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Knowledge on anaphylaxis, its associated factors and self-perceived confidence on its management among medical officers attached to the Teaching Hospital Karapitiya

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ABSTRACT

Introduction

Knowledge on anaphylaxis management is paramount in saving lives. The main objective of this study was to assess the knowledge on anaphylaxis, its associated factors and self-perceived confidence on its management among medical officers practising at Teaching Hospital, Karapitiya.

Methods

This cross-sectional study included all medical officers (n=531) working in Teaching Hospital Karapitiya. The data were collected within three months via a self-administered questionnaire. The questionnaire consisted of 3 main parts. Part A for demographic data, part B on knowledge on diagnosis and management of anaphylaxis generated from case scenarios and part C on self-perceived confidence on diagnosis and management of anaphylaxis.

Results

The response rate was 79% (n=395). Of the respondents, only 9.36% doctors diagnosed all case scenarios correctly. Nearly a quarter (25.8%) identified all anaphylaxis triggers and 25% identified all the amplifying factors. Majority (91.9%) of doctors identified adrenaline as the first line treatment. More than 80% correctly mentioned the second line treatment with more than 90% scored for correct initial management. The score of knowledge on treatment doses of adrenaline in the paediatric age group was poor (60%). Importance of adrenaline auto-injector was identified by 69.1% but knowledge on further follow up of anaphylaxis was sub-optimal. Self-perceived confidence in diagnosis of anaphylaxis 87.6% and the self-perceived confidence in management of anaphylaxis was 83.9%.

Conclusions & recommendations

Even though the self-perceived confidence in diagnosis and management of anaphylaxis was satisfactory among the doctors, the knowledge on triggers and amplifying factors were sub-optimal. Novel educational and training strategies must be implemented to overcome the identified deficiencies.

Keywords: *Adrenalin, anaphylaxis, triggers, self-perceived confidence.*

Introduction

Anaphylaxis is a potentially fatal, generalized, or systemic hypersensitivity reaction that occurs in minutes to a few hours after exposure to a triggering agent (1). Cardiovascular, respiratory, skin, and gastrointestinal are the main systems affected (2, 3). In children and younger ages commonest trigger of anaphylaxis is food. However, in the middle-aged and elderly, insect stings and medications play a major role (4). When a definite trigger cannot be isolated it is called as idiopathic anaphylaxis which attributes to 6.5 - 35% of the cases and relatively common in the middle age group (5, 6). Any trigger that can causes systemic mast cell and basophil degranulation can potentially cause this. Protracted anaphylaxis/ biphasic anaphylaxis is rare where it lasts for days (1, 7, 8). The worldwide incidence of anaphylaxis ranges between 50 to 112 episodes per 100 000 person-years. Estimated lifetime prevalence is 0.3-5.1% (9). The clinical presentation and its pattern recognition are the keys to diagnose anaphylaxis. According to the World Allergy Organization Anaphylaxis Guidance 2020, it is highly likely when any one of the following 2 criteria are fulfilled (5).

1. Acute onset of an illness (minutes to several hours) with simultaneous involvement of the skin, mucosal tissue, or both (*e.g.,* generalized hives, pruritus or flushing, swollen lips-tongue-uvula)

   And at least one of the following;

   a. Respiratory compromise (*e.g.,* dyspnoea, wheeze-bronchospasm, stridor, reduced peak expiratory flow, hypoxaemia)

   b. Reduced blood pressure or associated symptoms of end-organ dysfunction (*e.g.,* hypotonia collapse, syncope, incontinence)

   c. Severe gastrointestinal symptoms (*e.g.* severe crampy abdominal pain, repetitive vomiting), especially after exposure to non-food allergens

2. Acute onset of hypotension or bronchospasm or laryngeal involvement after exposure to a known or highly probable allergen for that patient (minutes to several hours), even in the absence of typical skin involvement.

The above criteria which are highly sensitive (96.7%) and specific (82.4%) and are in line with the guidelines developed by the World Allergy Organization (WAO), the American Academy of Allergy Asthma and Immunology (AAAAI), and the European Academy of Allergy and Clinical Immunology (EAACI) (4, 5, 8). In some instances, even with the single body system involvement, anaphylaxis can be diagnosed; for example, when hypotension occurs with known allergen exposure without other organ involvement, hypotension alone is adequate for the diagnosis (1, 10). Fatal anaphylaxis occurs in less than 1% of total mortality risk (9).

Various agents have been identified as triggers for anaphylaxis worldwide as well as nationally. The occurrence of anaphylaxis is increasing and therefore early recognition, optimal management is of utmost importance to saves lives and prevent serious complications (1-3). Despite the available treatment facilities, deaths still occur in hospital and community settings due to anaphylaxis. Guidelines emphasize the prompt initial treatment with adrenaline which is the lifesaver when intramuscularly injected into the mid-outer thigh with a dose of 0.01 mg/kg of a 1:1000 (1 mg/mL), up to 0.5 mg in adults and 0.3 mg in children as soon as diagnosis or when a strong suspicion of anaphylaxis is made (1).

The guidelines have emphasised the importance of early recognition, treatment, and subsequent follow-up of patients with anaphylaxis. Studies done internationally and locally have identified lack of knowledge in diagnosis and treatment of anaphylaxis among doctors (7, 8, 11, 12). Further follow-up of anaphylaxis not been assessed properly in local studies (11, 13).

This study aimed to assess knowledge, perception, self-perceived confidence on the diagnosis, management and follow up of anaphylaxis among medical officers.

Methods

This descriptive cross-sectional study was conducted in Teaching Hospital Karapitiya from July 2021 to September 2021 over a 3-month period. The calculated sample size was 384.

The study population included all medical officers (n=531) working at Teaching Hospital Karapitiya and all specialist consultants were excluded from the study. The informed written consents were taken, and the contact information of the principal investigator was provided for any clarification. The study instrument was a self-administered, pre-tested questionnaire in the English language that consisted of three parts. Section A obtained brief socio-demographic data and background details. Section B assessed the knowledge on diagnosis and management of anaphylaxis, its triggers, co-factors, and knowledge on the first and second-line treatment, management of anaphylaxis on special circumstances and further follow up of anaphylaxis. Part B included 07 case scenarios. The most likely diagnosis was anaphylaxis in 04 cases, allergic reaction in 02 and not anaphylaxis in 01. Section C assessed the self-perceived confidence in diagnosis and management of anaphylaxis.

Data obtained from these forms were incorporated and analysed by the password protected *Statistical Package of Social Sciences* (*SPSS*) version 25. Percentages and means were used to describe the characteristics of the study population and performance concerning knowledge, perception, and self-confidence on anaphylaxis. The Ethics Review Committee of the Faculty of Medicine, University of Ruhuna, granted ethical approval for the study [reference number - 2021.P.088 (27.08.2021)].

Results

Out of 500 questionnaires distributed, 395 participants returned questionnaires with a 79% response rate even with the COVID-19 pandemic in place. Among the respondents, 52.2% were males. While 61% were grade medical officers, 13.9% were intern-medical officers. Resident house officers, registrars and senior registrars constitute 6.8%, 11.6%, 6.6% respectively. The participants' knowledge on identifying the potential anaphylaxis triggers and the percentages are shown in Table 1. Only 102 participants (25.8%) correctly identified all given anaphylaxis triggers.

Findings revealed that the knowledge regarding the 6 main amplifying factors notified in WAO anaphylaxis Guidance 2020, were sub-optimal. The numbers and percentages are shown in Table 2.

Table 1: Knowledge on identification of potential triggers for anaphylaxis in the study sample.

Triggers	Percentage of medical officers with correct identification (n)
Fish and seafood	98.5% (n - 389)
Peanut and other tree nuts	91.6% (n - 362)
Spinach and Sarana	58.7% (n - 232)
Penicillin	97.7% (n - 386)
NSAIDS	89.4% (n - 353)
Rubber and latex	77.2% (n - 305)
Anti-Rabies vaccine	91.9% (n - 363)
Antivenom	89.4% (n - 353)
Bee and wasp stings	89.4% (n - 353)
Seminal fluid	51.4% (n - 203)
Radiological contrast	74.4% (n - 294)

Table 2: Knowledge on identification of risk factors/ amplifying factors for anaphylaxis

Risk factor/ amplifying factor	Percentage of medical officers with correct identification (n)
Physical exercise	46.6% (n - 184)
Alcohol	61.8% (n - 244)
Acute infection	76.7% (n - 303)
Emotional stress	54.2% (n - 214)
Travelling	25.1% (n - 99)
Pre-menstrual status	25.8% (n - 102)

Only 37 participants (9.36%) correctly identified all seven cases. 180 doctors diagnosed all four cases of anaphylaxis with a 45.6% success rate. Anaphylaxis was caused by intravenous iron in case scenario 7, where hypotension with systolic blood pressure drops of 30% was the only clue to the diagnosis, and 91.6% of participants correctly diagnosed it. 85.3% diagnosed case scenario 6 which included the development of severe respiratory symptoms after exposure to a known allergen emphasizing the importance of adequacy of single system involvement even without any skin involvement in the diagnosis of anaphylaxis.

Only 60% diagnosed case 5 as anaphylaxis where involvement of the skin and gastrointestinal system causing severe symptoms without hypotension or respiratory symptoms with a non-food allergen trigger. Case 1 and 3 were allergic reactions not fulfilling the criteria for anaphylaxis.

75.2% diagnosed case 1 as an allergic reaction and 51.1% diagnosed case 3 as an allergic reaction. In Case 3, only the cutaneous and mucosal systems were involved without meeting the diagnostic criteria for anaphylaxis. Case 4 included a Vaso-vagal syncope which is one of the most common mimickers of anaphylaxis where 62.8% diagnosed it.

Table 3: Correct diagnosis of case scenarios

	The Case Scenario	Percentage with Correct Diagnosis
1.	A 30-year-old bank officer, without previous history of allergies had 2 tablespoons of a new protein supplement following exercise. After 40 min he developed itchiness of the body with an urticarial. Also had nausea and dizziness. At the ETU his BP was 1110/70 mmHg. SPO_2 - 98% without bronchospasms.	Allergic reaction 75.2%
2.	An 18-year-old girl had an oyster soup for the first time in her life. After 15 min she developed chest tightness and difficulty in breathing. In the ETU her BP was 88/60 mmHg with spo2 of 88%, with widespread bronchospasms.	Anaphylaxis 97.7%
3.	A 45-year-old lady known to have mild allergy to Ibuprofen took Meloxicam prescribed by the GP. After 30 minute she developed generalised itching with tingling sensation of her face and lips. After 10 minutes she developed swelling of her lips and nausea. In the ETU her BP was 120/80 mmHg with Spo2 of 99% and without any broncho spasms.	Allergic reaction 51.1%
4.	A 28-year-old intern medical officer without history of any allergy was waiting for his first COVID vaccination. Just after few seconds of the vaccine he collapsed while sitting on the chair. He was put on a bed and then resuscitated. He was h aemodynamically stable.	Vaso-vagal syncope 62.8%
5.	A 38-year-old carpenter while making a roof had an insect bite. After 10 minutes he started generalised body itching, rash, severe crampy abdominal pains, and refractory vomiting with dizziness. Soon after he reached the ETU his BP was 110/80 mmHg. His spo2 was 99% without bronchospasms	Anaphylaxis 60%
6.	A 22-year-old boy known to have prawn allergy had a mixed fried rice which contains prawns accidentally. 10 minutes later she developed severe SOB and wheeze with a stridor	Anaphylaxis 85.3%
7.	A CKD patient while receiving IV Iron infusion for the first time in his life developed shortness of breath , wheeze, chest tightness. There was more than 30% drop in his systolic blood pressure.	Anaphylaxis 91.6%

The percentages of correct diagnosis of all anaphylaxis case scenarios among different designations of medical officers are shown in Figure 1

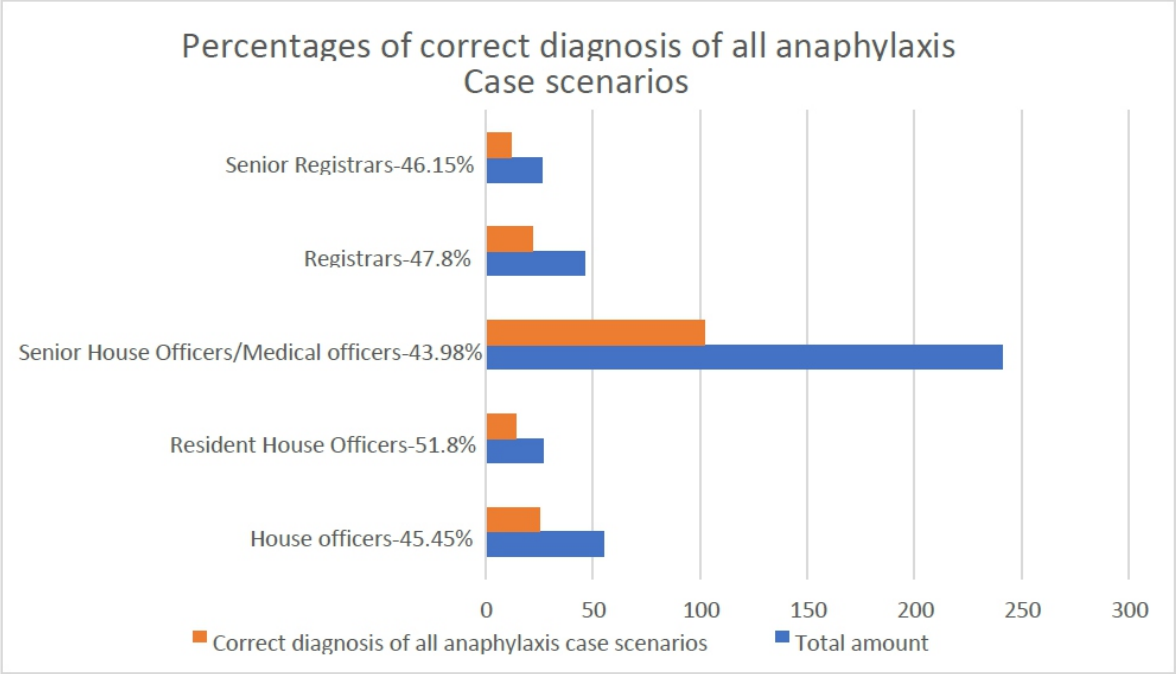

Figure 1: Correct diagnosis of case scenarios by the category of medical officer

Knowledge of the management of anaphylaxis

More than 90% of the time, the initial management was correct, which included calling for help, stopping the triggers, and checking the airway, breathing, and circulation (the respective percentages were 99.7%, 98.7%, 91.6%). Supine positioning and foot end elevation were identified by 88.9% and 86.1%, respectively.

Need for supplementary oxygen and IV fluid bolus if indicated was appreciated by 85.6% and 79.2% respectively. The importance of commencing cardiopulmonary resuscitation in cardiac arrest due to anaphylaxis was appreciated by 97.7%. Of the participants, 91.9% correctly identified adrenaline as the first-line treatment with the correct route as the intramuscular and the 1 : 1000 strength 0.5 ml as the correct dose. Of participants, 82.8% identified IV chlorpheniramine and 86.3% identified IV hydrocortisone as adjunctive therapies. EAACI guidelines have emphasised in refractory-stridor, adrenaline nebulisation can be a used. The fact that systemic steroids lack any mortality benefit in anaphylaxis was agreed by 84.1%. Of the participants, 51.9% identified the correct dose of adrenaline in children between 1-5 years as 0.15 ml 1 : 1000 intramuscularly. For children between 6-12 years as 0.3 ml of 1 : 1000 intramuscular adrenalin, was identified by 55.4%. While, 60% identified the infant adrenaline dose as 0.01 mg/kg, 66.3% of participants identified the measurement of serum tryptase level as beneficial for unclear anaphylaxis diagnosis.

Management of anaphylaxis in special circumstances

Importance of intravenous adrenaline infusion with close cardiac observations in severe refractory anaphylaxis with profound hypotension, was appreciated by 54.7%. In pregnancy, the management of anaphylaxis does not change and 92.4% correctly identified adrenaline as the first-line management and 92.7% correctly identified that intramuscular adrenaline is not contraindicated in severe coronary artery disease.

Follow up of patients with anaphylaxis

Patients with severe or recurring anaphylaxis should be referred to an immunologist or a general physician at discharge, as recommended by the guidelines, was identified by 74.7%.

Adrenaline auto-injector (AAI) was considered by 69.1% as an important mode of further treatment in severe or recurrent anaphylaxis.

Self-perceived confidence in diagnosis and management of anaphylaxis

Of the respondents, 87.6% agreed that they are confident in the correct diagnosis. Self-perceived confidence in management was 83.9%. House officers (36.3%) and senior house officers (47.3%) found to have sub-optimal knowledge compared to resident house officers and postgraduate trainees. Senior registrars (76.92%) had the highest level of confidence with registrars (65.22%) becoming second highest.

Discussion

Only 9.37% (n=37) of doctors correctly identified all 7 case scenarios highlighting the inadequate knowledge among medical officers, especially in complex diagnostic situations. Knowledge on diagnosing anaphylaxis triggers and mimickers were better compared to previous local studies. More than 90% doctors identified the correct dose and route for adrenalin administration in adults. However, the knowledge in management of refractory anaphylaxis and paediatric adrenalin dosage was suboptimal. Though the self-perceived confidence in diagnosis and management of anaphylaxis was good, sub-optimal knowledge was shown regarding the future follow up of patients diagnosed with anaphylaxis.

A previous Sri Lankan study in 2016 showed only a 2% of diagnostic accuracy among first contact level doctors and a 2019 local study among final year medical students showed diagnostic accuracy of 7.3% (11, 12). Hence the present study revealed an improvement of knowledge in diagnosis of anaphylaxis among medical doctors, one hundred and eight (45.6%) participants correctly diagnosed all anaphylaxis cases. Except for the case 5, diagnostic accuracy was above 85%. Case 5 which included severe gastro-intestinal symptoms for diagnosis, showed a sub-optimal level of knowledge. Sixty percent diagnosed it as anaphylaxis where the non-food allergen was the trigger. This emphasises the need for frequent updates with the latest guidelines (1, 4).

WAO Guidelines 2020 have mentioned syncope as a great mimicker of anaphylaxis (5). Only 62.8% diagnosed case 4 as vaso-vagal syncope. As the present study, a UK study showed higher rates of diagnosis of anaphylaxis case scenarios than the diagnosis of non-anaphylaxis case scenarios (14). In this study, knowledge on food-related triggering factors were good except for local green leaves such as sarana and spinach where the awareness was inadequate. The majority identified acute infection and alcohol as possible amplifying factors. Ninety percent correctly identified the need for initial stabilisation of patients in the acute care setting. Recent studies and guidelines have emphasized the importance of cardio-pulmonary resuscitation in cardiac arrest in anaphylaxis where our participants had a very good response rate (15). Most of the participants (91.9%) identified adrenalin as the first-line treatment with correct strength, dosage, and route of administration. In a previous study in Singapore emergency department, more than 80% identified the correct dose and mode of administration (13). Majority identified intravenous hydrocortisone and chlorpheniramine as second-line drugs. Most of the doctors knew that systemic or oral steroids lacks mortality benefit in anaphylaxis as per various guidelines (1). The knowledge regarding adrenaline paediatric doses, strengths and routes were unsatisfactory in our study. Usage of serum tryptase levels to aid the diagnosis of anaphylaxis had been considered in many guidelines and now it is well accepted (16). However, in this study, awareness of serum tryptase levels was sub-optimal.

Ninety-two of doctors identified adrenaline as the first-line management of anaphylaxis in pregnancy and severe coronary artery disease. Only 54.7% knew that in refractory hypotension with anaphylaxis, intravenous adrenaline infusion can be used. Furthermore, 74.7% identified patients with recurrent or severe anaphylaxis need follow up by a general physician or an immunologist. A previous Sri Lankan study had shown only 50% of awareness for referring patients to specialised immunology for general medicine clinics for further follow-up (12). Doctors' knowledge regarding the adrenaline auto-injectors (AAI) was not satisfactory due to 100 availability and limited usage due to their high cost. A Sri Lankan

study has also shown the same results in 2016 (11). Limited awareness of the AAI had led to poor prescribing rates even in developed countries (17).

Of the respondents, 87.6% had self-perceived confidence in the diagnosis of anaphylaxis. In a previous study done the University of Sri Jayewardenepura with involving final year medical students, showed 79.7% self-perceived confidence in the diagnosis. The same study showed 62.1% of self-perceived confidence in the management (12) and 83.9% of participants had self-perceived confidence in the management of anaphylaxis.

Strengths and Limitations

Compared to previous local studies our study included postgraduate trainees (registrars/ senior registrars) in various streams where previous local studies failed to include. Participants were given 7 case scenarios to assess their knowledge. However, our study did not include Consultant Physicians who work as first contact level doctors specially in ETU. As participants answered and returned questionnaires later, they may have received assistance from other sources, resulting in actual knowledge lower than reported in this study.

Conclusions and recommendations

The knowledge on anaphylaxis and its associated factors and self-perceived confidence of its management were sub-optimal amongst the medical doctors in Teaching Hospital Karapitiya. However, these findings were more favourable when compared to two previous studies which included first contact level doctors and pre-interns (11, 12). Furthermore, it was found that junior medical officers have less knowledge on anaphylaxis than postgraduate trainees.

This current study emphasizes the importance of training and educational programs for medical officers to improve knowledge of anaphylaxis diagnosis, management, and follow-up. These interventions would ultimately lead to the provision of the best patient care island wide.

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