 to January 2021. Ethical clearance was obtained from the institution ethics committee before commencement of the study. Following informed consent, all dental practitioners were enrolled in the study if willing to participate in the study. The minimum sample size was calculated using the formula:  $n = Z^2P(1-P)/d^2$ <sup>(15)</sup> with absolute error margin of 10% ( $d = 0.1$ ), type 1 error of 5% ( $Z = 1.96$ ), and proportion of respondents with good knowledge of signs and symptoms and management of anaphylaxis due to dental local anesthesia of 50% was chosen as best guess as no previous study was done in our environment<sup>16</sup>. The calculated minimum sample size required for the study was 96. This was further adjusted to compensate for non-response rate of 5% to give a final minimum sample size of 101.

A prevalidated<sup>8</sup>, close-ended, semi-structure and self-administered questionnaire was utilized in this study. The questionnaire consisted of 21 items divided into four main sections: (1) Demographic characteristics, (2) general knowledge on local anesthetic anaphylaxis, (3) knowledge on signs and symptoms of local anesthetic anaphylaxis, (4) knowledge on treatment of local anesthetic anaphylaxis. The reliability of the questionnaire

was established using pilot test by collecting data from 10 respondents, not included in the sample. Their feedback was analyzed by intra-class correlations which were found to be 0.91 and 0.95 with Cronbach's alpha coefficient values of 0.70 and 0.74, indicative of an acceptable reliability level. Trained research assistants helped to distribute the questionnaires. Data was analyzed using Statistical Package for Social Sciences version 20.0, IBM, Armonk, NY, USA. Variables were presented in frequencies and percentages using frequency tables.

#### RESULTS

The 101 respondents approached agreed to participate in the study and all returned the questionnaires distributed given a response rate of 100%. Table 1 shows the socio-demographic characteristic of the respondents. More (64.4%) males participated in the study compared to their female counterparts and majority of the respondents were in the age group of 30 -39 years. More than half (59.4%) of the respondents were junior residents while the least group were the senior residents (8.90%). The years of practice of most of the respondents (55.4%) were between 6 and 15 years. Most of the respondents (24.8%) were from the Department of Oral and Maxillofacial Surgery, followed by Restorative Dentistry (16.8%) while the least were from Department of Prosthodontics (2.0%).

Table 2 shows the general knowledge on dental local anesthetic anaphylaxis. Though majority of the respondents (85.1%) have heard of anaphylaxis due to LA, it is surprising that few individual (14.9%) have not heard of anaphylactic reaction from LA. Just only 5(5.0%) respondents have seen a case of anaphylactic reaction and of these, majority (80.0%) of cases occurred during treatment. None of the respondents completely knew the signs and symptoms of anaphylactic reaction from LA (Table 2).

Table 3 shows the knowledge on treatment of anaphylactic reaction from LA. More than two-third (96.3%) of the respondents answered that they usually use lidocaine as the local anesthetics in their daily practice. Majority of the respondents (88.9%) answered in affirmative that they do ask their patients if they have any drug allergies before the treatment. Only 64(63.0%) respondents agreed that they ask their patients if they have received local anesthetic before for any dental procedure. Majority of the respondents (88.9%) do not agree to give a test dose of LA before treatment. Most of the respondents (71.6%) claimed they will not continue with treatment in the event of suspected patient with LA allergy.

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None of the respondents got the list of complete drugs that needed to be in dental office for LA anaphylaxis. Less than half (36.6%) of the respondents knew that epinephrine is the drug of first choice for anaphylactic reactions. Only 50(49.5%) of the respondents knew that the best

route for epinephrine administration is intramuscular route. Only 15(14.9%) and 37(35.6%) of the subjects knew the correct dose of epinephrine in 30 kg and 70 kg patients respectively. Just only 15(14.8%) of the respondent knew the timing of repeated dosage of epinephrine

Table 1: Sociodemographic characteristics of the respondents (n =101)

Characteristics	Count (%)
<b>Age(years)</b>	
20-29	18(17.8)
30-39	64(63.4)
≥40	19(18.8)
<b>Gender</b>	
Male	65(64.4)
Female	36(35.6)
<b>Rank of respondents</b>	
House officer	20(19.8)
Junior residents	60(59.4)
Senior residents	9(8.90)
Consultants	12(11.9)
<b>Year of practice (years)</b>	
≤5	33(32.7)
6-15	56(55.4)
≥16	12(11.9)
<b>Department of respondents</b>	
Oral and maxillofacial surgery	25(24.8)
Restorative dentistry	17(16.8)
Oral medicine	4(4.00)
Peadodontic	13(12.9)
Orthodontic	14(13.9)
Periodontics	3(3.00)
Prosthodontics	2(2.00)
Family dentistry	11(10.9)
Oral pathology	6(5.90)
Dental public health	6(5.90)

Table 2: General knowledge on local anesthetic anaphylaxis (n=101)

Variables	Count (%)
Have you heard of systemic adverse reaction due to local anesthetics	
Yes	86(85.1)
No	15(14.9)
Have you seen a patient with systemic adverse reaction due to local anesthetics	
Yes	5(5.00)
No	96(95.0)
If yes, did it occur during your treatment	
Yes	4(80.0)
No	1(20.0)
The signs and symptoms that remind you of anaphylaxis	
Nausea and vomiting	37(36.6)
Wheeze	26(25.7)
Shortness of breath	43(42.6)
Skin rash	38(37.6)
Facial swelling	25(24.8)
Hypotension	32(31.7)

Table 3: Knowledge on treatment of anaphylaxis (n=101)

Variables	Count(%)
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Which local anesthetic do you normally use in your daily practice	
Lidocaine	98(96.3)
Articaine	1(1.20)
Prilocaine	2(2.50)
Do you ask your patients if they have any drug allergies before the treatment	
Yes	87(88.9)
No	14(11.1)
Do you ask patients whether they have received local anesthetic before for any dental procedure	
Yes	64(63.0)
No	37(37.0)
Do you give a test dose on a routine basis	
Yes	14(11.1)
No	87(88.9)
What do you do when you see a patient with a suspected local anesthetic allergy	
I don't begin the treatment	73(71.6)
I make a skin prick test with the suspected drug allergy	13(13.6)
I refer the patient to an allergy specialist with the suspected drug for testing	15(14.8)
I treat the patients without local anesthetics	0(0.00)
What do you do when you see a patient without any drug allergy, but with any other allergic diseases such as asthma or hay fever	
I make the treatment without considering the other allergic problems	29(23.5)
I accept these problems as a risk factor and refer the patient to the specialist	72(76.5)
The drugs to be kept in office for anaphylaxis	
Epinephrine	37(36.6)
Antihistamine	35(34.7)
Corticosteroids	34(33.7)
Glucagon	23(22.8)
Salbutamol	26(25.7)
None	56(55.4)
Which drug should be used as the first choice in the treatment of anaphylaxis	
Antihistamine	22(21.8)
Corticosteroids	25(24.7)
Epinephrine	44(43.6)
Glucagon	0(0.00)
Salbutamol	1(1.00)
Don't know	9( 8.90 )
When using epinephrine, which route do you prefer as initial route	
Intramuscular	50(49.5)
Subcutaneous	11(10.9)
Intravenous	16(15.8)
Don't know	24(23.8)
The dose of epinephrine in a 30 kg child is	
0.05mg	19(18.8)
0.15mg	15(14.9)
Don't know	67(66.3)
The dose of epinephrine in a 70 kg child is	
0.5mg	36(35.6)
0.25mg	7(6.90)
Don't know	58(57.5)
How often should you give a repeated dose of epinephrine	
Every 5-10 minutes	15(14.8)
Every 10-20 minutes	7(6.9)
Every 20-30 minute	24(23.8)
Don't know	55(54.5)

## DISCUSSION

The response rate of 100% in this study is an indication that the findings can be generalized to Nigerian dental practitioners. Although the incidence of anaphylactic reaction to LA following dental procedures is low, as the consequences of reaction are severe, dentists should be equipped with the necessary knowledge and equipment to manage the reactions. Studies on knowledge of local anesthetic anaphylaxis among dentist have shown non-promising results<sup>8-13</sup>. The purpose of this study was to provide useful information to practicing dental practitioners that will help to reduce the incidence of mortality due to anaphylactic reaction from local anesthesia.

Although anaphylaxis following administration of local anesthetic is rare in daily dental practice, it can be fatal if not recognized early<sup>5</sup>. The true incidence of anaphylaxis is unknown. The incidence of anaphylaxis in dental practice is said to be between 0.004 to 0.015 cases/dentist/year.<sup>1-3</sup> In comparison, the incidence during general anesthesia is between 1 in 4000 to 1 in 25000<sup>7</sup>. Morbidity from anaphylaxis occurs in 0.5% to 1.3% of all cases<sup>23-25</sup>. In the present study, only 5% of the respondents have seen a case of anaphylactic reaction that occurred during dental treatment with LA. Actually, reactions are seldom related to the local anesthetic itself and most general reactions are not allergic but are the result of vasovagal, psychogenic, toxic, or predictable side effects of the epinephrine that is often used in combination with local anesthetics<sup>11</sup>. Another possible but rare cause type of immediate-type reactions is preservatives, such as methylparaben, that were present in multidose vials<sup>7</sup>. Ester-type anesthetics express more possibility of allergic reactions when compared to the amide group<sup>10</sup>.

The sign and symptoms of anaphylaxis may be as mild as an urticarial rash or swelling of lips to as severe as difficulty in breathing, wheeze, or persistent cough due to bronchospasm, persistent dizziness, or collapse due to hypotension with or without skin manifestation<sup>27</sup>. According to the data obtained in our study, none of the respondents knew completely the signs and symptoms of anaphylactic reaction from LA. This finding corroborated that reported in previous studies<sup>8-13</sup>.

Ampoules of epinephrine, antihistamines, corticosteroids, salbutamol and glucagon should be kept in every medical setting, including dental offices<sup>9</sup>. Epinephrine is the drug of choice and the mainstay of therapy for prophylaxis and subsequent therapeutic intervention depends on the clinical response to it. No substitute or alternative can be used to replace epinephrine, though systemic corticosteroids and antihistamine

can also be used to treat severe systemic reactions<sup>22</sup>. Despite this, none of the respondents got the complete drug list to be kept in the office for LA anaphylaxis. Only 36.6% knew that epinephrine should be kept in the hospital office. The data in this study revealed that less than half (43.6%) of the respondents knew that epinephrine is the drug of first choice for anaphylactic reactions.

In the events of significant incident of anaphylaxis, epinephrine was previously administered by intramuscular (IM) injection into the lateral thigh<sup>23</sup>. Until 10-15 years ago it had been accepted that subcutaneous (SC) injection was the preferred route of epinephrine<sup>6</sup>. Simon et al have shown that epinephrine is more effective when given IM route rather than SC in the management of anaphylaxis<sup>16</sup>. Only 49.5% of the respondents knew that the best route epinephrine administration is intramuscular route in this study. As recommended by the Centre for Disease Control (CDC), if drawing from a vial of 1:1000 of epinephrine, suggest the following amount of epinephrine depending on the age: greater than 12 years of age - 0.5mg(0.5ml); 6-12 years of age - 0.3mg(0.3ml); less than 6 years of age - 0.15mg(0.15ml)<sup>18</sup>. Sadly, only 14.9% and 35.6% of the respondents knew the correct dose of epinephrine in children and adult patients respectively. Repeat of administration of epinephrine should be given every five minutes if symptoms are persisting<sup>21</sup>. Despite this, just only 14.8% of the respondent knew the timing of repeated dosage epinephrine.

### CONCLUSION

The present study has revealed the lack of knowledge of dental practitioners in managing anaphylactic reactions. Continuing dental education programs consisting of workshops and hands-on courses in this field should be therefore suggested.

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### Source of Support

Nil.

### Conflict of Interest

None declared

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