



## APPROACHES OF SURGICAL AND INTERNAL BRANCH RESIDENT PHYSICIANS TO ANAPHYLAXIS

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### Abstract

**Aim:** The aim of this study is to evaluate the level of knowledge about anaphylaxis among resident physicians working in a tertiary care hospital in Istanbul.

**Methods:** Our descriptive study was conducted with resident physicians working in a tertiary hospital in Istanbul. A questionnaire including questions about the diagnosis and treatment of anaphylaxis was administered to physicians.

**Results:** 172 resident physicians were surveyed within the scope of the study. While 47.0% (n=79) of the physicians were internal medicine residents, 53.0% (n=89) were surgical medicine residents. In terms of duration of employment in the profession, 76.2% (n=131) had a working period of 5 years or less. Median age was 29.0 years; minimum age was 25.0 years and maximum age was 53.0 years. All resident physicians felt that anaphylaxis could be life-threatening. The rate of those who correctly knew the clinical criteria for the diagnosis of anaphylaxis was 63.4% (n=109). The rate of those who knew that adrenaline was the first-line drug in the treatment of anaphylaxis was 95.9% (n=165). While 86.6% (n=149) of the physicians answered that adrenaline was administered intramuscularly, 70.0% (n=119) correctly answered the dose of adrenaline and 76.0% (n=130) correctly answered the name of the muscle where adrenaline was administered. The proportion of physicians who stated that anaphylaxis patients should be followed up for 24 to 72 hours was significantly higher in surgical branches (82.0%; n=73) than in internal branches (68.4%; n=54) (p<0.001).

**Conclusions:** The knowledge of resident physicians regarding anaphylaxis is not at a desired level. Trainings should be organized for physicians to increase their knowledge and awareness about anaphylaxis.

**Keywords:** Anaphylaxis, level of knowledge, physician assistants

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## Introduction

Anaphylaxis is an allergic reaction characterized by symptoms affecting the dermal, respiratory, cardiovascular and gastrointestinal systems that develop within minutes or hours after a known or probable trigger<sup>1</sup>. In patients with anaphylaxis, skin and mucosal symptoms are most common (>90% of cases), followed by symptoms affecting the respiratory and cardiovascular systems (>50%)<sup>2</sup>. According to the European Academy of Clinical Immunology and Allergy (EAACI)(2); at least one of the following 3 criteria must be met for the diagnosis of anaphylaxis (Table 1). Depending on the region, the most common causes of anaphylaxis are foods, drugs and insect stings<sup>3,4</sup>. Foods, especially peanuts, nuts, milk and eggs are the most common cause of anaphylaxis in children<sup>2,5</sup>. In adults, wheat, celery and fruits such as shellfish and peaches are the most common causes of

food-related anaphylaxis<sup>6</sup>. Venom-associated anaphylaxis is generally caused by bee venom<sup>7</sup>. Drug-induced anaphylaxis is usually caused by antibiotics and non-steroidal anti-inflammatory drugs<sup>8</sup>.

The incidence of anaphylaxis has been reported as 8.4-111.2/100,000 person-years<sup>9</sup>. In children, the incidence for all-cause anaphylaxis is 1-761/100,000 person-years, while the incidence for food-induced anaphylaxis is 1-77/100,000 person-years<sup>10</sup>. Mortality rates due to anaphylaxis are between 0.5-1<sup>1</sup>. The therapeutic dose of adrenaline is 0.01 mg/kg (1/1000). In treatment, adrenaline is administered intramuscularly into the vastus lateralis (thigh) muscle. If clinical improvement is not achieved after adrenaline, adrenaline can be administered 3 times with an interval of 5 minutes.

**Table 1.** Diagnostic criteria for anaphylaxis

|  |
|--|
| <p>1) Sudden onset of illness (minutes to hours) involving the skin, mucous membranes or both (generalized rash, itching or redness, swelling of the lips/tongue/uvula) and at least one of the following:</p> <ul style="list-style-type: none"><li>a) <i>Respiratory system involvement (respiratory distress wheezing/bronchospasm, stridor, decreased PEF, hypoxemia, etc.)</i></li><li>b) <i>Hypotension or findings associated with end organ dysfunction (hypotonia/ collapse, syncope, incontinence, etc.)</i></li></ul>   |
| <p>2) Onset of at least 2 of the following criteria present shortly (minutes to several hours) after exposure to the possible allergen:</p> <ul style="list-style-type: none"><li>a) <i>Involvement of skin and mucous membranes (generalized rash, pruritus or redness, swelling of the lips/tongue/uvula)</i></li><li>b) <i>Respiratory system involvement (respiratory distress, wheezing/bronchospasm, stridor, decreased PEF, hypoxemia, etc.)</i></li><li>c) <i>Hypotension and related findings (hypotonia/collapse, syncope, incontinence, etc.)</i></li><li>d) <i>Gastrointestinal symptoms (cramping abdominal pain, vomiting, etc.)</i></li></ul> |
| <p>3) Decrease in blood pressure after exposure to allergen known to the patient (from minutes to several hours)</p> <ul style="list-style-type: none"><li>a) <i>For infants and children: low systolic blood pressure (age-specific) or &gt;30% decrease in systolic blood pressure</i></li><li>b) <i>For adults: systolic blood pressure &lt;90 mmHg or &gt;30% reduction in systolic blood pressure compared baseline value for the individual</i></li></ul>  |

In one study, the incidence of biphasic reactions in children was reported to be 10% in peanut-induced anaphylaxis and 4% in other food-induced anaphylaxis cases<sup>11</sup>. Patients with anaphylaxis should be monitored for 24-72 hours due to the not uncommon risk of biphasic reactions. Allergy department should be consulted for further examination and evaluation of patients. Patients with anaphylaxis should be prescribed an adrenaline autoinjector if necessary, and patients and their caregivers should be informed about the use of the autoinjector<sup>12,13</sup>.

Since anaphylaxis is a sudden onset clinical picture with serious consequences, it is extremely important that the diagnosis is made quickly and treatment is started immediately<sup>14</sup>. Immediate treatment of anaphylaxis is vital and reduces mortality<sup>15</sup>. For this reason, physicians should have sufficient knowledge and awareness about anaphylaxis<sup>14,16</sup>. In this context, the aim of this study was to evaluate the level of knowledge about anaphylaxis among resident physicians working in a tertiary care hospital.

## Materials and Methods

Our descriptive study was conducted with resident physicians working in a tertiary hospital in Istanbul. Physicians were administered a questionnaire including questions about the diagnosis and treatment of anaphylaxis. In the preparation of the survey questions, studies in the literature were utilized<sup>17,20</sup>. Ages, genders, departments, and service durations of the physicians were also evaluated in the study.

### Statistical evaluation

SPSS (Statistical Package for Social Sciences) for Windows 25.0 program was used for data analysis and recording. Median, minimum, maximum values, number (n) and percentages (%) were used for descriptive data. The relationship between categorical variables was evaluated by Fisher exact test and

Pearson chi-square test.  $P < 0.05$  was accepted as the level of statistical significance.

## Results

172 resident physicians were surveyed within the scope of the study. While 47.0% (n=79) of the physicians were internal medicine residents, 53.0% (n=89) were surgical medicine residents. Sociodemographic characteristics of the participants and questions related to anaphylaxis are given in Table 2.

Resident physicians were asked questions to assess their knowledge about anaphylaxis. There were no questions that all resident physicians answered correctly.

The responses of physicians to the information questions are given in Table 3.

**Table 2.** Sociodemographic characteristics, questions about anaphylaxis

| Age (median) (min-max)                              |            | 29.0 (25.0-53.0) |       |
|---|------------|------------------|-------|
|   |            | n                | %     |
| Department  | · Internal | 79               | 47.0  |
|   | · Surgery  | 89               | 53.0  |
| Duration of practice (years)                        | · 1-5      | 131              | 76.2  |
|   | · 6-10     | 36               | 20.9  |
|   | · >11      | 5                | 2.9   |
| Time since most recent anaphylaxis training (years) | · 1-5      | 146              | 84.9  |
|   | · 6-10     | 26               | 15.1  |
|   | · >11      | 0                | 0     |
| Believes that anaphylaxis can be life-threatening   | · Yes      | 172              | 100.0 |
|   | · No       | 0                | 0     |
| Encountering anaphylaxis                            | · Yes      | 109              | 63.7  |
|   | · No       | 62               | 36.3  |
| Treating anaphylaxis                                | · Yes      | 96               | 55.8  |
|   | · No       | 76               | 44.2  |
| Keeping adrenaline in the department                | · Yes      | 156              | 90.7  |
|   | · No       | 16               | 9.3   |
| See adrenaline                                      | · Yes      | 140              | 81.4  |
|   | · No       | 32               | 18.6  |

**Table 3.** Physicians' responses to knowledge questions

| Questions  | n (%)      |
|--|------------|
| Know the signs and symptoms of anaphylaxis correctly                                     | 144(83.7)  |
| Know the correct clinical criteria for the diagnosis of anaphylaxis                      | 109(63.4)  |
| Those who correctly know the first-line drug to be administered in anaphylaxis           | 165(95.9)  |
| Those who know the correct adrenaline re-administration interval                         | 119(69.2)  |
| Those who know the correct recommended route of adrenaline administration in anaphylaxis | 149(86.6)  |
| Appropriate intramuscular adrenaline dose  |            |
| · mg/kg 1/1000   | 119 (70.0) |
| · mg/kg 1/100  | 17 (10)    |
| · mg/kg 1/10000  | 19 (11.2)  |
| · Does not know  | 15 (8.8)   |
| Recommended location for adrenaline administration                                       |            |
| · Vastus lateralis (mid-anterolateral thigh)   | 130 (76.0) |
| · Deltoid (mid-anterolateral upper arm)  | 26 (15.2)  |
| · Gluteus maximus (sciatic)  | 10 (5.8)   |
| · Does not know  | 5 (2.9)    |
| Follow-up time after reaction in patient with anaphylaxis                                |            |
| · 24-72 hours  | 131(76.2)  |
| · 1-2 hours  | 7 (4.1)    |
| · 6-8 hours  | 21 (12.2)  |
| · Does not know  | 13 (7.6)   |
| Heard about adrenaline auto-injector   | 142(82.6)  |

The responses of the physicians according to the branches in which they work are presented in Table 4. It was observed that surgical branch resident physicians answered the follow-up period after reaction in patients developing anaphylaxis as 24-72, which is a statistically significantly higher rate ( $P<0.001$ ) (Table 4).

## Discussion

Since anaphylaxis is a serious clinical diagnosis, physicians must have a high level of awareness and knowledge about anaphylaxis. In this study where we aimed to evaluate the resident physicians' level of knowledge regarding anaphylaxis, the correct answers given to the information questions posed in the questionnaire were examined and the responses of the internal and surgical branches to these questions were compared.

In the study, all resident physicians answered positively to the question that anaphylaxis

can be life-threatening. The proportions of those who knew the signs and symptoms of anaphylaxis and the clinical criteria for the diagnosis of anaphylaxis correctly were 83.7% and 63.4%, respectively. Since the first step in the approach to anaphylaxis is the rapid diagnosis of anaphylaxis, physicians should be familiar with the clinical picture of anaphylaxis and know the diagnostic criteria. In one of the studies, less than half of the physicians knew the symptoms of anaphylaxis<sup>21</sup>. In another study, only 16.7% of physicians knew all signs and symptoms of anaphylaxis. In the same study, more than 1/3 of the physicians did not utilize any academic source regarding the diagnostic criteria for anaphylaxis<sup>22</sup>. Since both our study and the results of similar studies show that physicians do not have sufficient knowledge about anaphylaxis findings and diagnostic criteria for anaphylaxis, educational programs on anaphylaxis should be organized during medical education and medical specialty training.

**Table 4.** Responses to knowledge questions according to department of employment

| <i>Questions</i>   | Internal<br>branch<br>(n=79)<br>n (%)* | Surgery<br>branch<br>(n=89)<br>n (%)* | P      |
|--|--|---------------------------------------|--------|
| Knows the signs and symptoms of anaphylaxis correctly                                    | 67(84.8)                               | 75(84.3)                              | 0.923  |
| Know the correct clinical criteria for the diagnosis of anaphylaxis                      | 55(69.6)                               | 51(57.3)                              | 0.099  |
| Correctly knows the first-line drug to be administered in anaphylaxis                    | 76(96.2)                               | 85(95.5)                              | 0.821  |
| Knows the correct adrenaline re-administration interval                                  | 59(74.7)                               | 58(65.2)                              | 0.181  |
| Those who know the correct recommended route of adrenaline administration in anaphylaxis | 72(91.1)                               | 76(85.5)                              | 0.251  |
| Appropriate intramuscular adrenaline dose  |  |                                       |        |
| · mg/kg 1/1000   | 56 (70.9)                              | 59(67.8)                              | 0.524  |
| · mg/kg 1/100  | 6 (7.6)                                | 11(12.6)                              |        |
| · mg/kg 1/10000  | 8(10.1)                                | 11(12.6)                              |        |
| · Does not know  | 9 (11.4)                               | 6 (6.9)                               |        |
| Recommended location for adrenaline administration                                       |  |                                       |        |
| · Vastus lateralis (mid-anterolateral thigh)   | 62 (78.5)                              | 66 (75.0)                             | 0.768  |
| · Deltoid (mid-anterolateral upper arm)  | 10 (12.7)                              | 16 (18.2)                             |        |
| · Gluteus maximus (sciatic)  | 5 (6.3)                                | 4 (4.5)                               |        |
| · Does not know  | 2 (2.5)                                | 2 (2.3)                               |        |
| Follow-up time after reaction in patient with anaphylaxis                                |  |                                       |        |
| · 24-72 hours  | 54 (68.4)                              | 73(82.0)                              | <0.001 |
| · 1-2 hours  | 2 (2.5)                                | 5 (5.6)                               |        |
| · 6-8 hours  | 10 (12.7)                              | 11(12.4)                              |        |
| · Does not know  | 13 (16.5)                              | 0 (0)                                 |        |
| Heard about adrenaline auto-injector   | 64(81.0)                               | 75(84.3)                              | 0.577  |

In our study, the proportion of physicians who knew that adrenaline was the first-line drug to be administered in the treatment of anaphylaxis was above 95% in both surgical and internal branches.

In one of the studies, 89.4% of physicians working in the emergency department answered that adrenaline was the first-line drug in the treatment of anaphylaxis<sup>23</sup>. In one of the studies conducted in our country, 90.5% of medical students stated that adrenaline was administered as the first drug in anaphylaxis<sup>19</sup>. In a study conducted with nurses, the majority of nurses knew that adrenaline was the first-line drug in the treatment of anaphylaxis. However, in the same study, approximately half of the nurses answered the signs and symptoms of anaphylaxis correctly<sup>24</sup>. In our study, similar to the literature, the rate of

knowing the findings and diagnostic criteria of anaphylaxis was low, whereas the rate of knowing that adrenaline is the first-line drug for treatment was higher.

In a study in the literature, 57.5% of physicians correctly answered the dose of adrenaline in the treatment of anaphylaxis<sup>25</sup>. In our study, while physicians knew that adrenaline was the first-line treatment, the rate of physicians knowing the correct dose of adrenaline was 70.0%. There is a need to inform physicians and healthcare professionals about the therapeutic dose of adrenaline in anaphylaxis.

In our study, 91.1% of residents in internal medicine and 85.5% of residents in surgical medicine answered that adrenaline was administered intramuscularly in the treatment of anaphylaxis. In a study conducted in our

country, only 40.9% of family physicians answered that adrenaline was given intramuscularly in the treatment of anaphylaxis<sup>26</sup>. According to another study, approximately half of the physicians (49.2%) knew the correct route of administration of adrenaline in the treatment of anaphylaxis<sup>27</sup>. According to a study conducted in dentists, 64.6% of the participants knew that adrenaline is given intramuscularly in the treatment of anaphylaxis<sup>28</sup>. Although the rate of physicians in our study knowing the correct route of administration of adrenaline in case of anaphylaxis is higher compared to the literature, the level of knowledge on this subject should be increased, especially in surgical branches. Some patients with anaphylaxis may develop a new attack after clinical improvement. This condition is called "biphasic anaphylaxis"<sup>29</sup>. Because of the risk of biphasic anaphylaxis, follow-up of anaphylaxis patients is extremely important. In our study, the rate of those who answered that the follow-up period for anaphylaxis should be 24-72 hours was 68.4% in internal branches, while this rate was 82% in surgical branches. There is a lack of knowledge about the follow-up period of anaphylaxis patients, especially among internal medicine physicians. Since the findings of biphasic anaphylactic reaction in patients may be more serious than the initial findings<sup>30</sup>, it is extremely important for physicians to know the correct follow-up period of the anaphylaxis patient. In the literature; recurrence of anaphylaxis within 1 year in patients with anaphylaxis was reported as 10.6%<sup>31</sup>. Physicians should prescribe adrenaline autoinjectors and educate patients with anaphylaxis regarding the use of adrenaline autoinjectors because of the risk of recurrent anaphylaxis. According to our study, almost 1 in 5 physicians had never heard of the adrenaline autoinjector. In the literature, 40% of pediatric residents did not know the use of adrenaline autoinjector, this rate decreased to 18% according to the survey repeated after training<sup>32</sup>. This information once again emphasizes the importance and benefit of trainings on anaphylaxis.

The study questionnaire was applied to resident physicians working in one hospital. This situation creates a limitation in terms of the generalizability of the study results. In the study, the knowledge levels of resident physicians from both internal and surgical branches were evaluated. Evaluation and comparison of the results of both branches in terms of anaphylaxis knowledge level is the strength of the study.

## Conclusion

According to the results of the study; the level of knowledge about anaphylaxis in resident physicians of internal and surgical branches is not adequate. There is a need to increase the level of knowledge and awareness of physicians about anaphylaxis and to organize trainings on this subject. With the training and survey studies to be planned, it can be ensured that the knowledge and awareness of other healthcare professionals who are likely to encounter anaphylaxis cases can be evaluated and increased.

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Ethics committee approval was obtained from Health Sciences University Haydarpaşa Numune Training and Research Hospital Ethics to revoke this consent at any time. All methods were carried out in accordance with relevant guidelines and regulations.

### Consent for publication

All authors agree to the publication. Informed consent was obtained from all subjects for publishing their data in the manuscript.

### Competing interests

All authors declare that they have no competing interests.

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