Middle Black Sea Journal of Health Science / Mid Blac Sea J Health Sci **May 2025; 11(2): 97-106**

ORGINAL ARTICLE **DOI:** 10.19127/mbsjohs.1550914

Knowledge Levels of Physicians, Nurses, and Health Technicians Working in A Children's Hospital Regarding Anaphylaxis and Adrenaline Auto-Injectors

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Received: 16 September 2024, Accepted: 20 February 2025, Published online: 31 May 2025

Abstract

Objective: Anaphylaxis should be recognized and treated by physicians and healthcare workers. In our study, we aimed to determine the knowledge and education levels regarding anaphylaxis and the attitudes towards adrenaline auto-injector use among doctors, nurses, and health technicians working in the Women's and Children's Annex of Ordu University Training and Research Hospital, a tertiary healthcare institution.

Method: A 15-item questionnaire designed to assess demographic data, employment status, and knowledge level about anaphylaxis and its management was administered to the participants.

Results: The study was completed with 136 participants, including 66 physicians, 58 nurses, and 12 technicians. It was found that 75 participants had knowledge about adrenaline auto-injectors, with 9.3% having previously issued a report on auto-injectors. Physicians showed greater knowledge in correctly administering adrenaline during anaphylaxis compared to other professional groups. Healthcare workers in the emergency department demonstrated higher levels of knowledge in adrenaline administration compared to those in other units. While no significant relationship was found between professional experience and the selection of correct treatment methods in anaphylaxis, those with longer professional lives were found to have better knowledge about adrenaline administration proportionally. Another finding from our study is that participants who received training within less than 3 years had more accurate knowledge about adrenaline administration compared to others.

Conclusion: The repetition of essential training and keeping knowledge up-to-date are crucial for correct application and treatment in anaphylaxis. There is a need for organizing training sessions to increase knowledge levels and awareness, particularly among healthcare workers, including physicians.

Keyword: Anaphylaxis, Adrenaline, Auto-injector

Suggested Citation Altinok EI, Yapar Gumus C. Knowledge Levels of Physicians, Nurses, and Health Technicians Working in A Children's Hospital Regarding Anaphylaxis and Adrenaline Auto-Injectors. Mid Blac Sea Journal of Health Sci, 2025;11(2):97-106.

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INTRODUCTION

Allergy refers to an exaggerated reaction of the immune system to substances or agents that usually do not cause any reaction in most individuals. These substances, known as allergens, can enter the body through the mouth, skin, or respiratory tract. For an allergic reaction to develop, the individual must have been previously exposed to the allergen (1).

Common allergic diseases include atopic dermatitis, allergic rhinitis, asthma, allergic conjunctivitis, angioedema, and food, insect, and drug allergies. It is known that the prevalence of these diseases has significantly increased in recent years, supported by studies conducted in various countries (2). Food, insect, and drug allergies often present with urticaria, which are raised, red, itchy welts that blanch with pressure. Another type of allergic reaction is angioedema, which is localized swelling in the subcutaneous tissue, most commonly affecting the extremities, face, genital organs, airways, and gastrointestinal system. Anaphylaxis is a severe allergic reaction with a rapid onset that can be fatal (3).

Anaphylaxis is an IgE-mediated immunological reaction leading to the rapid release of mediators from mast cells and basophils. However, IgG (only in animal models) and immune complex/complement-mediated immunological reactions can also cause anaphylaxis. The most common triggers are known to be foods, with a prevalence reported between 0.05-2% (4). Exercise, cold, contrast agents, and various drugs can also trigger mediator release through non-immunologic pathways, termed anaphylactoid reactions.

The diagnosis of anaphylaxis is made based on clinical signs, history, and physical examination findings. When taking a history, details such as when and how the event occurred, its duration, any treatments applied, and potential and probable triggers should be thoroughly investigated. Anaphylaxis should be considered in the presence of sudden onset of symptoms involving two or more systems, such as the skin, respiratory, circulatory, and digestive systems (5). While symptoms typically appear within the first two hours after exposure, late-onset cases should not be overlooked, and information about medications taken and foods consumed in the last 4-6 hours should be obtained. Skin findings are often present but may not always accompany anaphylaxis.

The first choice and life-saving medication in the event of anaphylaxis is intramuscular

adrenaline. Despite the potential risk of death, this risk can be minimized with correct and prompt treatment approaches (6).

The treatment dose is 0.01 mg/kg (maximum 0.3 mg) in children and 0.5 mg in adults. There are no contraindications, and the dose can be repeated at 5-minute intervals if clinically necessary. All patients who have experienced anaphylaxis should be prescribed an adrenaline auto-injector, and the patient and their relatives should be practically informed on its use. If an adrenaline auto-injector is to be used, 0.15 mg/dose should be applied for children weighing between 7.5-25 kg, and 0.3 mg/dose for those over 25 kg (7). Moreover, patients should be referred to allergy clinics for follow-up and, if necessary, for planning immunotherapy.

Recognizing and treating anaphylaxis, which can be fatal but is treatable with rapid intervention, is essential for both physicians and healthcare workers. Various studies conducted in our country indicate a lack of knowledge on this subject (8, 9).

This study aims to assess the knowledge and education levels regarding anaphylaxis and attitudes towards using adrenaline auto-injectors among doctors, nurses, and health technicians working in the Obstetrics and Pediatrics annex of the Ordu University Training and Research Hospital, a tertiary healthcare institution.

METHODS

The study was designed to include physicians, nurses, and anesthesia technicians working in the Obstetrics and Pediatrics annex of Ordu University Training and Research Hospital. The current total number of these individuals was obtained from the personnel department of our hospital (155 individuals). Using epi info 7, the sample size was calculated as 128, assuming a 66% prevalence, with a 5% margin of error, a 95% confidence interval, and a 20% non-response rate (10). The improbable sample technique was used. A 15-question survey was administered to evaluate demographic data, work assessments, and knowledge levels regarding anaphylaxis and its management. Participants who could not be contacted face-to-face during the study and those who did not want to fill out the consent form were excluded.

Statistical analysis

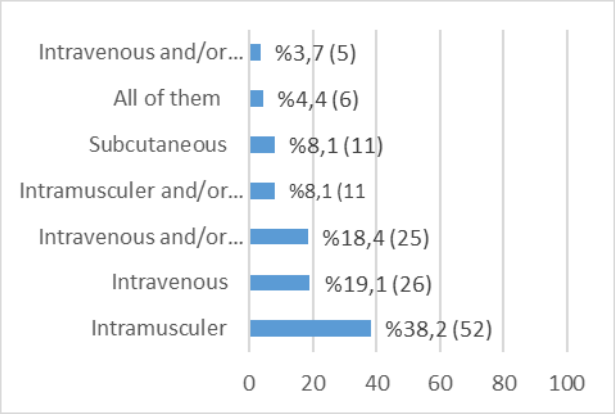
The data were analyzed using the SPSS 26.0 software package. For categorical variables, the data are presented as frequencies and percentages, while for numerical variables, the mean and standard deviation values are provided. A 95% confidence level was typically used when calculating the confidence interval. The chi-square test was used to examine the relationship between the method of adrenaline administration and other independent variables. The significance level was set at $p<0.05$.

RESULTS

The study was completed with 136 participants, including 66 doctors (48.5%), 58 nurses (42.6%), and 12 technicians (8.9%). The physicians in the study specialized in Pediatrics, Obstetrics and Gynecology, Pediatric Surgery, Anesthesia, Family Medicine, and Emergency Medicine. In total, 103 (75.7%) participants were female, and 33 (24.3%) were male. The mean age was calculated as 34.11 ± 8.99 years. The distribution and work statuses of the participants are shown in Table 1.

Of the participants, 99 (72.8%) reported having received training on anaphylaxis, with most of this training (62.6%) occurring outside their current institution. Among the participants, 88 (64.7%) had previously encountered an anaphylaxis case, with 51.1% of them being physicians. The most common causes of anaphylaxis in encountered cases were drugs (33%), bee stings (27.3%), and food allergies (5.7%). Thirteen participants (15.2%) reported that adrenaline was not administered in the anaphylaxis cases they encountered, and 9 (10.5%) stated that only adrenaline was used. The majority (51, 59.3%) indicated that adrenaline, steroid, and antihistamine were used together (Table 2).

Questions regarding the method of adrenaline administration and knowledge of adrenaline auto-injectors were directed to measure knowledge levels. Among the participants, 52 (38.2%) knew that adrenaline should be administered intramuscularly in anaphylaxis cases. Twenty-six participants (19.1%) stated it should be administered intravenously, and 25 participants (18.4%) indicated it could be administered intravenously and/or intramuscularly (Graph 1).



Graph 1. Routes of Adrenaline Administration in Anaphylaxis According to Participants (Percentage and Frequency)

It was found that 75 participants (55%) had knowledge of adrenaline auto-injectors, and 9.3% of them had previously issued an auto-injector prescription.

Physicians were more knowledgeable than other occupational groups regarding the correct administration of adrenaline in anaphylaxis ($p<0.001$). Participants working in emergency services had higher knowledge levels about adrenaline administration compared to those working in other units ($p<0.001$). Another finding was that participants who had received anaphylaxis training within the past three years had more accurate knowledge about adrenaline administration compared to other participants ($p=0.03$) (Table 3).

Table 1. Demographic Characteristics and Employment Status of Participants

Gender	**Number (n)**	**Percent (%)**
Female	103	75.7
Male	33	24.3
Age (mean ± standard deviation = 34.11 ± 8.99)		
≤34	77	56.6
>34	59	42.4
Occupation		
Doctor	66	48.5
Nurse	58	42.6
Technician	12	8.9
Years of practice		
<5	50	36.8
5-10	21	15.4
>10	65	47.8
Work unit		
Emergency department	30	22.1
Operating room	21	15.4
Outpatient clinic	22	16.2
Ward	30	22.1
Intensive care unit	14	10.3
Other	19	14

Table 2. Treatments administered in encountered cases

	Number (n=88)	**Percent (%)**
Adrenaline	9	10.5
Adrenaline+Antihistamine	7	8.1
Adrenaline+Steroid	6	7
Steroid	1	1.2
Steroid+Antihistamine	12	14
Adtrenaline+Steroid+Antihistamine	51	59.3

Table 3. Characteristics of healthcare professionals according to the method of adrenaline administration in anaphylaxis.

	Method Of Adrenaline Administration Frequency (Percentage)		
	Intramuscular	**Others**	***P***
Gender			
Female	36 (69.2)	67 (79.8)	*0.16*
Male	16 (30.8)	17 (20.2)	
Age (mean ± standard deviation = 34.11 ± 8.99)			
≤34	31 (59.6)	46 (54.8)	*0.57*
>34	21 (40.4)	38 (45.2)	
Occupation			
Doctor	36 (69.2)	30 (35.7)	***<0.001***
Nurse	15 (28.8)	43 (51.2)	
Technician	1 (1.9)	11 (13.1)	
Years of practice			
<5	19 (36.5)	31 (36.9)	*0.96*

≥5	33 (63.5)	53 (63.1)	
Work unit			
Emergency department	20 (38.5)	10 (11.9)	***<0.001***
Other	32 (61.5)	74 (88.1)	
History of allergic disease			
Yes	18 (34.6)	33 (39.3)	*0.58*
No	34 (65.4)	51 (60.7)	
Anephylaxis training			
Yes	41 (78.8)	58 (69)	*0.21*
No	11 (21.2)	26 (31)	
Currently receiving training at the institution			
Yes	12 (29.3)	25 (43.1)	*0.16*
No	29 (70.7)	33 (56.9)	
≤3 years	25 (61)	24 (40.7)	***0.03***
>3 years	16 (39)	35 (59.3)	
Previous encounter with anaphylaxis case			
Yes	37 (71.2)	51 (60.7)	*0.21*
No	15 (28.8)	33 (39.3)	
Causative agent of anaphylaxis in encountered case			
Drug	14 (37.8)	15 (29.4)	*0.38*
Food	3 (8.1)	2 (3.9)	
Bee sting	11 (29.7)	13 (25.5)	
Other	9 (24.3)	21 (41.2)	
Treatment administered in encountered case			
Adrenaline only	5 (13.9)	4 (8)	***0.02***
Adrenaline + Antihistamine and/or steroid	30 (83.3)	34 (68)	
Non-adrenaline	1 (2.8)	12 (24)	
Knowledge about adrenaline auto-injector			
Yes	33 (63.5)	42 (50)	*0.12*
No	19 (36.5)	42 (50)	
Issuance of adrenaline auto-injector prescription			
Yes	5 (9.6)	2 (2,4)	*0.07*
No	47 (90.4)	82 (97.6)	

DISCUSSION

Anaphylaxis, a sudden onset condition that can result in death, must be well recognized and managed by healthcare professionals. The incidence of anaphylaxis in the general population is 49.8 per 100,000 person-years, whereas it is 70 per 100,000 person-years in

children (11). Therefore, it is crucial for pediatricians and other healthcare providers working with children to be equipped with the knowledge and skills to manage anaphylaxis when encountered. This study aimed to evaluate the knowledge levels of healthcare professionals working in our institution, which provides services in emergency, intensive care, operating rooms, outpatient clinics, and inpatient services, in the field of pediatric and women's health.

Although food-related anaphylaxis is expected to be more common compared to other triggers (4), our findings identified drug-induced and bee sting-related anaphylaxis as the most frequent cases encountered.

Among the participants, 68.2% of the physicians reported previous encounters with anaphylaxis. Physicians constituted the group with the highest encounter rate of anaphylaxis at 51.1% among all participants. In a study by Çimen et al. (12) involving 301 participants, 64% reported previous encounters with anaphylaxis, with physicians having the highest rate, although other healthcare workers also reported experiences with anaphylaxis at a rate of 54%. Significant differences were noted in the knowledge of adrenaline administration between those who had previous experience with anaphylaxis and those who did not. However, in our study, while participants with longer professional experience (>5 years) had more encounters with anaphylaxis, there was no significant difference in correct adrenaline administration between those who had encountered anaphylaxis and those who had not ($p=0.96$).

Among all participants, the group with the highest correct response rate regarding the intramuscular route of administration was physicians, at 69.2% ($p<0.001$). Furthermore, 54.5% of physicians knew that intramuscular adrenaline is the first-line treatment for anaphylaxis. According to Akova et al. (13), a study involving 30 pediatric residents, all residents chose adrenaline as the first-line medication, and 97% of them knew that the intramuscular route was the preferred method of administration. Another study involving family physicians reported a 90% preference for adrenaline as the first-line treatment for anaphylaxis (14). While there was no significant difference ($p=0.3$) in knowledge about adrenaline being the first-line treatment between experienced family physicians (over 10 years of experience) and other groups, experienced physicians showed significantly better knowledge about administration routes ($p=0.004$). In our study, although there was no significant relationship between professional experience and choice of correct treatment method for anaphylaxis ($p=0.96$), participants with longer work experience had a better knowledge level regarding adrenaline administration (63.5%).

Our study also found that only 1.9% of technicians and 28.8% of nurses knew that adrenaline should be administered via the intramuscular route. Baççıoğlu et al. (9) reported higher knowledge levels regarding correct anaphylaxis treatment among nurses compared to other medical auxiliary staff. However, they emphasized a significant decrease in knowledge levels among specialist doctors, medical students, nurses, and technicians. We believe that the limited number of anesthesia and emergency technicians in our study might have created constraints.

In our study, 72.8% of participants had received training on anaphylaxis, with approximately half of them having received training within the last 3 years. There was no significant difference in correct application between those who received training and those who did not. However, proportionally, 78.8% of those who had correct knowledge about adrenaline administration had received previous training. Among the total 84 participants who administered adrenaline via non-intramuscular routes for anaphylaxis, 69% had received training on anaphylaxis before. According to Çimen et al. (12), there was a significant difference ($p<0.001$) in having correct knowledge about adrenaline treatment between those who received anaphylaxis training and those who did not. Another finding from our study was that individuals who received training within less than 3 years had better knowledge about adrenaline administration compared to others ($p=0.03$), highlighting the importance of regular training and keeping knowledge updated for correct application and treatment of anaphylaxis.

Only 29.3% of participants who received training on anaphylaxis did so within their current institution, and most of them had received training more than 3 years ago. This result suggests a need for planning new training sessions.

In managing anaphylaxis in the long term by patients and/or their families, recognizing the clinical signs of anaphylaxis, avoiding triggers, prescribing and teaching the use of adrenaline auto-injectors by doctors are life-saving practices (15). In our study, 55% of participants knew about adrenaline auto-injectors. Among them, 49 were physicians, and only 7 of them reported having issued an auto-injector prescription before. In a study conducted with family physicians in our country, 75.6% of physicians were found to be aware of adrenaline auto-injectors (16).

The limitations of our study include its single-center design and the imbalance in the distribution among groups, which may affect the statistical analysis. Additionally, the absence of probability sampling is another limitation, as it may reduce the generalizability of the findings to the broader population.

CONCLUSION

There is a need for organizing educational programs to increase knowledge and awareness about anaphylaxis among healthcare professionals, especially among physicians. It is essential to educate healthcare professionals about adrenaline use and prescription of auto-injectors to enhance awareness among patients and families dealing with anaphylaxis. Providing anaphylaxis training to healthcare professionals who encounter anaphylaxis for the first time and keeping this training updated are crucial.

Acknowledgements: The authors would like to appreciate the patients participation in this study.

Ethics Committee Approval: Approval for this study was obtained from the Ordu University Non-Interventional Research Ethics Committee (date 29.09.2023 and number 2023/246)

We state that the parents have given their written informed consent to be involved in the study, in accordance with the Declaration of Helsinki.

Peer-review: Externally peer-reviewed

Author Contributions: Concept: EIA, Design: EIA, Data Collection and Processing: EIA, CYG, Analysis and Interpretation: EIA, Writing: EIA, CYG,

Conflict of Interest: The authors declared no conflict of interest.

Financial Disclosure: The authors declared that this study has not received no financial support.

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