



Knowledge of Healthcare Professionals Regarding the Primary Management of Anaphylaxis in Madinah, Saudi Arabia

**Nasser S. AlHaddad¹, Abdul Rahman A. Alshaeri², Athar A. Faidh³,
Yaser M. Alahmadi⁴, Hossein M. Elbadawy³ and Ahmed J. Aldhafiri^{3*}**

¹Department of Pediatrics, Ohud Hospital, Madinah, KSA.

²Department of Pharmacy, Ohud Hospital, Madinah, KSA.

³Department of Pharmacology, College of Pharmacy, Taibah University, Madinah, KSA.

⁴Department of Clinical and Hospital Pharmacy, College of Pharmacy, Taibah University, Madinah, KSA.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i45A32737

Editor(s):

(1) Dr. Dharmesh Chandra Sharma, G. R. Medical College & J. A. Hospital, India.

Reviewers:

(1) Dwi Aris Agung Nugrahaningsih, Universitas Gadjah Mada, Indonesia.

(2) Fauna Herawati, Universitas Surabaya, Indonesia.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/74256>

Original Research Article

Received 17 July 2021

Accepted 27 September 2021

Published 30 September 2021

ABSTRACT

Aim: To assess the knowledge, attitude and practice of healthcare professionals regarding the anaphylaxis in Medina, Saudi Arabia.

Settings and Design: This was a population-based epidemiological study using a survey composed of 20 questions about the causes, symptoms, and treatment of anaphylaxis.

Methods: This survey was distributed to healthcare professionals who represented different job categories including consultants, specialists, interns, residents, nurses, and medical students.

Statistical Analysis Used: One-way ANOVA is used to compare the knowledge score across different job categories. SPSS V26 software was used for the analysis and a *p* value of <0.05 was considered significant.

Results: The mean of the correct answers for all participants was 60% and no difference in the

mean scores was found in all participant from different job categories. The minimum achieved score was 30% and the maximum score was 100%. The score for the correct answers to each question was varied from 21% to 81%.

Conclusions: The shortage of knowledge among the healthcare professionals regarding anaphylaxis predicts the occurrence of undesirable outcomes for patients. Educating healthcare professionals regarding the management of anaphylaxis can improve the quality of healthcare services.

Keywords: Anaphylaxis; survey; healthcare; emergency; knowledge.

1. OBJECTIVES

Knowledge of healthcare professionals and medical students regarding anaphylaxis was rated at 60%, with no significant differences related to health profession. This raised the demand for improvement in the knowledge of the management of emergency conditions specifically, anaphylactic shock.

2. INTRODUCTION

Anaphylaxis is the severe systemic hypersensitivity reaction[1]. However, the definition of anaphylaxis varies slightly in the literature. According to the American academy for allergy, asthma and immunology (AAAAI), anaphylaxis is a life-threatening allergic reaction. Clinical features of anaphylaxis include, among many, flushing, urticaria, angioedema, rhinitis, anxiety, headache, cyanosis, asphyxia, tachycardia, hypotension, circulation collapse, shock and infarctions. The severity of the reaction is largely unpredictable, despite the body of evidence on different clinical outcomes in the literature. The management of anaphylaxis should consider the acute and chronic phases of the anaphylactic attack[2]. The right emergency management is key to patients' survival. Ignoring prognosis by the patient or the physician commonly occur, resulting in unfavourable outcome[3]. Although the mortality rates are not surging, majority of deaths from anaphylaxis can be avoided [4]. Regarding the emergency management of anaphylaxis, epinephrine should be given at a dose relevant to age and body weight, while this dose can be repeated when necessary, if the blood pressure and pulse are good. In addition to adrenaline, other treatments can be added according to necessity. Intravenous fluids can help with restoring blood pressure while bronchodilators such as salbutamol can offer good respiratory assistance. It is also recommended to administer antihistamine drug such as chlorpheniramine intravenous (IV) and hydrocortisone [2]. Self-

administration of adrenaline metered doses can be helpful, however, this requires special training to be given to the patient and to raise their awareness of the use and risk of self-medication, and on the other hand, educate the physician well to be qualified to give sufficient support to the patient [5]. The identification of the causative agent which resulted in anaphylaxis to the patients is also important. This will provide protection to the patient on while continuing with his life activities as usual. The history of previous exposures to allergens can be greatly useful and will help the physician provide the right advice regarding types of foods and drugs which should be avoided. The most common types of food reported to cause anaphylaxis includes peanuts and tree nuts [6,7], dairy products [8], seafood [9, 10] and fruits [11-13], among others. The emergency department is the frontline for the management of most anaphylaxis cases [14]. Not following the clinical guidelines for identifying anaphylaxis were shown to results in misdiagnosis in almost half of the patients, as researched previously [15, 16]. Guidelines for anaphylaxis management are available from different resources [17-20], however, the use of adrenaline is essential and is not an issue for debate [20]. The available strengths are one mg/ml and 0.1mg/ml, the first being the most common and is preferred to be taken initially by intramuscular route, while the following dose, if needed can be taken using intramuscular [21] or intravenous injections for the following doses. Other concentrations available for single dose self-injection dosage forms. Anaphylaxis immune response has always been attributed to IgE, however, it was evident that IgE is not the only factor responsible for anaphylaxis [22]. It was evident that other factors are also involved, including IgG, FcγRIII, platelets aggregation factor (PAF) and macrophages [23]. Here we explore the knowledge of healthcare professionals in the city of Madinah, western region of Saudi Arabia, regarding the management of anaphylaxis and the medical training required for these situations.

3. MATERIALS AND METHODS

This is a cross-sectional study conducted in the city of Madinah, located in the western region of Saudi Arabia. The study was conducted from August-November 2019 among healthcare professionals (HCPs) working in public and private hospitals in the region. Participants included intern physicians, residents, specialists, consultants, nurses and medical students. An electronic questionnaire was distributed to all hospitals in the city, and it was completed anonymously by healthcare professionals. A validated self-administered questionnaire was developed after a thorough literature review. The questionnaire initially tested among 15 participants and open-ended questions were limited to reduce information bias. Confidentiality was maintained throughout the study by not disclosing respondent's identities. The study population included the medical professions specified earlier, all HCPs participating from other professions such as pharmacists and technicians were excluded. The subjects who participated in the study but did not provide a consent to participate were also excluded from the final sample. The questionnaire was distributed to a target population of 200 participants, however, only 112 completed questionnaires were obtained. To ensure to avoid bias in data analysis, results were randomized and participants' identification information were removed before statistical analysis was carried out by a member who did not participate in data collection. Sample randomization was carried out using computer-generated random numbers. The scores were compared across participants from different jobs using the SPSS software and employing the one-way ANOVA method as described in the following section.

3.1 Knowledge Scoring System

Knowledge of the participants was assessed by answering of 20 questions. The number of correctly answered questions were calculated and a percentage was given for each participant. The percentage represents the overall score for each participant.

3.2 Statistical Analysis

Descriptive statistics were presented for the professional healthcare occupation (job) and correct answers as numbers and percentages being categorical variables. A percentage score is calculated for each participant based on the

software, version 26, and the number of correct answers. This score is presented as mean, standard deviation, median, minimum and maximum. One-way ANOVA is used to compare the knowledge score across different job categories. SPSS V26 software was used for the analysis and a p value of <0.05 was considered significant.

4. RESULTS

4.1 Participants by Profession

A total of 112 participants from the medical field participated in this study. The participants are from a variety of jobs. Sixteen consultants participated, along with 29 interns, 21 medical students, 11 nurses, 16 residents and 19 specialists from different departments. Percentages of participants by job categories are shown in the following figure (Fig. 1).

The figure represents the distribution of the test sample by job categories calculated as a percentage from the total number of participants in the study.

4.1.1 Questions for the assessment of knowledge on anaphylaxis

The number of participants who correctly answered each question and their percentages are calculated. The following table shows the numbers and percentages of correct answers for each question. The question that had the highest percentage of correct answers is question 13 (81%) followed by question 12 (Q12) as 79%. The question that had the lowest percentage of correct answers is Q3, correctly answered only by 21% of all participants followed by Q8 that was correctly answered by 33% of the participants (Table 1).

4.2 Knowledge Score Analysis

The minimum achieved score was 30% and the maximum score was 100%, the later indicating that all questions were correctly answered. The mean score is 60% (SD=17%) and the median was also 60%. This means that 50% of the participants scored less than 60%. 17% of participants scored between 21-40%, majority of participants (44%) scored between 41-60%, 27% scored between 61-80% and 13% scored between 81-100%. The distribution of the scores is presented in the following graph (Fig. 2).

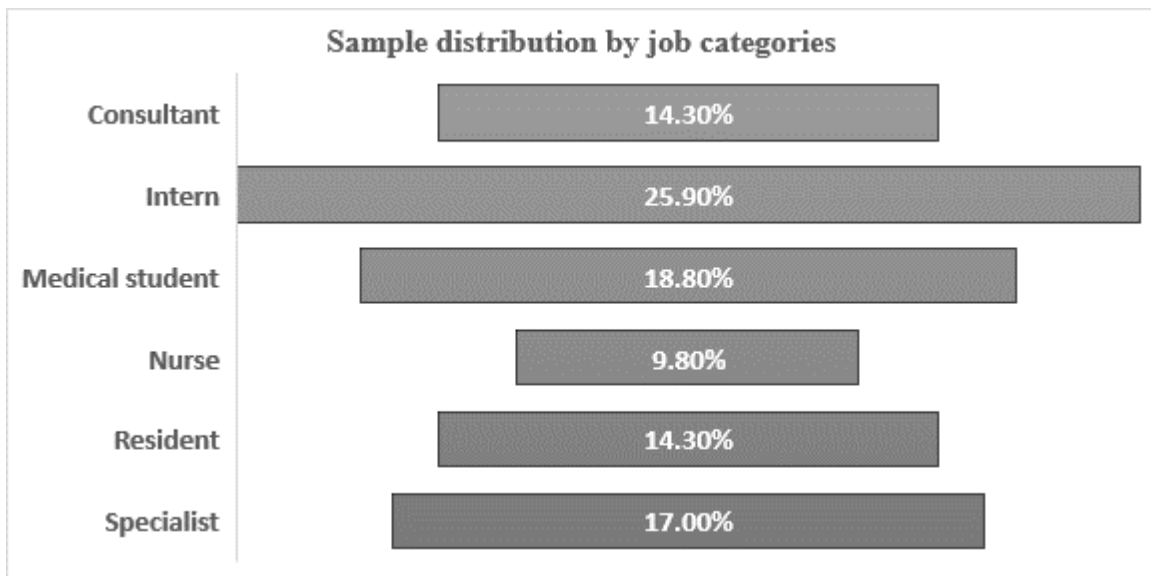


Fig. 1. Sample distribution by job categories

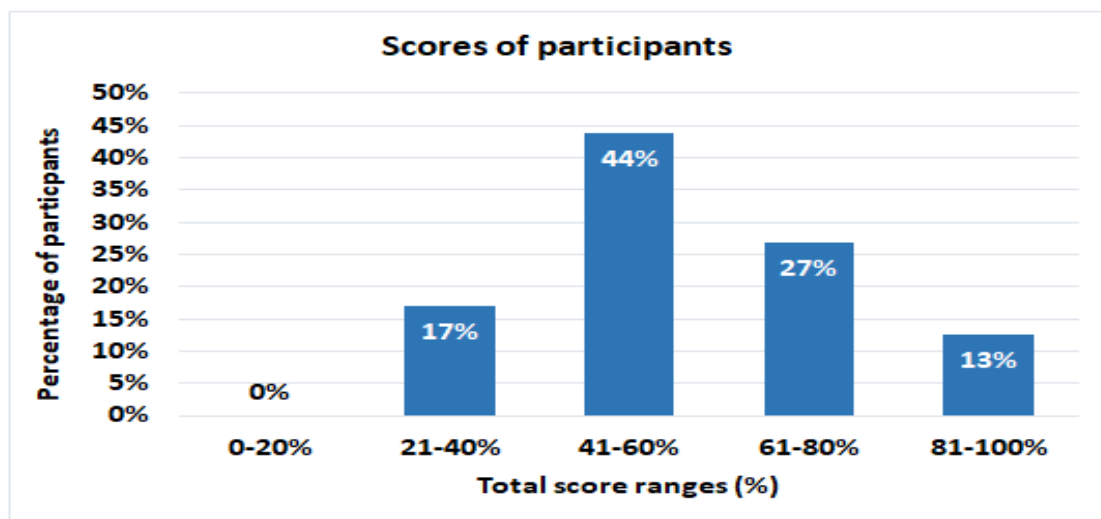


Fig. 2. Scores distribution between participants

The figure shows the number of participants in each score category. Percentages of participants are shown in the Y axis while the total score (%) is represented in the x axis. Scores were distributed into five categories; 0-20%, 21%-40%, 41%-60%, 61%-80% and 81-100% correct answers.

4.2.1 Correlation between jobs and knowledge of anaphylaxis management

There was no significant difference in the mean scores of participants from different job categories as presented in the following table (P value =0.113). This indicated that there were no

correlations between knowledge of anaphylaxis management and different jobs of participants. While the score was lowest for nurses, this difference was not statistically significant. The score of interns was also less than all other categories, except for nurses, this can be attributed to the experience level at this stage of the career (Table 2). Mean score for each job is shown in Fig 3.

The figure shows the mean scores as percentage of correct answers to the questionnaire. Interviewed patients were from six job categories as shown on the x axis.

Table 1. Correct answers per question

Questions for knowledge assessment	Number of correct answers	percentage of correct answers
1 Symptoms of anaphylaxis can occur?	40	36%
2 Anaphylaxis and anaphylactic shock are synonyms?	62	55%
3 Which of these are not likely to cause anaphylaxis?	24	21%
4 A mild allergic reaction to an allergen in the past is not a risk factor for a life-threatening reaction in the future?	76	68%
5 Norepinephrine is a good alternative for epinephrine in treating anaphylaxis?	66	59%
6 Mild anaphylaxis doesn't involve the respiratory or cardiovascular systems?	72	64%
7 Epinephrine should be given early in symptoms of anaphylaxis?	75	67%
8 Antihistamines and corticosteroids are good substitutes for epinephrine in treating anaphylaxis?	37	33%
9 Anaphylaxis always requires medical treatment?	71	63%
10 Anaphylaxes is always IgE mediated?	71	63%
11 Epinephrine and adrenaline are synonyms?	81	72%
12 Epinephrine is a?	89	79%
13 Sudden onset of urticaria and recurrent vomiting after exposure to an allergen should be considered as anaphylaxis?	91	81%
14 Food / foods that cause life threatening reactions are?	68	61%
15 Epinephrine is available in two strengths : 0.1 mg/ml for IV,IO and ET, 1 mg /ml for IM injection?	72	64%
16 Initial doses of epinephrine should be given into?	41	37%
17 Anaphylactic symptoms/signs may recur after successful treatment even without re-exposure to the culprit allergen?	80	71%
18 Urgent laboratory workups is required to confirm the diagnosis of anaphylaxis?	80	71%
19 The most common cause of death from anaphylaxis is delay in giving epinephrine?	69	62%
20 There are no absolute contraindications for use of epinephrine in treating anaphylaxis in children?	74	66%

Table 2. Knowledge score for each job category

Job	N	Mean	SD	Minimum	Maximum
Consultant	16	63.1%	16.7%	35.0%	85.0%
Intern	29	56.8%	14.4%	30.0%	90.0%
Medical student	21	62.0%	19.1%	30.0%	100.0%
Nurse	11	49.5%	13.5%	30.0%	75.0%
Resident	16	59.3%	15.6%	31.6%	90.0%
Specialist	19	66.5%	19.6%	35.0%	95.0%
Total	112	60.0%	17.1%	30.0%	100.0%

N= number of participants, SD=standard deviation

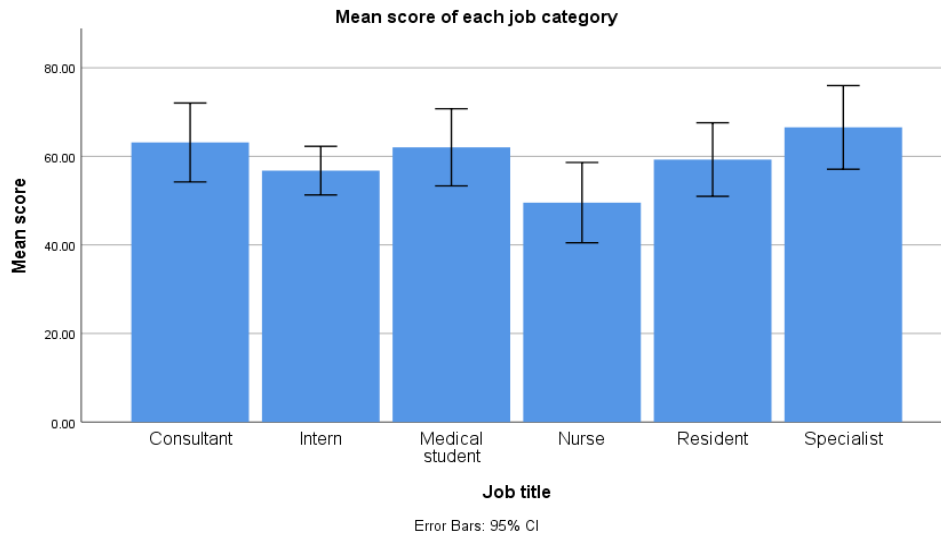


Fig. 3. The mean score for each job category

5. DISCUSSION

This study was conducted in order to assess the knowledge, attitude, and practice of healthcare professionals who work in hospitals in Madinah, Saudi Arabia, about the anaphylactic reaction and how to manage it. Even though the rate of death cases from anaphylactic shock is not surging, many incidents can still be avoided which can save many lives [19]. To the best of our knowledge, there is limited information in the literature about the anaphylactic shock management in Saudi Arabia. Therefore, a survey composed of [20] questions about anaphylactic shock was used to interview 112 healthcare professionals. These questions aimed at assessing the general knowledge of participants regarding different aspects of anaphylaxis such as causes, symptoms and clinical management. The healthcare professionals participating in this study were recruited to represent different job categories including consultants, specialists, interns, residents, nurses and medical students. Analysis showed no differences between the job categories regarding the overall score of correct answers. In general, the results of this study showed that the average score for the correct answers was 70% for all participants. Moreover, the minimum achieved score was 30% while the maximum score was 100% indicating the large variation among the participants.

It is important that healthcare providers recognize the urgency of an anaphylactic shock and that it could be fatal if medical intervention is

delayed for as short as 15 minutes [24]. One of the noticeable finding was that only 24 of 112 participants had answered the question three regarding the causative of anaphylaxis. It is well known that different food types, medication, exercise and insect stings can cause anaphylactic reactions. For example ingestion of peanuts, milk, shellfish, sesame, eggs and chickpeas are most prevalent causes of anaphylactic shock [25]. Also medications such as penicillin, aspirin, chemotherapy can trigger anaphylactic reaction [26]. Knowing the causes and the history of patient exposure, the healthcare professionals would be able to avoid the recurrence of anaphylaxis episodes and ultimately save lives. In addition, asking the participants if the antihistamines and corticosteroids are good substitutes for epinephrine in treating anaphylaxis, only 37 out of 112 participants gave the correct answer. This can be alarming, however, professional development sessions regarding the knowledge about anaphylaxis can be useful. Intramuscular epinephrine is the drug of choice to manage the anaphylaxis in addition to supplemental oxygen and other drugs such as antihistamines, bronchodilators, and corticosteroids can be co-administrated as an adjunct therapy [19]. If the anaphylactic patients did not receive epinephrine immediately, poor outcomes is expected, including death [27]. Of note, correct answers to each question were variable (21% to 81%) demonstrating the strength and weakness areas of the knowledge of all participants, which can be later addressed by training sessions. When we compared the scores for the correct answers

between different job categories, we found that at least one participant from each job category achieved only 30-35%. This indicates individual differences independent from the level of seniority or job categories. Although medical students were the only group in which 100% was achieved as the highest score while the highest score for the nurses was only 75%. However, if the questionnaire was carried out on emergency department, the scores would be expected much higher which would not be representative for healthcare professionals in general. This information might help authorities to design an educational program for the healthcare professionals focusing on the areas requiring more attention. However, one explanation for the low average score from this study is that not all participants are working in the emergency department therefore they did not have the experience of handling cases of anaphylactic shock. Moreover, the education and training programs they went through might not have provided them with an adequate background or their knowledge was not updated. For this, the demand for continuous education programs and postgraduate self-study is evident. The results of this study showed areas of improvement in the knowledge of healthcare professionals in Madinah's hospitals regarding the emergency conditions including the anaphylactic shock. As one of the main goals of this study is to help patients who are suffering from anaphylactic shock episodes and save their lives, the surveys should have been distributed to a larger number of healthcare professionals to better verify the readiness of healthcare professionals.

6. CONCLUSIONS

An evident shortage of knowledge among the healthcare professionals regarding anaphylaxis predicts the occurrence of undesirable outcomes for patients. This demands additional education of healthcare professionals regarding the management of anaphylaxis to improve the quality of healthcare services.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Johansson S, Bieber T, Dahl R, Friedmann PS, Lanier BQ, Lockey RF, et al. Revised nomenclature for allergy for global use: Report of the Nomenclature Review Committee of the World Allergy Organization. *J Allergy Clin Immunol.* 2004;113:832-6.
2. Walker S, Sheikh A. Managing anaphylaxis: effective emergency and long-term care are necessary. *Clin Exp Allergy.* 2003;33:1015-8.
3. Patel L, Radivan FS, David T. Management of anaphylactic reactions to food. *Arch Dis Child.* 1994;71:370.
4. Pumphrey R. Lessons for management of anaphylaxis from a study of fatal reactions. *Clin Exp Allergy.* 2000;30:1144-50.
5. Mostmans Y, Grosber M, Blykers M, Mols P, Naeije N, Gutermuth J. Adrenaline in anaphylaxis treatment and self-administration: experience from an inner city emergency department. *Allergy.* 2017;72:492-7.
6. Summers CW, Pumphrey RS, Woods CN, McDowell G, Pemberton PW, Arkwright PD. Factors predicting anaphylaxis to peanuts and tree nuts in patients referred to a specialist center. *J Allergy Clin Immunol.* 2008;121:632-8.
7. Sampson HA. Peanut anaphylaxis. *J Allergy Clin Immunol.* 1990;86:1-3.
8. Abe S, Kabashima K, Moriyama T, Tokura Y. Food-dependent anaphylaxis with serum IgE immunoreactive to dairy products containing high-molecular-weight proteins. *J Dermatol Sci.* 2010;57:137-40.
9. Hajeb P, Selamat J. A contemporary review of seafood allergy. *Clin Rev Allergy Immunol.* 2012;42:365-85.
10. Abe N, Ito T, Kobayashi T, Egusa C, Maeda T, Okubo Y, et al. A case of anaphylaxis due to fish collagen in a gummy candy. *Allergol Int.* 2020;69:146-7.
11. Mempel M, Rakoski J, Ring J, Ollert M. Severe anaphylaxis to kiwi fruit: immunologic changes related to successful sublingual allergen immunotherapy. *J Allergy Clin Immunol.* 2003;111:1406-9.
12. Hegde V, Venkatesh Y. Anaphylaxis following ingestion of mango fruit. *Journal of Investigational Allergol Clin Immunol.* 2007;17:341.
13. Thongkhom R, Oncham S, Sompornrattanaphan M, Laisuan W.

- Banana anaphylaxis in Thailand: case series. *Asia Pac Allergy*. 2020;10.
14. Bohlke K, Davis RL, DeStefano F, Marcy SM, Braun MM, Thompson RS, et al. Epidemiology of anaphylaxis among children and adolescents enrolled in a health maintenance organization. *J Allergy Clin Immunol*. 2004;113:536-42.
 15. Harduar-Morano L, Simon MR, Watkins S, Blackmore C. Algorithm for the diagnosis of anaphylaxis and its validation using population-based data on emergency department visits for anaphylaxis in Florida. *J Allergy Clin Immunol*. 2010;126:98-104.
 16. Gaeta TJ, Clark S, Pelletier AJ, Camargo CA. National study of US emergency department visits for acute allergic reactions, 1993 to 2004. *Ann Allergy Asthma Immunol*. 2007;98:360-5.
 17. Scolaro R, Crilly H, Maycock E, McAleer P, Nicholls K, Rose M, et al. Australian and New Zealand anaesthetic allergy group perioperative anaphylaxis investigation guidelines. *Anaesth Intensive Care*. 2017;45:543-55.
 18. Sheikh A, Sheikh Z, Roberts G, Muraro A, Dhimi S, Sheikh A. National clinical practice guidelines for food allergy and anaphylaxis: an international assessment. *Clin Transl Allergy*. 2017;7:23.
 19. Muraro A, Werfel T, Hoffmann-Sommergruber K, Roberts G, Beyer K, Bindslev-Jensen C, et al. EAACI food allergy and anaphylaxis guidelines: diagnosis and management of food allergy. *Allergy*. 2014;69:1008-25.
 20. Simons FER, Arduoso LR, Bilò MB, El-Gamal YM, Ledford DK, Ring J, et al. World Allergy Organization anaphylaxis guidelines: summary. *J Allergy Clin Immunol*. 2011;127:587-93.
 21. Sicherer SH, Simons FER. Epinephrine for first-aid management of anaphylaxis. *Pediatrics*. 2017;139:e20164006.
 22. Munoz-Cano R, Picado C, Valero A, Bartra J. Mechanisms of Anaphylaxis Beyond IgE. *Journal of Investig Allergol Clin Immunol*. 2016;26:73-82; quiz 2p following 3.
 23. Strait RT, Morris SC, Yang M, Qu X-W, Finkelman FD. Pathways of anaphylaxis in the mouse. *J Allergy Clin Immunol*. 2002;109:658-68.
 24. Krčmová I, Novosad J. Anaphylactic symptoms and anaphylactic shock. *Vnitř Lek*. 2019;65:149.
 25. Simons FER, Arduoso LR, Bilò MB, El-Gamal YM, Ledford DK, Ring J, et al. World allergy organization guidelines for the assessment and management of anaphylaxis. *World Allergy Organ J*. 2011;4:13-37.
 26. Simons FER. Anaphylaxis: recent advances in assessment and treatment. *J Allergy Clin Immunol*. 2009;124:625-36.
 27. Sicherer SH, Simons FER. Epinephrine for first-aid management of anaphylaxis. *Pediatrics*. 2017;139.

© 2021 AlHaddad et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<https://www.sdiarticle4.com/review-history/74256>