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ORIGINAL ARTICLE

Knowledge and Attitude towards Anaphylaxis Reaction by Local Anesthesia among Dental Practitioners

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ABSTRACT

Background: Anaphylaxis or Type I hypersensitivity response is an acute, severe, and potentially life-threatening response to an allergen. It occurs as an immune mediated reaction due to the release of mediators by mast cells. The anaphylactic response involves skin, cardiovascular, respiratory or gastrointestinal systems. In dental settings, anaphylaxis can be faced in reaction to multiple medications including the administration of local anesthetic agents. The reaction involves difficulty in breathing, light headedness, wheezing or clammy skin. The knowledge and attitude of the treating dentist related to the anaphylaxis reaction is of prime importance as it may result in morbidity or mortality if not managed properly.

Aim and objective: The aim of the study was to assess the knowledge and attitude of dental practitioners in Islamabad-Rawalpindi related to anaphylaxis reactions in patients who have been administered local anesthesia.

Method: This cross-sectional study was conducted in Islamabad-Rawalpindi between Jan to June 2021. Total 377 dentist were enrolled in this study after taking consent the closed-ended questionnaire-filled. The questionnaire had two sections regarding the knowledge and practice attitude towards anaphylaxis reaction in response to local anesthesia. The data was analyzed by chi-Square test using SPSS version 24.

Results: There were 377 dentists in the sample, with the age between 5-30 years old, with less than 5 years of experience. Only 4% of dentists said they routinely offer a test dosage, despite the fact that 96% of dentists had the practice of asking about previous medication allergies before beginning treatment. Just 28.9% of dentists were doing aspiration before the administration of local anesthesia with 63.1% were checked expiry date. Interestingly, most dentists kept epinephrine, antihistamine, corticosteroids, glucagon, and albutamol as emergency medicine but 79.7% agreed on epinephrine as a drug of choice and injected intramuscularly.

Conclusion: Although anaphylaxis during dental operations is uncommon, it may have serious repercussions if it does occur. Results from the current research highlight dentists' knowledge gaps when it comes to dealing with adverse responses.

Keywords: Anaphylaxis, Epinephrine, Hypersensitivity, Local anesthetic agent

INTRODUCTION

According to the World Health Organization, anaphylaxis is defined as "a severe, life-threatening systemic hypersensitivity response which is characterized by an acute onset of potentially life-threatening airway, breathing, or circulatory problems".(1) Anaphylaxis is an immunological response to an allergen involving immunoglobulin E (IgE), that activates the basophils and mast cells to release vasoactive inflammatory mediators such as leukotrienes, histamine, prostaglandins and tryptase.(1, 2) It is a generalized response with cutaneous, respiratory, cardiovascular or gastrointestinal symptoms. It may involve a state of anxiety and confusion as well as a feeling of warmth and itching that may lead to urticaria and inflammation of the bronchi and larynx. (1) Immediacy of the onset of symptoms means there was a more severe response to the allergen. The incidence of death related to anaphylactic reaction is mostly due to obstruction of a respiratory tree or the collapse of circulation or both.(2) A study determining the incidence of anaphylaxis in South Asians (Pakistani, Indian, and Bangladeshi ethnicities) in Britain found that the incidence rate was 58.3 cases per 100 000 person-years.(3) The most common triggers which can cause anaphylaxis include food, insect stings, latex and certain medications, including local anesthetic agents.(4) Patients reporting to a dental setup are at risk of developing anaphylactic reactions as they normally receive local anesthesia during different routine dental procedures.(5) An anaphylactic response is an immune-mediated hypersensitivity reaction that may be fatal if brought on by a substance that has been given. Prevention of anaphylaxis may be considerably aided by managing risk factors and carefully monitoring to avoid allergies and triggers. When a medication allergy is suspected, it's best to see an allergist for a proper diagnosis and treatment.(4)

The local anesthetic agents are either of the amide or ester groups depending upon the linkage and the ester group is more prone to cause anaphylaxis, mostly owing to p-aminobenzoic acid; a breakdown product.(6, 7) The additives and preservatives in local anesthesia can also be the offending agent.(8) Proper history record and certain pre-procedural tests can be performed to prevent anaphylaxis such as the skin prick test, in which a small amount of anesthesia is deposited intradermally and the body's response is noted prior to administration of the prescribed dose. (9)The symptoms of anaphylaxis are quite unpredictable and may differ from one individual to another, so the treating dentist should have a sound knowledge of the mechanism, presentation, and management of anaphylaxis, as lack of training and failure to manage this medical emergency may lead to serious consequences and litigation. Therefore, to diagnose medical issues, particularly anaphylaxis, dental practitioners must have an adequate understanding of the possible adverse reaction in response to any constituent of local anesthesia.(10, 11)

In previous studies, the knowledge and attitudes of dentists regarding anaphylaxis have been assessed but there is no such study has been conducted in Pakistan. Thus using the current study, we aimed to analyze the knowledge and attitude of dentists regarding anaphylaxis and its management with the help of a validated questionnaire used in the study by M Krishnamurthy and colleagues.(1)

METHODOLOGY

Study Design: Cross-sectional study
Setting: Dental teaching hospitals of Rawalpindi-Islamabad
Duration: The study was conducted over a span of six months (Jan - Jun 2021).
Sample Size: 377 (calculated by WHO calculator with a confidence interval of 95% and 5% margin of error)
Sampling Technique: Partial enumeration sampling technique

Inclusion criteria: All practicing dentists of dental teaching hospitals of Rawalpindi/Islamabad were included in the study.
Exclusion criteria: Dentists who refused to be part of the research, Participants who responded with partially/unfilled questionnaires.
Data Collection: A close-ended and validated questionnaire in the form of Google forms and a printed questionnaire was used as a tool to collect the data using a complete enumeration sampling technique. The questionnaire had two sections regarding the knowledge and practice attitude towards anaphylaxis reaction in response to local anesthesia.
Data Collection Procedure: After the approval from the ethical review board, informed consent from the dentists working at teaching hospitals of Rawalpindi/Islamabad. All dentists were used to perform patient evaluation, patient preparation and management, and preparation of test solutions which were 0.1mL of 1:10 dilution, 0.3mL of 1:10 dilution, 1mL of 1:10 dilution and 0.1ml of 1:1 dilution. The dentist performed anesthesia is shown as figure 2. The evaluation was done after 15-20 minutes of incubation and the results were noted as (-) no visible change, (+) 1-2 cm change in diameter (wheal or erythema), (++) 2-3 cm change in diameter (wheal or erythema), (+++) diameter > 3 cm (wheal with erythema). As a result, if the patient presented negative skin test, the specified local anesthetic may be injected intraorally to confirm the findings. After the final injection, the patient should be monitored for at least an hour and a half to make sure there is no delayed response. And if the patient showed an adverse response, the patient must be closely observed, given the proper therapy, and referred to a specialist if required. We collected the information to fill close-ended and validated questionnaire from the dentist and observed their practices.

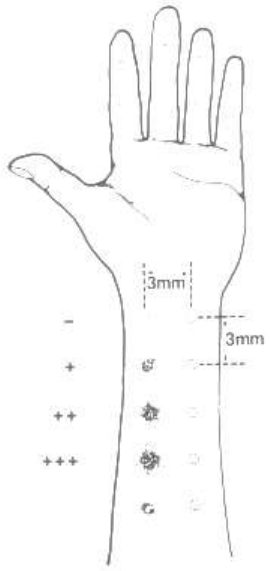

Figure 1: Injection areas and examples of reactions to test solutions.

Data Analysis Procedure: Data shall be entered and analyzed using SPSS ver. 22. The data obtained shall be subjected to statistical analysis using Chi-Square test.

RESULTS

There were 377 dentists in the sample, with the highly enrolled dentist between 5-30 years old, with less than 5 years of experience. They were mostly general dentists practicing in teaching institutes. In this study 72 (22.2%) were surgeons and 120 (36.9%) were others enrolled as shown in table 1.

Table 1: Demographic Characteristics of the Participants

Demographic Characteristics	Frequency	Percent	P value
Age in Years			
>46	32	9.8	0.02
25–30	206	63.4	
31–45	87	26.8	
Experience			
>16	31	9.5	0.01
6–15	95	29.2	
Less than 5	199	61.2	
Institute			
Both	64	19.7	0.045
Private practice	80	24.6	
Teaching institute	181	55.7	
Practicing			
General dentist	213	65.5	0.049
Specialist dentist	112	34.5	
Field of Specialization			
Operative dentistry	72	22.2	0.035
Oral & Maxillofacial Surgery	38	11.7	
Oral Medicine	9	2.8	
Orthodontics	25	7.7	
Others	120	36.9	
Periodontology	4	1.2	
Prosthodontics	47	14.5	

Dentists overwhelmingly favor using Lidocaine as a local anesthetic, with 93.8% preferring it over other options, and 95.4% preferring those that also include adrenaline. Only 4% of dentists said they routinely offer a test dosage, despite the fact that 96% of dentists had the practice of asking about previous medication allergies before beginning treatment.

A mere just 28.9% of dentists were doing aspiration before the administration of local anesthesia with 63.1% were checked expiry date. Results also showed that although everyone in the group knew some of the symptoms of anaphylaxis, none had a complete understanding of all of them. There were no differences in this consciousness with respect to age, years of experience, or area of expertise.

It was found in the survey that just 58.8% were used 0.1ml of 1:10 dilution local anesthesia were used to check the allergy mostly 58.5% were done intradermally. Interestingly, most dentists kept epinephrine, antihistamine, corticosteroids, glucagon, and salbutamol as emergency medicine but 79.7% agreed on epinephrine as a drug of choice and injected intramuscularly.

Table 2: Outcome of the questionnaire

	Frequency	Percentage
Which local anesthetics do you use in your daily practice:		
a) Lidocaine	305	93.8
b) Articaine	13	4
c) Prilocaine	7	2.2
d) Others	0	0
Do you prefer local anesthesia?		
a) With adrenaline	310	95.4
b) Without adrenaline	15	4.6
Do you take history of drug allergies before starting the treatment?		
a) Yes	312	96
b) No	13	4
Do you ask your patients whether they have a history of local anesthetic administration for any prior dental procedures?		
a) Yes	281	86.5
b) No	44	13.5
Do you perform aspiration before administering local anesthesia?		
a) Yes	94	28.9
b) No	231	71.1
Do you check expiry date before administration of local anesthesia?		
a) Yes	205	63.1
b) No	120	36.9
Do you know which group of local anesthetics is more likely to cause anaphylaxis?		
a) Ester group	191	58.8
b) Amide group	112	34.5
c) None of the above	22	6.8
What would be your response when you come across a patient with a suspected local anesthesia allergy?		
a) I do not begin the treatment	104	32
b) I make a skin prick test with the suspected drug by myself	34	10.5
c) I refer the patient to an allergy specialist with the suspected drug for testing	95	29.2
d) I administer local anesthesia of an alternative drug class	79	24.3

e) Others	13	4
What is the recommended dose for injecting LA for testing LA allergy?		
a) 0.1mL of 1:10 dilution	191	58.8
b) 0.3mL of 1:10 dilution	83	25.5
c) 1mL of 1:10 dilution	33	10.2
d) 0.1mL of 1:1 dilution	18	5.5
Which is the route of administration for needle insertion during LA allergy testing?		
a) Intramuscular	73	22.5
b) Intradermal	190	58.5
c) Intravenous	28	8.6
d) Sublingual	0	0
e) I do not know	34	10.5
After evaluating the injection site for 15-20 minutes, the severe response was:		
a) 1-2 cm in diameter change, wheal or erythema	65	20
b) 2-3 cm in diameter change, wheal or erythema	104	32
c) 3 cm or greater diameter wheal with erythema	111	34.2
d) no visible change at injection site	16	4.9
e) I do not know	25	7.7
f) Other	4	1.2
What can be the most common symptom associated with anaphylactic reaction?		
a) Nausea and vomiting	72	22.2
b) Dyspnea	71	21.8
c) Urticaria	131	40.3
d) Skin swelling	21	6.5
e) Hypotension	30	9.2
What reaction is suggestive of anaphylaxis after giving L.A?		
a) Urticaria	166	51.1
b) Hypotension	56	17.2
c) Dyspnea	61	18.8
d) Sudden fainting	42	12.9
Do you have an emergency drug kit in dental setup?		
a) Yes	210	64.6
b) No	115	35.4
How often do you check the emergency drug kit?		
a) Daily	18	5.5
b) Once fortnightly	20	6.2
c) Once a month	64	19.7
d) Once every 3 months	87	26.8
e) Others	136	41.8
Which of the following medicines are kept in the emergency drug kit of your dental setup?		
a) Epinephrine	45	13.8
b) Antihistamine	21	6.5
c) Corticosteroids	14	4.3
d) Glucagon	5	1.5
e) Salbutamol	5	1.5
f) None of the above	82	25.2
g) All of the above	153	47.1
Which is the first drug of choice in the management of anaphylaxis?		
a) Epinephrine	259	79.7
b) Antihistamine	40	12.3
c) Corticosteroids	18	5.5
d) Glucagon	3	0.9
e) Salbutamol	5	1.5
Which is the preferable route of administration for the epinephrine injection as an emergency drug for anaphylaxis reaction?		
a) Intramuscular	208	64
b) Subcutaneous	30	9.2
c) Intravenous	68	20.9
d) Sublingual	7	2.2
e) I do not know	12	3.7

DISCUSSION

Adverse drug responses (ADRs) include drug allergies, which are part of the spectrum of immunologically mediated hypersensitivity reactions that may have a wide range of causes and clinical manifestations. It's responsible for about 5%-15% of all ADRs. [12, 13] People who have a true allergy to local anesthetics are not often allergic to the anesthetic agent itself (or "caine"). [14] Allergic reactions to the preservatives in local anesthetic solutions are more prevalent than you may think, though they are still rather uncommon (i.e. IgE mediated). Preservatives, such as bisulfite, used in multiple-dose vials of local anesthetic might also rarely produce an instant response. Local anesthetic sensitivity is not increased in people with atopy, although many patients with atopy are sent to allergy clinics by dentists for evaluation of drug allergy [15]. The prevalence of allergic responses to local anesthetic after dental treatments varies from 1 in 3,500 to 1 in 13,000 in developed nations. Recent investigations in Australia and Norway have revealed an incidence of 1 in 10,000 to 1 in 20,000 and 1 in 6,000, respectively. [16, 17] Dentists should be prepared to handle an allergic response, despite the low occurrence rate, due to the severity of the reaction's repercussions. [18] Because of the importance of further reducing the occurrence rate, this research aimed to assess the level of knowledge held by dentists in Islamabad/ Rawalpindi on the symptoms, signs, and therapy of anaphylaxis. According to research done by Baldo BA et al, most dentists only utilize a little amount of local anesthetic and vasoconstrictor during procedures. Anaphylactic drug allergy is one of the most unexpected adverse medication responses since it is not dose-dependent and may be lethal. Toxic responses to the anesthetic agent and/or the vasoconstrictor, as well as anxiety reactions, are often misdiagnosed by medical professionals as hypersensitivity to local anesthetic solution. [19]

The study was focused on the knowledge and attitude of dental practitioners in Islamabad-Rawalpindi related to anaphylaxis reactions in patients who have been administered local anesthesia. Our research found that more than half of dentists felt comfortable dealing with anaphylaxis at their dental office, while the other half had the mentality of contacting an ambulance in the event of an emergency. In the event of a severe anaphylactic reaction, the first line of defense is an intramuscular (IM) injection of epinephrine into the lateral thigh. [1] In this study, researchers found that although most dentists (79.7%) agreed that epinephrine should be the first line of treatment for anaphylaxis, just 3.7% did not know how to administer the medicine in the event of an allergic reaction.

The symptoms of anaphylaxis are among in the patient needs emergency rooms every day. Some patients can experience concomitant cutaneous, cardiovascular, and respiratory manifestations. Immediate recognition and treatment of anaphylaxis is essential. [3, 19] Dentists should be familiar with the signs and symptoms of anaphylaxis and how to manage the severe responses in light of recent improvements, since dentists may also meet patients suffering from anaphylaxis in the course of their daily practice. Avoiding or stopping the problematic substance is the gold standard in treating an allergy to medication [9, 16].

Leach L et al, demonstrated that EpiPen delivered through intramuscular injection into the lateral thigh, is the therapy of choice for anaphylaxis [20]. Our findings, in contrast to those of another research by Sheikh A et al, indicate that this is common knowledge among private practice dentists. Despite the fact that systemic corticosteroids and antihistamines may be used to treat severe systemic responses, there is no substitution or alternative to epinephrine. Only 11% of dentists in this survey reported using these methods routinely for the treatment of anaphylaxis. [21, 22]

All medical facilities should have common medications like epinephrine, antihistamines, and corticosteroids since they are very cheap. When compared to previous studies, ours findings shows that almost three-quarters of dental practices maintain epinephrine on hand. Administering epinephrine intramuscularly (IM) was the standard of care, as was the case in the previous investigations. Many dentists understood the significance of this, while others did not. Only around a quarter of dental practitioners favored the intravenous administration of epinephrine. This may result in a substantial rise in heart rate, which can have grave implications. Patients' body weights are used to determine the optimal epinephrine dosage. Children and adults weighing 30 kg or more often take 0.3 mg. To treat adults and children between 15 and 30 kilograms (kg), the recommended daily dosage is 0.15 mg. [23-25]

The study findings also shows that most medical facilities are inadequately prepared to deal with unexpected medical emergencies. A dentist is ultimately responsible for addressing any emergency circumstances at a dental clinic, therefore their inexperience and unfamiliarity with doing so might have unfavorable results and lead to legal lawsuits by patients [3-6].

The limitation of the study is very low sample size. The large cohort analysis should be done for the prevalence of knowledge gap of dentists at national level. Dentists needs to be educated

more on CPR and other basic life support techniques to help with this. Workshops and hands-on courses in the area of dentistry should be required as part of a continuing education program.

CONCLUSION

Although anaphylaxis during dental operations is uncommon, it may have serious repercussions if it does occur. Results from the current research highlight dentists' knowledge gaps when it comes to dealing with adverse responses. Few dentists seem to be prepared to deal with patients who have anaphylaxis at their clinics or private practices. For this reason, dentists need to learn more about anaphylaxis and how to treat it.

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