



## Research Article

# Evaluation of the Attitude of Anesthetists About Anaphylaxis in Turkey

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### Abstract

**Objectives:** Anaphylactic reactions are important health problems encountered by anesthesiologists during anesthesia administration. The aim of the study was to determine the attitude of anesthesiologists regarding the management of anaphylactic reactions.

**Methods:** Anesthesiologists across the country were administered a questionnaire consisting of 24 questions that evaluated their attitude regarding anesthesia management in anaphylactic reactions.

**Results:** A total of 223 (70.4% female) anesthesiologists were included in our study. Participants' level of knowledge for recognizing the signs of anaphylaxis was sufficient. Furthermore, 89.7% of the participants knew that anaphylaxis could occur without skin symptoms. The rate of using adrenalin for anaphylaxis treatment was 74.8%, and the proportion of participants who knew the dose correctly was 65%. The adrenalin administration route was stated as intravenous by 52.5% and intramuscular by 13.1% of the participants.

The rate of preoperative questioning of the patient's history of a drug and food allergy was 91.5% and 81.2%, respectively. The answers revealed that 61% of the participants were worried when administering anesthesia to a patient with history of drug allergy.

**Conclusion:** Although the knowledge of anesthetists regarding anaphylaxis is generally sufficient, its importance emphasized during specialized training should be continuously updated.

**Keywords:** Anaphylaxis, anesthetists, attitude, drug allergy

The incidence of allergic diseases is increasing. The correct attitude toward the problems emerging due to allergic diseases (asthma, drug allergy, anaphylaxis, etc.) during anesthesia administration is important as it may

prevent mortality and morbidity. The perioperative anaphylactic reaction incidence has been reported as 1:3500–1:25000 according to various resources.<sup>[1-3]</sup> The incidence of anaphylactic reactions developing during anesthesia is not

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fully known because these reactions can be confused with many clinical scenarios; mild cases may not be recognized, and adequate records may not be maintained. Anaphylactic symptoms may be confused with signs of hypovolemia and anesthesia depth, and the patient may be covered with surgical drapes, thereby masking certain symptoms and making the diagnosis difficult.<sup>[4, 5]</sup> Differences have also been observed in the clinical reactions of anaphylaxis developing during anesthesia. Vascular collapse has been observed in 88% of patients.<sup>[6, 7]</sup> cardiovascular symptoms in 74.7%,<sup>[8]</sup> and skin symptoms (urticaria, angioedema, and flushing) in 70%.<sup>[6, 7]</sup> Tongue, palate, and uvula swelling; stridor; hypoxia; incontinence; abdominal pain; vomiting; nausea; and rhinorrhea may also be observed.<sup>[9]</sup> Skin symptoms and bronchospasm are the most important findings in children, whereas hypotension and shock are not commonly observed at the beginning of anaphylaxis.<sup>[10]</sup> The most important problem is the ability of general anesthesia to mask the symptoms.

The most common cause of anaphylaxis during anesthesia is a neuromuscular blocking agent.<sup>[11]</sup> Anaphylaxis developing due to other drugs (sodium thiopental, propofol, etomidate, ketamine, and benzodiazepines) has been less common.<sup>[12, 13]</sup> Latex is the second most common reason for anaphylaxis, followed by muscle relaxants. Latex allergy is commonly seen in people who come into frequent contact with latex-containing materials; e.g., patients with spina bifida, those who have undergone numerous operations at an early age, those on dialysis, those undergoing frequent catheterization, and those associated with healthcare.<sup>[1, 4]</sup> Besides, patients with latex allergy can show a cross reaction with certain foods, which should also be considered during preoperative evaluation.<sup>[14]</sup> Antibiotics are the third common cause of perioperative anaphylaxis.<sup>[11]</sup>

Deficiencies in the knowledge and attitudes of physicians on anaphylaxis have been reported in various studies.<sup>[15, 16]</sup> However, there are only few studies evaluating the attitude of anesthesiologists. The recognition and management of the reactions that may occur during surgery are under the responsibility of the anesthesiologist. Thus, the attitude of the anesthetist toward the management of anaphylaxis as well as other allergic diseases is extremely important to reduce morbidity and mortality.

In this study, we evaluated the attitudes of anesthesiologists working in various clinics across the country toward patients with anaphylactic reactions.

## Methods

After receiving approval from the Ethics Committee of Ankara Children's Hematology Oncology Training and Research

Hospital (No: 2015-062), anesthesiologists working in various clinics across the country were invited to participate in the study. Questionnaires were provided to the anesthesiologists who confirmed participation through hospital visits or emails. The prepared questionnaire consisted of 24 questions evaluating the demographic data and knowledge and attitude of anesthetists regarding anesthesia management in patients with anaphylaxis and drug, food, and latex allergies. While three questions were regarding demographic data, three were regarding attitude and behavior and 18 regarding knowledge. Six were multiple choice questions, and multiple answers were possible for two questions. The options for 12 questions were "yes," "no," or "I don't know." The participants were classified according to their place of work [university hospitals (group A), state and private hospitals (group B), and training and research hospitals (group C)].

## Statistical Analysis

All the data were evaluated using SPSS for Windows version 11.5 packet program. We used the Chi-Square test for evaluation. Frequencies and percentages were presented as descriptive statistics. Statistical significance was accepted as 0.05.

## Results

Our questionnaire was completed by a total of 223 anesthesiologists from various anesthesia clinics across the country. Females accounted for 70.4% (n:157) of the participants. Of these anesthesiologists, 41 were working at a university hospital, 111 at a training and research hospital, 60 at a state hospital, and 11 at a private hospital. The mean duration since specialization was  $10.42 \pm 7.29$  years.

Participants' answers to questions evaluating their attitudes about anaphylaxis are summarized in Table 1. The accuracy of the answers regarding recognition of the clinical signs was considerably high; participants were allowed to select more than one response for these questions. The participants selected urticaria (86.5%), angioedema (68.6%), hypotension (64.6%), tachycardia (62.3%), tachypnea (45.3%), and wheezing (34.5%) as the most common clinical symptoms.

Most importantly, 89.7% of the participants knew that anaphylaxis could occur without skin symptoms. The rate of suggesting the investigation of tryptase levels in suspected anaphylactic cases was 36.8%.

The rate of using adrenalin as the first option in anaphylaxis was 74.8%, and the percentage of participants who knew the correct dose of adrenalin was 65%. The question "In which way do you primarily administer adrenaline?" was answered as intravenous (IV) by 52.5% and intramuscular

**Table 1.** Attitude of anesthetists on anaphylaxis

|   | Anesthesiologist<br>n (%) | University hospital<br>(%) | State and<br>private<br>hospitals (%) | Training and<br>research<br>hospitals (%) | p     |
|---|---------------------------|----------------------------|---------------------------------------|---|-------|
| <b>Etiology</b>   |                           |                            |                                       |   |       |
| The most common reason is neuromuscular blocking agents                 | 87 (39.0)                 | 51.2                       | 25.4                                  | 43.2                                      | 0.014 |
| Late period anaphylaxis are related to latex, volume extenders or paint | 152 (68.2)                | 75.6                       | 59.2                                  | 71.2                                      | 0.131 |
| <b>Clinical Findings</b>  |                           |                            |                                       |   |       |
| Urticaria   | 193 (86.5)                | 92.7                       | 87.3                                  | 83.8                                      | 0.352 |
| Angioedema  | 153 (68.6)                | 80.5                       | 60.6                                  | 69.4                                      | 0.088 |
| Tachypnea   | 101 (45.3)                | 56.1                       | 35.2                                  | 47.7                                      | 0.078 |
| Wheeze  | 77 (34.5)                 | 51.2                       | 19.7                                  | 37.8                                      | 0.002 |
| Tachycardia   | 139 (62.3)                | 68.3                       | 63.4                                  | 59.5                                      | 0.593 |
| Hypotension   | 144 (64.6)                | 85.4                       | 50.7                                  | 65.8                                      | 0.001 |
| <b>Laboratory</b>   |                           |                            |                                       |   |       |
| Investigation of tryptase levels in the diagnosis of anaphylaxis        | 82 (36.8)                 | 48.8                       | 25.4                                  | 39.6                                      | 0.001 |
| <b>Treatment</b>  |                           |                            |                                       |   |       |
| First choice is adrenalin   | 167 (74.8)                | 87,8                       | 54,9                                  | 82.9                                      | 0.001 |
| Adrenalin administration route  |                           |                            |                                       |   |       |
| Intra muscular  | 29 (13.1)                 | 34.1                       | 5.6                                   | 10.1                                      | 0.001 |
| Intra venous  | 116 (52.5)                | 41.5                       | 49.3                                  | 58.7                                      |       |
| Subcutaneous  | 76 (34.4)                 | 24.4                       | 45.1                                  | 31.2                                      |       |
| Accuracy of adrenalin dose  | 145 (65.0)                | 75.6                       | 49.3                                  | 71.2                                      | 0.003 |

(IM) by 13.1% of participants.

Regarding the etiology, 39% of the anesthesiologists knew that neuromuscular blocking agents are the most common reason for perioperative anaphylaxis.

The question on the etiology of anaphylaxis in the late stage of surgery (latex, volume expanders, and dye) was answered correctly by 68.2% of the participants. The role of premedication in the prevention of pseudo-allergic reactions was known by 55.2% of the participants.

The answers of the anesthesiologists to the questions evaluating their attitude on drug, food, and latex allergies are summarized in Table 2. The rate of preoperative questioning of the patient's history about drug and food allergies was 91.5% and 81.2%, respectively. The answers revealed that 61% of the participants were worried when administering anesthesia to a patient with a history of drug allergy. The percentage of anesthesiologists who knew that there was more risk of a drug allergy with parenteral administration was 85.2%.

## Discussion

Attitude and knowledge of anaphylaxis in anesthesiologists practicing across the country were evaluated for the

first time in our study. The knowledge of the participants on allergic diseases and anaphylaxis were generally seen to be largely adequate.

Anaphylaxis is an emergency situation that develops with an IgE-mediated early-type reaction and requires quick diagnosis and intervention.<sup>[17]</sup> The diagnosis and treatment of perioperative anaphylaxis, which is a special situation, is difficult. The number of studies on the attitude and knowledge levels of anesthetists on this subject is limited. Operating room conditions in the perioperative period, intubation during the anesthesia process, and tachycardia or hypotension that can develop due to the drugs used make the diagnosis difficult. The percentage of participants recognizing the clinical symptoms was considerably high in our study. Furthermore, 89.7% of the participants knew that anaphylaxis could occur without skin symptoms. However, clinical symptoms such as wheezing and hypotension have been found to be less known in group B.

A yes response to the question "Should the tryptase level be checked in case of suspected anaphylaxis?" was reported by 36.8% of the participants and by 25.4% of participants in group B. This rate was better than the questionnaire results (13.6%) reported in the study of Sturn et al. which cov-

**Table 2.** Attitude of anesthetists on drug, food, and latex allergies

|  | Anesthesiologist<br>n (%) | University<br>hospital (%) | State and<br>private<br>hospitals (%) | Training and<br>research<br>hospitals (%) | p     |
|--|---------------------------|----------------------------|---------------------------------------|---|-------|
| Querying drug allergy  | 204 (91.5)                | 100                        | 84.5                                  | 92.8                                      | 0.002 |
| Querying food allergy  | 181 (81.2)                | 85.4                       | 84.5                                  | 77.5                                      | 0.622 |
| Worrying about administration of anesthesia to a patient with a history of drug allergy              | 136 (61.0)                | 61.0                       | 52.1                                  | 66.7                                      | 0.424 |
| Alternative drug preference in patients with penicillin allergy                                      |                           |                            |                                       |   |       |
| Macrolide  | 127 (57.0)                | 56.1                       | 39.4                                  | 68.5                                      | 0.001 |
| Fluoroquinolone  | 43 (19.3)                 | 39.0                       | 18.3                                  | 12.6                                      | 0.001 |
| Aminoglycoside   | 49 (22.0)                 | 12.2                       | 19.7                                  | 27.0                                      | 0.126 |
| Alternative drug preference in patients with aspirin allergy should be paracetamol and/or meloxicam. | 163 (73.1%)               | 80.5                       | 73.2                                  | 70.3                                      | 0.451 |
| The risk and severity of a reaction to drugs is increased with parenteral administration.            | 190 (85.2)                | 87.8                       | 87.3                                  | 82.9                                      | 0.909 |
| The risk of a reaction with neuromuscular muscle relaxants is higher in those with cosmetic allergy. | 52 (23.3)                 | 19.5                       | 23.9                                  | 24.3                                      | 0.324 |
| Drug allergies can be seen in the neonatal period and infancy.                                       | 151 (67.7)                | 80.5                       | 62.0                                  | 66.7                                      | 0.226 |
| The risk of a reaction is higher with the ester group of local anesthetics                           | 171 (76.7)                | 82.9                       | 71.8                                  | 77.5                                      | 0.546 |
| Atracurium and mivacurium can cause a reaction by causing histamine release.                         | 204 (91.5)                | 90.2                       | 81.7                                  | 98.2                                      | 0.002 |
| Spina bifida is a risk for latex allergy.  | 106 (47.5)                | 51.2                       | 38.0                                  | 52.3                                      | 0.085 |
| Latex allergy can be present in patients with kiwi, banana and avocado allergies.                    | 110 (49.3)                | 58.5                       | 46.5                                  | 47.7                                      | 0.682 |

ered physicians in various specialization branches.<sup>[15]</sup>

Adrenaline is the first choice in the treatment of anaphylaxis.<sup>[18, 19]</sup> The option “The drug to be preferred primarily in anaphylaxis treatment is adrenalin” was preferred by 74.8% of the participants, but 13.7% also selected antihistamines and steroids (second-line treatment). The rate of selecting adrenaline as the first choice in group B was significantly low (54.9%).

The adrenalin dose was answered correctly by 65% of the participants. Primary care physicians were asked the same questions in the study conducted by Erkocoglu et al, and 53.1% responded as “adrenalin only,” whereas 16.6% answered the recommended adrenalin dose correctly.<sup>[16]</sup>

Anesthesiologists answered both questions correctly at a higher rate than that by primary care physicians. While 13.1% of anesthetists preferred the IM route for adrenaline administration, 52.5% preferred the IV route in our study. The IV route was preferred because it is already open in

the perioperative period. Side effects are rare at the correct IM dosage. IV adrenaline can be used by anesthetists who have relevant experience and know how to titrate it in clinical practice.<sup>[18, 19]</sup>

The most common causes of perioperative anaphylaxis are neuromuscular blocking agents (50%–70%), latex (12%–16.7%), and antibiotics (15%).<sup>[11]</sup> While anaphylaxis is related to muscle relaxants and antibiotics in the early perioperative period, it is usually associated with latex, volume expanding agents, and paints (methylene blue) in the later stage.<sup>[4, 20]</sup> According to our results, the percentage of participants who knew that neuromuscular blocking agents are the most common cause of perioperative anaphylaxis was 39%. Although muscle relaxants are commonly used in anesthesia, the percentage of correct answer was low, especially in group B (25.4%).

Muscle relaxants can also lead to non-IgE-mediated mast cell degranulation and anaphylactoid reactions.<sup>[21, 22]</sup> Be-

sides, the participants gave the correct answer to "Atracurium and mivacurium often cause reactions by leading to histamine secretion" at a high rate (91.5%). This difference between the answers may be due to the similar clinical symptoms of anaphylaxis and anaphylactoid reaction and difficulty of differentiation under the effect of anesthesia. The correct answer was given for "The anaphylaxis occurring at the late stage of the surgery is usually related to volume expander agents or paints" by 68.2% of the participants.

There is no prior encounter with muscle relaxants in many cases, but cosmetic products are thought to make individuals susceptible.<sup>[21, 22]</sup> Only 23.3% of the anesthetists knew that the risk of a reaction with muscle relaxants was higher in those with cosmetic allergy.

Premedication is recommended for the prevention of pseudo-allergic reactions. Only half (55.2%) of the physicians provided a correct answer on this subject.

A reaction to local anesthetics is rare, and less than 1% of patients develop it via an allergic mechanism. Reactions secondary to ester-type local anesthetics and paraaminobenzoic acid metabolites have been identified.<sup>[21-23]</sup> The correct answer was provided to "The risk of an allergic reaction is higher with ester-type local anesthetics" by 76.7% of participants.

The proportion of participants answering "yes" to the question "Patients with spina bifida are at a risk for latex allergy" was 47.5%. The proportion of those who said yes to the item "Patients with kiwi, banana, and avocado allergies are at a risk for latex allergy" was 49.3%.

Drug reactions affect more than 7% of the general population and 10%–20% of hospitalized patients.<sup>[24]</sup> Physicians often encounter patients with a history of drug allergy, which can make treatment more difficult. The history of drug allergy was questioned by 91.5% of our participants, and 61% were worried during anesthesia administration in patients with a history of drug allergy. Klieman et al.<sup>[25]</sup> concluded that patients could be managed correctly with detailed questioning in terms of drug allergies even if they are not referred to an allergy specialist, and this may eliminate unnecessary referrals and cost. We believe that anesthesiologists can make the decision on whether to refer patients for allergy consultation by obtaining appropriate patient history, as there are relatively few allergy specialists in Turkey and they cannot always be accessed.

The use of alternative drugs in the presence of a drug allergy is important in terms of preventing reactions. The cephalosporin cross-reactivity rate in patients with penicillin allergy was predicted to be 2%–7%.<sup>[1, 19]</sup> The percentage of anesthesiologists who correctly used an alternative an-

tibiotic in patients with penicillin allergy was 84.3% in our study. The rate of choosing an alternative analgesic in patients with aspirin allergy was 73.1%.

The correct answer was provided for "The risk of drug allergy is higher in parenteral administration" by 85.2% of participants and for "Drug allergy can be seen in the neonatal and childhood period" by 67.7%. Knowledge and attitude of the participants on this study topic were generally good. Unfortunately, the answers by anesthesiologists in group B (private and state hospitals) were inadequate, which could be attributed to the lack of continuity in education.

## Conclusion

In conclusion, the attitude to allergic disorders and anaphylaxis should be multidisciplinary. Anesthetists who have a high probability of encountering such problems should constantly update their knowledge to be able to manage emergency treatment. Although the knowledge of anesthetists regarding allergic diseases and anaphylaxis was generally adequate, seminars and in-service trainings on these subjects should continue after specialization training, especially for anesthesiologists not working in a training clinic and making individual decisions; the importance of this issue should be emphasized during the specialization training process.

## Disclosures

**Ethics Committee Approval:** After receiving approval from the Ethics Committee of Ankara Children's Hematology Oncology Training and Research Hospital (No: 2015-062), anesthesiologists working in various clinics across the country were invited to participate in the study.

**Peer-review:** Externally peer-reviewed.

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