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Level of knowledge of emergency room physicians about Paediatric Anaphylaxis guidelines for diagnosis and management: Findings from a cross-sectional study

Dr. Najla Alsediq[1,2,3]* ,

[1]Consultant Pediatric Allergy and Immunology, Pediatric Department, King Abdullah Specialist Children Hospital;
[2] Assistant Professor, College of Medicine, King Saud Bin Abdulaziz University for Health Sciences;
[3]King Abdullah International Medical Research Center, Riyadh, Saudi Arabia

Abstract

Introduction

Appropriate management of anaphylaxis is vital to save patients' lives. However, the management of anaphylaxis can be daring for many reasons. Moreover, it has been found that anaphylaxis is inadequately diagnosed and managed in the hospitals of different countries of Middle East and Eastern Mediterranean, which might be due to the gaps in the knowledge, attitudes and practice preferences of Emergency Room (ER) physicians. Thus, we aimed to assess the level of knowledge and practice attitudes of ER physicians regarding anaphylaxis in some tertiary hospitals in Riyadh, capital of Saudi Arabia.

Methods

We undertook a cross-sectional survey of a convenience sample of all ER physicians working at three tertiary hospitals in Riyadh capital of the Kingdom of Saudi Arabia (KSA). A 20-item validated, and a structured questionnaire was used to collect the data. The study questionnaire was distributed to the physicians and 95 physicians responded to the study questionnaire in three hospitals. A descriptive and exploratory analysis was used to analyse the data.

Results

Of the total study participants, 76.8% were males and 39.6% had an experience of more than 10 years. More than a third and near to half of the physicians were aware of symptoms of anaphylaxis. Around 80.2% of the physicians showed a preference to give epinephrine to the patients when they arrived with anaphylaxis and 77.1% preferred the intramuscular route for administration of epinephrine in the thigh. Around 73.7% reported that they refer patients with anaphylaxis to an allergy specialist which is considered a proper follow-up. We only found a significant difference in the usage of epinephrine by different tertiary hospitals with a p-value of 0.027. We found a significant mean difference for the proper diagnosis of patients with anaphylaxis by gender (p-value: 0.035) and region for residency (p-value 0.037). However, we did not find any statistically significant difference regarding the management pathway at the ER regarding different types of the hospital (p-value: 0.162).

Conclusion

The study demonstrated that physicians of these three hospitals have basic knowledge regarding the management of anaphylaxis; however, strategies should be formulated to encourage the use of modern techniques such as the use of autoinjector. Educational programs for physicians and patients should be conducted. Further longitudinal studies with a large sample size should be conducted to build upon the findings of the current study.

Keywords: Knowledge; Anaphylaxis; Physicians; Saudi Arabia.

* Consultant Pediatric Allergy and Immunology, Pediatric Department, King Abdullah Specialist Children Hospital; Assistant Professor, College of Medicine, King Saud Bin Abdulaziz University for Health Sciences; King Abdullah International Medical Research Center, Postal code: 3660; Zip code:11481; Riyadh, Saudi Arabia, Email: Alsediq-n@hotmail.com

1. Introduction

Anaphylaxis is an acute allergy with a quick onset that might result in death[1, 2]. The lifetime prevalence of anaphylaxis is calculated as 0.05% to 2%[3, 4]. The occurrence of anaphylaxis is showing an upward trend in several developed nations, such as the USA, UK, and Australia[5-10]. The increase in the rate of anaphylaxis occurrence is more evident amongst the children, and the most common trigger is food[11-14]. Furthermore, studies conducted on the rate of anaphylaxis occurrence in the Arabian nations are too minimal [15-17]. Several patients with comorbid such as, chronic respiratory illnesses , asthma, cardiovascular conditions, mastocytosis as well as clonal mast cell abnormalities are susceptible to life-threatening anaphylaxis [18-23]. Furthermore, patients who use NSAIDs, sleeping pills, beta-blockers, and angiotensin-converting enzyme inhibitors are at higher risk of fatal anaphylaxis [18-21, 24].

Appropriate management of anaphylaxis is vital[25, 26]. Failing to provide treatment such as epinephrine rapidly adds to the risk of fatality, biphasic anaphylaxis, and encephalopathy due to ischemia and /or hypoxia[27]. The time for observing the patient after clearly resolving the symptoms of anaphylaxis should be determined according to the specific factors for the particular patient, such as the response to the treatment, severity of the first symptoms, and the distance of the closest emergency facility from the home of the patient[28, 29]. Normally, observation of 4-6 hours is recommended, but for the patients of prolonged anaphylaxis monitoring for longer hours or admission in the hospital is suggested [20, 30-32]. The management of anaphylaxis can be difficult for several reasons[33]. Even though definitions of anaphylaxis are present; its symptoms are not specific and the presentation can be variable[34, 35]. Furthermore, the absence of an obvious definition of anaphylaxis can also get in the way of studies investigating the Pathophysiology and epidemiology of this disorder[35, 36]. An additional difficulty is the absence of a single diagnostic test that can be used to diagnose anaphylaxis.

The prime move on the way to close these gaps is to examine the existing circumstances of anaphylaxis management across diverse settings and physicians [35, 36]. Studies were done on the knowledge, attitudes, and practice preferences of ER physicians in cases of Anaphylaxis in several western countries, but no similar studies were done in Arab countries except in Turkey. Generally, it seems there is an explicit difference between existing recommendations for anaphylaxis treatment and their implementation[37]. The existing evidence confirms the need to disseminate international recommendations for the treatment and diagnosis of anaphylaxis, as well as the availability of an autoinjector of adrenaline, to strengthen control and to avoid a fatal outcome[38]. Even the clinical guidelines across the world for diagnosis of anaphylaxis vary and variation also exists in the systems of coding and the pattern of the study performed. In the western countries, several gaps were identified; in

some studies, there were difficulties in the diagnosis of anaphylaxis, underuse of epinephrine during an acute presentation, and insufficient education and follow-up plan[39-43].

Even though the majority of ER physicians properly use epinephrine in paediatric anaphylaxis, not all the doctors use the preferred administration route and others discharge patients home shortly after the event [30, 40-45]. Educating health care providers about the importance of fast diagnosis of anaphylaxis and prompt Epinephrine administration in acute situations are crucial [42, 46-49]. The presence of an action plan for anaphylactic patients, educating patients on how to use the Epinephrine autoinjector and appropriate referral to an allergist for follow-up are vital practices [50-54]. In Turkey, their experience was no different from that of western countries, Anaphylaxis was inadequately diagnosed and managed, this was not affected by the place of work, specialty, or employment type[55]. Given the existing gaps, we aimed to assess the level of knowledge and practice attitudes regarding anaphylaxis in some tertiary hospitals in Riyadh, the capital of Kingdome of Saudi Arabia to identify the present practice and management of anaphylaxis.

2. Material and Methods

2.1. Study Design and Study settings

We undertook a cross-sectional survey of a convenience sample of all ER physicians working at three tertiary hospitals in Riyadh capital of the Kingdom of Saudi Arabia (KSA). The Pediatric Emergency unit King Abdullah Specialist Hospital (KASH) has a total of 26 beds with an intermediate and critical level of care for all types of medical and surgical pediatric emergency patients up to 14 years of age. The King Fahad Medical City (KFMC) ER has a capacity of 20 beds with an intermediate and vital level of treatment to treat all types of medical and surgical pediatric emergency patients. Finally, The ER of Security Forces Hospital (SFH) has the capacity for pediatrics are 10 beds for the management of a number of pediatric emergency medical and surgical patients with an intermediate and vital level of treatment.

2.2. Study population

The study population was the ER physicians working at the three tertiary hospitals and all the ER physicians were invited to complete the survey. The total numbers of ER physicians in all three hospitals were around 150 at the time of the survey, who were invited to participate in the study.

2.3. Data Collection

We used a structured and validated questionnaire to collect the data. A 20-item questionnaire was the research questionnaire; part of it was taken from the pilot-tested research by representatives of the Department of Emergency Medicine and a board-certified allergist / immunologist at Miami Children's Hospital, USA. The other part was designed by the researcher based on the Anaphylaxis guidelines. The first 7 items comprised of demographic data: age, gender, level of training, training setting, and years of

experience. Items 8 to 13 were focused on Anaphylaxis diagnosis and management. Items from 14 to 20 were focused on ER observation, discharge medications, follow-up, and education of patients and health care providers. The study questionnaire was distributed to the physicians and 95 physicians responded to the study questionnaire in three hospitals.

2.4. Statistical Analysis

The coding of the responded was done manually first following questionnaire completion. Data were entered and analyzed using SPSS version 20, data screening was done by checking ranges and outliers for codes distributions that lies beyond the predefined possible values. Descriptive statistical analysis was used to describe the demographics of the ER physicians as proportions and frequencies. The factors associated with Epinephrine administration and proper follow-up were analyzed using Pearson's chi-squared test ($\chi 2$) and Fisher's exact test, the level of statistical significance is estimated using a P-value < 0.05. Mean and the standard deviation was used to describe numerical data associated with a proper diagnosis of anaphylaxis and ER physician characteristics. A P value < 0.05 was considered for statistical significance results.

2.5. Ethical consideration

The study was reviewed and approved by the Institutional Review Board of King Abdullah International Medical Research Center, Riyadh, KSA. Participation in the study was voluntary and they provided written informed consent to participate in the study. To survey respondents, no reward or compensation was given.

3. Results

3.1.Socio-demographic characteristics of study participants

A questionnaire was distributed to 150 pediatric emergency room physicians and a complete questionnaire was received from 96 physicians giving a response rate of 64%. Of the total study participants, 76.8% were males and 39.6% had an experience of more than 10 years followed by 32.3% had the experience of 5-10 years and 28.1% were in practice for less than 5 years. Around less than half of study participants (42.7%) were from King Abdul Aziz Medical City, while 29.2% were from the Security Forces hospital and 28.1% were from King Fahad Medical City (Table 1). Thirty-three percent had residency training with board certificate while 30.9% had bachelors and medical school degree and 19.1% was a consultant and 17.0% were in their fellowship training program (Table 1). Out of total 50.5% had done their residency from the Kingdom of Saudi Arabia and 15.1% had done from the west. Of a total 44.8% were of age 35 and below while 35.4% were of age group 36-45 years and only 19.8% were of age 46 and above. Regarding the number of treated anaphylaxis patients, 75.8% had seen 10 and less of anaphylaxis patients in one year as shown in table 1. Further, percentage of epinephrine use with respect to hospitals varied

between 68% to 96% as shown in figure 1. On the other hand, percentage of anaphylactic management pathway at ER with respect to hospitals ranged from 50% to 75% as demonstrated in figure 2.

Table 1: Socio-demographic characteristics of study participants (n=95)

Characteristic		n	%
Age group (years)	<=35	43	44.8
	36-45	34	35.4
	=>46	19	19.8
Gender	Female	22	23.2
	Male	73	76.8
Years since practice	<5	27	28.1
	5-10	31	32.3
	>10	38	39.6
Working station (Hospital)	King Abdulaziz Medical City	41	42.7
	King Fahad Medical City	27	28.1
	Security Forces Hospital	28	29.2
Current level of training	Bachelor's and medical school degree	29	30.9
	Consultant	18	19.1
	Fellowship training	16	17.0
	Residency training with board certification	31	33.0
Place of residency or fellowship training	Local training - Kingdom of Saudi Arabia	47	50.5
	Others	32	34.4
	Western	14	15.1
Patients with anaphylaxis seen in a year	<=10	72	75.8
	>10	23	24.2

Figure 1: Percentage of Epinephrine use with respect to hospitals

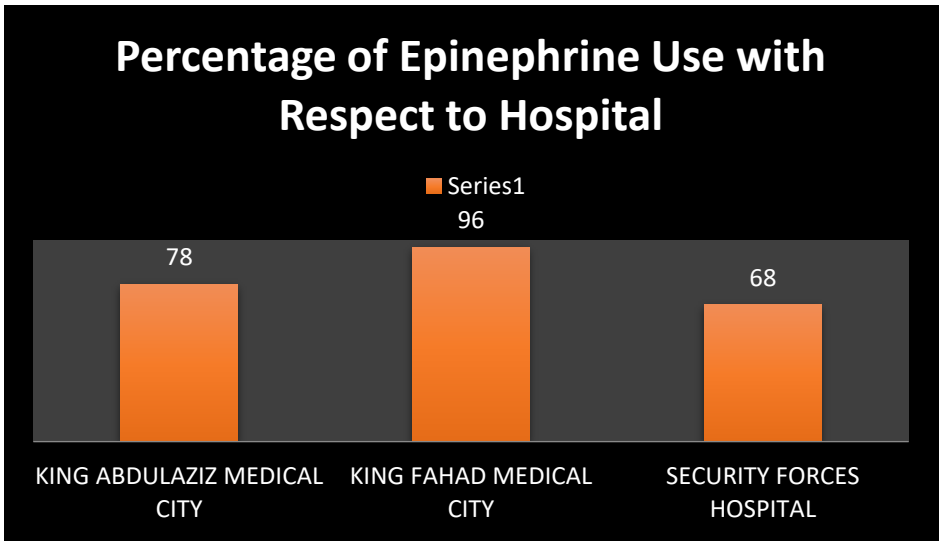
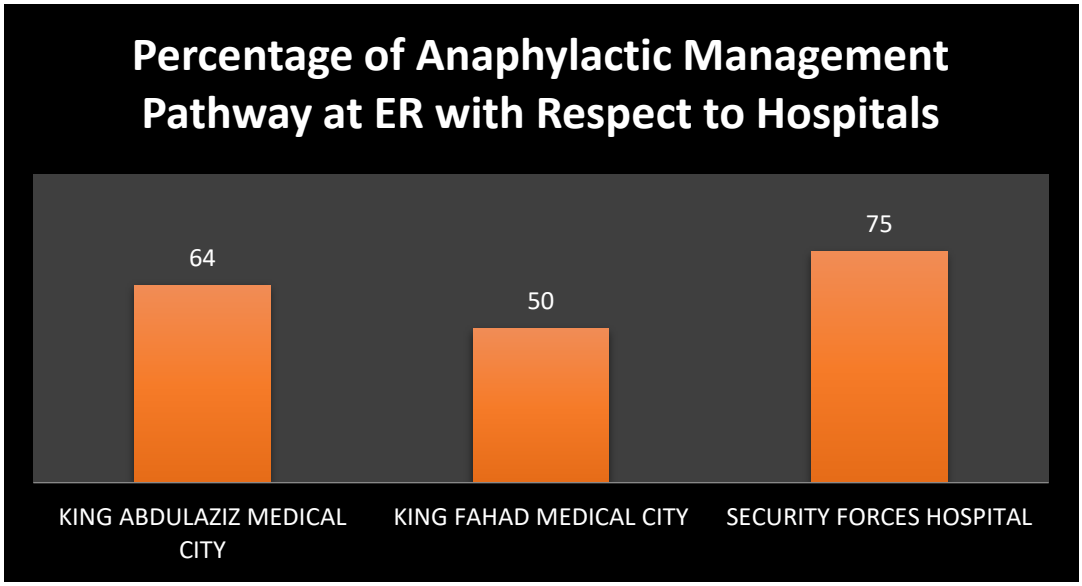


Figure 2: Percentage of anaphylactic management pathway at ER with respect to hospitals



3.2.Knowledge of study participants about symptoms associated with anaphylactic reactions

While assessing the knowledge of physicians regarding symptoms related to anaphylaxis, we found that shortness of breath was marked by 91.7%, itching of the skin by 85.4%, swelling of lips and wheezing by 81.3%, redness of skin by 78.1%, hives by 64.6%, coughing by 51.0%, abdominal cramps and hoarseness was marked by 50.0%, itching of the mouth and swelling of the tongue by 47.9%, itching of the throat by 45.8%, throat tightness by 43.8%, dizziness by 39.6%, vomiting and loss of consciousness by 36.5% and diarrhea by 16.7% (Table 2).

Table 2: Knowledge of study participants about symptoms associated with anaphylactic reactions (n=95)

Symptoms		n	%
Abdominal cramps	Yes	48	50.0
Coughing	Yes	49	51.0
Diarrhea	Yes	16	16.7
Dizziness	Yes	38	39.6
Hives	Yes	62	64.6
Hoarseness	Yes	48	50.0
Itching of the mouth	Yes	46	47.9
Itching of the skin	Yes	82	85.4
Shortness of breath	Yes	88	91.7
Itching of the throat	Yes	44	45.8
Redness of the skin	Yes	75	78.1
Swelling of the lips	Yes	78	81.3

Swelling of the tongue	Yes	46	47.9
Throat tightness	Yes	42	43.8
Vomiting	Yes	35	36.5
Wheezing	Yes	78	81.3
Loss of consciousness	Yes	35	36.5

3.3.Knowledge of study participants regarding different management aspects of anaphylaxis

Most of the physicians; 80.2% reported that they prefer to give Epinephrine to the patients when they arrived with anaphylaxis and 77.1% preferred the intramuscular route for administration of epinephrine in the thigh (Table 3). Moreover, 41.1% had used live autoinjector for practice and 68.8% had prescribed home autoinjector to the patients who were diagnosed with anaphylaxis and 68.2% had prescribed 1 home autoinjector to those patients and 87.9% also gave teaching about how to use autoinjector. Furthermore, 73.7% reported that they refer patients with anaphylaxis to an allergy specialist which is considered a proper follow-up. (Table 3) Only 16.1% direct their patients to an educational website. Fifty percent reported that they monitor their patients for 4-8 hours and 14.6% reported that they do not discharge patients with anaphylaxis. When asked about the medication they discharged their anaphylactic patients 70.8% reported antihistamine H1 Blocker, 62.5% reported corticosteroids, 56.35% reported epinephrine autoinjector and 16.7% reported bronchodilators(Table 3). Of total 63.4% reported that they have an anaphylaxis management pathway at their ER. When asked about lectures on anaphylaxis, 74.0% had ever received lectures on anaphylaxis and 96.9% believed that lectures on anaphylaxis can improve their practice(Table 3).

Table 3: Knowledge of study participants regarding different management aspects of anaphylaxis (n=95)

Knowledge about Medications used in ER		**n**	**%**
Antihistamines- H1 blockers (e.g., Benadryl, Hydroxyzine)	Yes	13	13.5
Antihistamines- H2 blockers (e.g., Zantac)	Yes	7	7.3
Bronchodilators	Yes	3	3.1
Corticosteroids	Yes	11	11.5
Epinephrine	Yes	77	80.2
Knowledge about proper administration route and site of epinephrine autoinjector			
Administration Route			
Subcutaneous (SQ)	Yes	11	11.5%
Intravenously (IV)	Yes	11	11.5%
Intramuscular (IM)	Yes	74	77.1%
Administration site			
Arm	Yes	17	17.7%
Thigh	Yes	74	77.1%

Buttocks	Yes	3	3.1%
Knowledge about anaphylaxis discharge medication and referral			
Antihistamines – H1 blockers (eg, Benadryl, Hydroxyzine)	Yes	68	70.8
Antihistamines – H2 blockers (eg, Zantac)	Yes	31	32.3
Bronchodilators	Yes	16	16.7
Corticosteroids	Yes	60	62.5
Epinephrine Autoinjector	Yes	54	56.3
Referred patients to specialist	Yes	70	73.7
Knowledge about anaphylaxis discharge medications and epinephrine autoinjector			
Used live autoinjector	Yes	39	41.1
Prescribed live autoinjector	Yes	66	68.8
Number of autoinjector	1 2 3	45 17 4	68.2 25.8 6.1
Educate patients about autoinjector	Yes	58	87.9
Direct patients to educational website	Yes	15	16.1
Physicians received lecture on anaphylaxis	Yes	71	74.0
Lecture can improve physician's knowledge	Yes	93	96.9
Knowledge about monitoring anaphylactic patients in ER			
Monitor patient in ER	0-2 2-4 4-8 8-12 24-72	4 22 9 10 48	4.2 22.9 9.4 10.4 50.0
Discharge patient with anaphylaxis	Yes	14	14.6
Management pathway at ER	Yes	59	63.4

3.4.The difference in the use of epinephrine for anaphylaxis for baseline characteristics

Table 4 reveals the findings regarding the difference in the use of epinephrine for anaphylaxis with respect to baseline characteristics. We only found a significant difference in the usage of epinephrine by different tertiary hospitals with a p-value 0.027. However, gender, year of practices, current training level, age group, and several patients seen in a year had no difference related to the usage of epinephrine (Table 4).

Table 4: Difference in use of epinephrine for anaphylaxis with respect to baseline characteristics (n=95)

		Epinephrine				
		No		Yes		P-value
		n	%	n	%	
Gender	Female	4	18.2	18	81.8	1.000

	Male	15	20.5	58	79.5	
Years since practice	<5	7	25.9	20	74.1	0.448
	5-10	4	12.9	27	87.1	
	>10	8	21.1	30	78.9	
Working station (Hospital)	King Abdulaziz Medical City	9	22.0	32	78.0	0.027
	King Fahad Medical City	1	3.7	26	96.3	
	Security Forces Hospital	9	32.1	19	67.9	
Current level of training	Bachelor's and medical school degree	6	20.7	23	79.3	
	Consultant	3	16.7	15	83.3	
	Fellowship training	1	6.3	15	93.8	
	Residency training with board certification	8	25.8	23	74.2	
Place of residency or fellowship training?	Local training - Kingdom of Saudi Arabia	10	21.3	37	78.7	0.824
	Others	7	21.9	25	78.1	
	Western	2	14.3	12	85.7	
Age group	<=35	8	18.6	35	81.4	0.965
	36-45	7	20.6	27	79.4	
	=>46	4	21.1	15	78.9	
Patients with anaphylaxis seen in a year	<=10	13	18.1	59	81.9	0.388
	>10	6	26.1	17	73.9	

The mean difference was calculated for the proper diagnosis of patients with anaphylaxis and found a significant mean difference among gender with p-value 0.035 and region for residency with a p-value 0.037 (Table 5). Regarding proper follow up there was no significant difference among gender, year of practices, hospital, current training level, region for residency, age group, and several patients seen in a year (Table 6). Security forces hospital had the highest percentage between the other tertiary hospitals regarding having an anaphylaxis management pathway. However, we did not find any statistically significant difference regarding the management pathway at the ER regarding different types of hospital (0.162).

Table 5: Difference in proper diagnosis with respect to baseline characteristics

Characteristics		**Proper Diagnosis**		
		Mean	SD	P-Value
Gender	Female	65.0	18.6	0.035
	Male	52.9	24.2	
Years of practice	<5	52.1	21.6	0.313
	5-10	53.5	23.8	
	>10	60.2	24.1	
Hospital	King Abdulaziz Medical City	59.8	22.1	0.231

	King Fahad Medical City	55.6	27.1	
	Security Forces Hospital	50.0	20.8	
Current level of training	Bachelor's and medical school degree	49.9	20.7	0.138
	Consultant	68.0	24.6	
	Fellowship training	54.8	25.7	
	Residency training with board certification	55.0	22.0	
Place of residency or fellowship training	Local training - Kingdom of Saudi Arabia	57.8	22.1	0.037
	Others	48.7	22.5	
	Western	68.1	25.3	
Age group	<=35	56.2	22.9	0.506
	36-45	52.6	23.6	
	=>46	60.4	24.4	
Patients with anaphylaxis seen in a year	<=10	54.2	22.6	0.300
	>10	60.1	26.1	

Table 6: Difference in proper follow up with respect to baseline characteristics (n=95)

Characteristics		**Proper follow-up**				
		No		Yes		
		n	%	n	%	P Value
Gender	Female	4	18.2	18	81.8	0.270
	Male	22	30.1	51	69.9	
Years of Practice	<5	8	29.6	19	70.4	0.831
	5-10	9	29.0	22	71.0	
	>10	9	23.7	29	76.3	
Hospital	King Abdu Aziz Medical City	8	19.5	33	80.5	0.080
	KING FAHAD MEDICAL CITY	6	22.2	21	77.8	
	SECURITY FORCES HOSPITAL	12	42.9	16	57.1	
Current level of practice	Bachelor's and medical school degree	11	37.9	18	62.1	0.343
	Consultant	3	16.7	15	83.3	
	Fellowship training	3	18.8	13	81.3	
	Residency training with board certification	8	25.8	23	74.2	
Place of residency or fellowship training	Local training - Kingdom of Saudi Arabia	13	27.7	34	72.3	0.882
	Others	9	28.1	23	71.9	
	Western	3	21.4	11	78.6	

Age group	<=35	12	27.9	31	72.1	0.423
	36-45	11	32.4	23	67.6	
	=>46	3	15.8	16	84.2	
Patients with anaphylaxis seen in a year	<=10	21	29.2	51	70.8	0.487
	>10	5	21.7	18	78.3	

4. Discussion

We conducted the cross-sectional study among ER physician of three tertiary hospitals in Riyadh to assess the level of knowledge related to anaphylaxis diagnosis and management as per anaphylaxis guidelines. Our findings reveal that most of the physicians had seen around 10 patients of anaphylaxis in a year's time. Regarding Anaphylaxis symptoms, most of the physicians chose shortness of breath, itching, redness of the skin, and wheezing, while around half reported abdominal cramps, coughing, hives, hoarseness, swelling of the tongue as common symptoms of anaphylaxis. Moreover, most doctors preferred to administer epinephrine into the thigh intramuscularly, which is the proper treatment of Anaphylaxis in the ER. Furthermore, less than half of the ER physicians have used live autoinjectors. More than fifty percent have prescribed home autoinjector but without teaching patients how to use it, while most of the physicians have prescribed it with teaching. Most of the physicians believed in referring their patients to an allergy specialist and half of the physicians reported that they monitor their patients for 4-8 hours. More than half reported that they discharge their patients with antihistamine H1 Blocker, corticosteroids, and epinephrine autoinjector. The usage of epinephrine was found to be significantly different among hospitals, while the management pathway at ER was found to be not significantly different between different tertiary hospitals.

The findings of our study are analogous to the findings of similar studies undertaken in different parts of the world, while in few findings we have found huge differences. In guidelines and in many studies they encourage the use of the IM route of epinephrine as the first line of treatment, in our study physicians also reported that they use the same as 1st line of treatment [50, 56, 57]. Regarding autoinjector more than half believed in its prescription. Our findings are consistent with the findings of studies that reported 33% to 64% had documentation of a prescription for epinephrine autoinjector at discharge [58, 59]. although international guidelines and expert advice recommend the use of autoinjector as the first line of treatment in our study reported that less than half had ever used autoinjector [60].

Regarding autoinjector more than half believed in its prescription. Our findings are consistent with the findings of studies that reported 33% to 64% had documentation of a prescription for epinephrine autoinjector at discharge [58, 59]. although international guidelines and expert advice recommend the use of autoinjector as the first line of treatment in our study reported that less than half had ever used autoinjector [60]. However, one of the studies contradict the findings and findings of that study suggest

that the degree of competence of physicians was inadequate to diagnose anaphylaxis, and in cases without hypotension or undefined contact with possible / known allergens, physicians used epinephrine. The specifics of epinephrine administration were partially right[61]. The easiest move is currently known to be a published anaphylaxis action plan, including diagnostic criteria for anaphylaxis[61].

Our research findings on more than three fourth home auto-injector prescribed with instruction and education were consistent with the results of a study conducted in the United States that reported 75% of physicians reported prescription of autoinjector with proper education[50]. Unlike the study conducted in the USA reported less referral to specialists our study reported that many physicians reported that they referred patients to the specialist. However, like our study, a study conducted in Turkey reported 85.2% of physicians reported referral to the specialist[62]. Our findings of ER observation of anaphylaxis patients for 4-8 hours are consistent with most of the studies conducted worldwide[56, 63, 64]. For example, a study conducted in the USA reported factors such as residency program site of care and higher volume of anaphylaxis cases as predictors of IM epinephrine use, however, we found a significant difference in the use of epinephrine in these 3 hospitals[50]. The same study reported the prescription of H1 blocker and epinephrine at discharge, our study also reported the same with the additional use of corticosteroids[50]. Related to symptoms such as our research associated with an anaphylactic reaction, a study conducted in the USA reported itching, hives, and trouble breathing as the most common symptoms related to anaphylactic reaction[64]. Most of the physicians have received the lectures regarding the management of anaphylaxis and the majority believed that proper education to patients can reduce the burden of anaphylaxis. Most of the findings of this study indicate that treatment and management are as per international guidelines. As reported by a few studies that management in developing countries is questionable and is not as per international guidelines but our study results are contrasted with such findings.

4.1. Strengths and Limitations

Our study has several strengths. First, to the best of our knowledge, it is the first study of its kind that has been conducted in the region of Saudi Arabia regarding knowledge of anaphylaxis treatment and management. Secondly, the sample was taken from three main hospitals of Saudi Arabia to give variability in the findings. Third, physicians of different experiences and educational backgrounds were included. Forth, part of the questionnaire was structured and validated as per our context.

However, our study findings need to be interpreted considering some limitations. First, a subjective tool was used to assess the knowledge, thus findings should be concluded with caution, however, the questionnaire was validated to see the face and content validity. Although we have included all the physicians of three hospitals still the sample size is small to generalize the findings of the present study..

5. Conclusion and Future directions

To recapitulate, our study demonstrated that physicians of these three hospitals have basic knowledge regarding the management of anaphylaxis; however, strategies should be formulated to encourage the use of modern techniques such as the use of autoinjector. Moreover, the educational program for physicians and patients should be conducted. Further longitudinal studies with a large sample size should be conducted to build upon the findings of the current study.

There are many healthcare implications of the findings of the current study. Firstly, as the anaphylactic reaction can be fatal and is prevented by proper management and treatment; this study enforced the importance of proper management and treatment to prevent fatal outcomes of such reaction. Second, proper guidance and simple education to patients could result in the prevention of these reactions, thus home management plans should be formulated to educate patients with such allergies and treatment. The third, educational program for physicians should be encouraged so that new practices such as the use of autoinjectors should be freely practiced.

6. Conflict of interest:

The authors declare there is no conflict of interest.

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