



# Drug Allergy and Anaphylaxis in Dentistry

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## ABSTRACT

**Objective:** Anaphylaxis is a fulminant hypersensitivity reaction that threatens life. Local anesthetics used by dentists might cause anaphylaxis. In this study, we aimed to assess the knowledge levels of dentists regarding local anesthetic allergy and anaphylaxis and to evaluate if the knowledge levels could be increased by training.

**Materials and Methods:** Ninety-five (49F/46M) dentists volunteered to participate in this survey. Questionnaire forms were filled in by face-to-face interviews with the dentists. Subsequently, a training program on drug allergy and anaphylaxis was conducted and three days later the questionnaire forms were filled in again.

**Results:** The recognition rate of anaphylaxis symptoms was 50%, before the training and it increased to 91.6% after the training ( $p<0.001$ ). The percentage of dentists who recognized the first medication to be used in case of anaphylaxis was 81.3% before the training and it increased to 100% after the training ( $p<0.001$ ). The percentage of dentists who knew the administration route and location of adrenaline were 64.6% and 30.2%, respectively before the training and these numbers were 100% and 97.9% after the training ( $p<0.001$ ).

**Conclusion:** In conclusion, the results showed that dentists had minor information deficiencies regarding local anesthetic allergy and anaphylaxis that could be corrected by training.

**Keywords:** Dentist, anaphylaxis, drug allergy

## INTRODUCTION

Anaphylaxis is a fulminant hypersensitivity reaction that threatens life (1). The incidence of anaphylaxis has increased over the past decade. Despite the increase in anaphylaxis incidence, the mortality rate remains the same. The reason why the mortality rate of anaphylaxis does not show any changes could be due to the fact that anaphylaxis has become a well-recognized disease with time and it is treatable (2,3). Food allergy, venom allergy and drug allergy can be shown among the most common causes of anaphylaxis (4,5). Drug allergy takes top place particularly for the anaphylactic reactions observed in hospitals (5). Anaphylactic reactions arising out of drug allergy have an important role among anaphylaxis-dependent deaths (6). Due to the local anesthetic drugs they administer to their patients, dentists face the risk of observing anaphylactic reactions (7). In this study, we

aimed to assess the knowledge levels of dentists regarding local anesthetic allergy and anaphylaxis, and to evaluate if the knowledge levels could be increased with training.

## MATERIAL and METHOD

A total of 95 dentists voluntarily participated in the survey. During monthly routine meetings held in dental hospitals where dentists actively work, face-to-face interviews were carried out and questionnaire forms were completed. In preparation of the survey questions, the studies of Baccioglu and Ucar, and Celiksoy et al. were utilized (8,9). Survey forms were appropriately prepared towards assessing and evaluating the demographic characteristics, knowledge levels, and skills of dentists regarding local anesthetic allergy and anaphylaxis. A drug allergy and anaphylaxis-themed training program was provided. The questionnaire forms were completed again

three days later, and the answers provided by the dentists before and after the training were compared. The Ethics Committee of the Kahramanmaraş Sütçü İmam University Medical Faculty approved this study (Code: 31.01.2018/03).

### Statistical Analysis

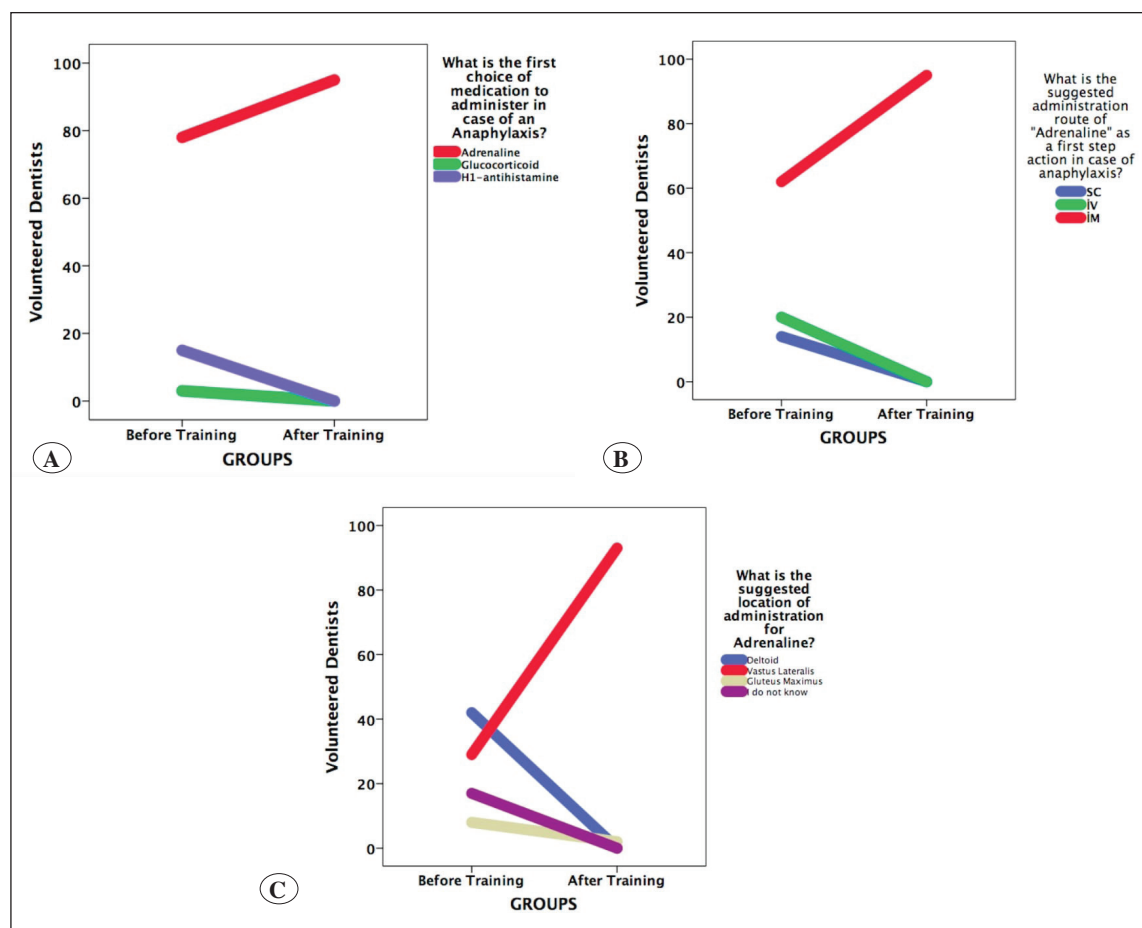
Statistical evaluation was conducted by using IBM SPSS (Statistical Package for the Social Sciences)18 . Unmeasurable variables were presented in figures and percentages while measurable variables were provided as mean ( $\pm$  standard deviation). Relations between variables were evaluated through the One-Way Anova, Chi-square, and McNemar Tests.  $P < 0.05$  accepted as statistically significant.

### RESULTS

Out of the 95 participants, 49 were female and 46 were male. The mean age was  $32.90 \pm 7.53$  years. Out of the 96 participants who completed the first questionnaire, one was unable to participate in the second one.

The recognition rate of anaphylaxis symptoms was 50% before training and it increased to 91.6% after the training ( $p < .001$ ). Answers to the first choice of medication to administer in case of an anaphylaxis were adrenaline (3.1%) glucocorticoids (81.3%), and antihistamines (15.6%) before the training which changed to adrenalin (100%) after the training (Figure 1A). Participants who recognized the first medication to be used in anaphylaxis made up 81.3% before training and this rate increased to 100% ( $p < 0.001$ ) after training. The answers to the suggested administration route of adrenaline in case of anaphylaxis were subcutaneous (14.6%), intravenous (20.8%), and intramuscular (64.6%). All participants answered as “intramuscular” to the same question after the training (Figure 1B). Awareness of adrenaline’s administration route was present in 64.6% of the participants before training and increased to 100% after training ( $p < 0.001$ ).

The answers to the suggested location of administration for adrenaline were the deltoid muscle (43.8%), vastus



**Figure 1.**  
A) The answers to the question “What is the first choice of medication to administer in case of anaphylaxis?”  
B) The answers to the question “What is the suggested administration route of “Adrenaline” as a first step action in case of anaphylaxis?”  
C) The answers to the question “What is the suggested location of administration for adrenaline?”

lateralis (side quadriceps) (30.2%), gluteus maximus (8.3%), and “I do not know” (17.7%) before the training. After the training, the answers were vastus lateralis (side quadriceps) (97.9%), and gluteus maximus (2.1%) (Figure 1C). The suggested administration location for an adrenaline shot was known by 30.2% of the participants before the training, and this rate increased to 97.9% after the training ( $p < 0.001$ ). The results are detailed in Table 1.

## DISCUSSION

Although allergic reactions against local anesthetics are rarely encountered, being prepared for allergy and anaphylaxis is necessary for all dentists. This requires dentists to know the potential side effects of the drugs, the symptoms, and proper management of anaphylaxis and drug allergy (10).

**Table I. Comparison of answers provided by dentists**

	Before Training (n=95)	After Training (n=95)	P
Have you ever encountered a patient who had a drug allergy? (Yes) n (%)	72 (75.7)	50 (52.6)	0.002 <sup>1</sup>
Do local drugs cause a systemic reaction? (Yes) n (%)	86 (90.5)	88 (92.6)	0.581 <sup>1</sup>
Do you think that allergy could pose a threat to human life? (Yes) n (%)	94 (98.9)	88 (92.6)	0.180 <sup>1</sup>
Participants who answered the question “Who should be tested for local anesthetic drug allergy?” correctly.	27 (28.4)	74 (77.9)	0.000 <sup>1</sup>
Participants who answered the question “In the occurrence of which event in relation to local anesthesia should we conduct an allergy test?” correctly.	82 (86.3)	92 (96.8)	0.013 <sup>1</sup>
Participants who were cognizant of the symptoms and indications of anaphylaxis. n (%)	48 (50.5)	87 (91.6)	0.000 <sup>1</sup>
Participants who were cognizant of clinical diagnosis criteria for the diagnosis of anaphylaxis. n (%)	46 (48.4)	41 (43.2)	0.635 <sup>1</sup>
What is the first choice of medication to administer in case of an anaphylaxis? n (%)			
a) Adrenaline	78 (82.1)	95 (100)	
b) Glucocorticoid (methylprednisolone)	3 (3.1)	0 (0)	
c) H1-antihistamine (e.g. diphenhydramine)	15 (15.7)	0 (0)	
Participants who were cognizant of the first medication to be administered in case of an Anaphylaxis.	78 (82.1)	95 (100)	0.000 <sup>1</sup>
What is the suggested administration route of adrenaline as a first step action in case of anaphylaxis? n (%)			
a) Subcutaneous	14 (14.7)	0 (0)	
b) Intravenous	20 (21.0)	0 (0)	
c) Intramuscular	62 (65.2)	95 (100)	
Participants who knew the correct way of administering adrenaline.	62 (65.2)	95 (100)	0.000 <sup>1</sup>
Participants who knew the re-administration interval of adrenaline.	31 (32.6)	93 (97.9)	0.000 <sup>1</sup>
Participants who knew the appropriate intramuscular dosage of adrenaline. n (%)	48 (50.5)	89 (93.7)	0.000 <sup>1</sup>
What is the suggested location of administration for adrenaline? n (%)			
a) Deltoid muscle	42 (44.2)	0 (0)	
b) Vastus lateralis	29 (30.5)	93 (97.9)	
c) Gluteus maximus	8 (8.4)	2 (2.1)	
d) I do not know	17 (17.8)	0 (0)	
Participants who were cognizant of the administration location of adrenaline.	29 (30.5)	93 (97.9)	0.000 <sup>1</sup>
Have you ever heard the adrenaline (Penepin®) automatic injection device? (Yes) n (%)	25 (26.3)	81 (85.3)	0.000 <sup>1</sup>

<sup>1</sup>McNemar Test

The question “Have you ever encountered a patient that had drug allergy?” had one of the most interesting results, because 75% of the participants said “yes” to this question before the training and this rate decreased to 52% after the training. We believe that the reason behind this decline is that once the knowledge levels of dentists on allergy increased, participants realized that previous events they encountered were not allergic reactions. In a study conducted by Celiksoy et al., it was determined that 90% of primary care physicians have never observed drug allergy. However, whether the event they outlined as drug allergy was an allergic event caused by a drug or not has been clarified (9).

More than 90% of participants answered “yes” to “Do local drugs cause a systemic reaction?” both before and after training. Further, more than 90% of participants answered “yes” to “Do you think that allergy could pose a threat to human life?”, again both before and after training. These rates bear importance since they demonstrate that dentists are aware of the critical characteristic of allergic events. Interestingly, in the primary care physician study carried out by Celiksoy et al., approximately 40% of the participants stated that local drugs do not cause any systemic reactions (9).

The question “Who should be tested for local anesthetic drug allergy?” was correctly answered before the training by 28% of the participants and this rate increased to 77% after the training. This increase in knowledge levels was determined to be important. Being aware of who should be tested for local anesthetic allergy will decrease the number of patients referred for allergy tests unnecessarily. Eighty-five per cent of the participants answered the “In the occurrence of which event due to local anesthesia should we conduct an allergy test?” question correctly before the training and this rate increased to 96% after the training. The fact that almost all the participants defined the events that necessitate performing an allergy test due to the administration of local anesthetic drugs correctly was considered a pleasing improvement.

The fact that only 50% of participants being aware of anaphylaxis symptoms before the training was considered worrying and the increase in this rate to 91% after the training was considered a promising improvement. Cognizance rates regarding the clinical diagnosis criteria for anaphylaxis were 47% before the training and decreased slightly to 43% after the training. Therefore, restructuring

of this part of the training program and reviewing it based on practice have become mandatory for future training. In a study carried out by Cetinkaya et al. on dentists, none of the participants had recognized anaphylactic events (11). Since anaphylaxis is a rapidly developing serious allergic reaction and might lead to death, its diagnosis and immediate treatment are of vital importance (12). Therefore, recognizing and diagnosing the anaphylactic reaction is the first treatment step. In a study carried out by Wang et al., up to 80% of the participants managed to diagnose anaphylaxis when cutaneous symptoms were present but this rate decreased to 55% when there were no cutaneous symptoms (13).

In the current study, 81% of participants answered “adrenaline” to the question “What is the first choice of medication to administer in case of an anaphylaxis?” before the training. After the training, this rate went up to 100%. In the study carried out by Celiksoy et al., 30% of the primary care physicians stated that they use adrenaline as the first choice in case of an anaphylactic event (9). In the study of Cetinkaya et al. on dentists, half of the participants said the first choice of medication to administer in an anaphylactic event is adrenaline (11). There are studies available in the literature that show high dosage adrenaline administration contrary to ones that suggest lower dosages as the first choice of medication in an anaphylactic event. In the study of Wang et al., 95% of the participants stated that they would use adrenaline as the first choice of medication in an anaphylactic event (13). In the study of Güvenir et al. (14) on primary care physicians, it was reported that adrenaline was the first choice of medication for 89% of participants in an anaphylactic event. In addition, in a similar study carried out by Wang et al. (15) on primary care physicians, it was reported that 80% of the participants answered that they would administer adrenaline as the first drug in an anaphylactic event.

Sixty-four per cent of the participants answered “intramuscular” to the question “what is the suggested administration route of “Adrenaline” as a first step action in case of anaphylaxis?” before training. Since 100% of the participants answered the same question as “intramuscular” after the training, it was accepted that this part of the training was well understood. In the study by Celiksoy et al. on primary care physicians, it was reported that 40% of the participants had chosen the intramuscular administration route for adrenaline (9). In the study carried out by Cetinkaya et al. on dentists, only the one-

third of the participants answered “intramuscular” to the suggested administration route of adrenaline (11). In the study carried out by İbrahim et al., it was reported that 85% of doctors answered “intramuscular” to “what is the preferred administration route of adrenaline?”, while only 47% of nurses stated that they prefer the intramuscular route for adrenaline administration (16). In the study conducted by Catal et al. on primary care physicians, it was reported that only 30% of the participants answered that they administer adrenaline through the intramuscular route in an anaphylactic event (17).

Thirty-two per cent of participants were aware of the adrenaline re-administration interval before the training. Since this rate increased to 97% after training, it was evaluated as a promising improvement. Before the training, only 50% of the participants knew the appropriate intramuscular dose of adrenaline, which is considered a crucial element in the treatment of anaphylaxis. Since this rate increased to 93% after training, this was considered an encouraging development. In our study, 30% of participants answered “vastus lateralis (side quadriceps)” to “What is the suggested location of administration for adrenaline?” before training and this rate increased to 97% after the training.

Finally, 26% of the participants answered “yes” to “Have you ever heard the adrenaline (Penepin®) automatic injection device?” before the training and this rate increased to 85% after the training. In the study of Catal et al. on primary care physicians, the cognizance rate for the adrenaline automatic injection device was reported as 76% (17).

Local anesthetics allergy and anaphylaxis cases, which are encountered among the dental practices, continue to be discussed in the literature (18-20). Dentists and allergists need to ensure collaboration to optimize patient care (21).

In conclusion, we demonstrated that while the dentists lack the necessary knowledge of drug allergy and anaphylaxis, this situation could be compensated with the assistance of training. We believe that studies that are carried out in this regard will contribute to the training process by raising the awareness related to this subject among dentists.

#### CONFLICTS of INTEREST

The authors have indicated that they have no conflicts of interest regarding the content of this article.

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