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Anaphylaxis management: Knowledge and practice among pediatricians in Kuwait.

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Abstract

Background: Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death. Intramuscular Epinephrine is the treatment of choice. It has been shown that failure or delay in administering epinephrine is associated with increasing severity of the reaction and death. Many studies have demonstrated that the actual use of epinephrine is suboptimal. This is the first study on anaphylaxis in Kuwait.

Objective: The aim is to assess the knowledge on anaphylaxis management among pediatricians and to determine the factors influencing their practice.

Methods: This was a cross-sectional survey among general pediatricians. The questionnaire comprised of 18 questions, covering demographic information besides information on both acute management of anaphylaxis and patient disposition following recovery. The survey period was from April 2015 to December 2015.

Results: 110 general pediatricians completed the questionnaire with a response rate of 50.4%. 53 were males (50.4%) and 57 were females (51%), with almost homogeneous distribution among the four main hospitals in Kuwait. 69.1% chose epinephrine as the first medication. The right dose of epinephrine was correctly chosen by 64.5% and 60% decided to give it intramuscularly, while only 30% of all respondents answered all the 3 entities correctly (IM epinephrine as the first medication in the right dose). The hospital of practice and the place of practice were important factors in determining the choice of the first medication.

Conclusion: In Kuwait, the knowledge on anaphylaxis management among general pediatricians is suboptimal. Programs to improve their knowledge and practice are warranted.

Keywords: Anaphylaxis, Epinephrine, Emergency, Management.

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Introduction

Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death [1,2]. It is diagnosed clinically if any one of the following 3 criteria presents: 1-acute onset of illness with involvement of skin, mucus membranes or both with at least one of the following: respiratory compromise, hypotension or end-organ dysfunction; 2-Two or more of the following occur rapidly after exposure to a likely allergen: involvement of skin or mucus membranes, respiratory compromise, hypotension or persistent gastrointestinal symptoms; 3-hypotension develops after exposure to a known allergen to that patient [1]. Recognition of its symptoms and signs can be difficult [3]. The most common presenting symptom is cutaneous involvement in more than 80% of the cases [1,2,4]. Many studies have demonstrated that the most common trigger in adults is drugs, while it is food in pediatrics [3,4].

Biphasic reaction is estimated to be 1-20% of all attacks [1,2,5]. The rate is higher in adult. Symptoms may recur 1-72 h after resolution of the initial presentation, but mostly within 8 h [1,5]. It has been shown that failure or delay in administering the recommended first line treatment, epinephrine, is associated with increasing risk of biphasic reaction and death [2,3,5].

Various studies demonstrated that the lifetime individual risk of anaphylaxis is around 1-3%. The overall mortality rate is about 1%. A recent study on the epidemiology in Europe has found that the incidence ranged from 1.5-7.9

per 100,000 person years [6]. However, the incidence is increasing [1,4]. Therefore, improving the physicians' knowledge and ability to correctly diagnose and treat anaphylaxis is crucial.

Epinephrine given by intramuscular injection is the treatment of choice [1-4]. The dose is 0.01 mg/kg with the maximum dose of 0.5 mg in adults and 0.3 mg in pediatrics. It may be given every 5 to 15 min as necessary. Epinephrine should be injected promptly in anaphylaxis. H1-antihistamine medications are not the treatment of choice because they are effective against urticaria and pruritus but not the systemic symptoms. Corticosteroids should be considered as a second line treatment to prevent biphasic/protracted reaction; their onset of action takes several hours [2,3].

Although epinephrine was recommended as the first line treatment in published guidelines, many studies have shown that the actual use of it in cases of acute anaphylaxis is still suboptimal [1-4,7,8]. The overall knowledge and use has been improving after The WHO published position paper in 2008 [1].

This is the first study on anaphylaxis in Kuwait. The aim of the study is to assess the knowledge on anaphylaxis management among pediatricians and pediatric emergency physicians and to determine the factors influencing their practice. The ultimate goal is to be able to provide appropriate tools (updated ER protocol, scientific days, and workshops) to improve patient care and outcome.

The Significance of the Study

This is the first study on anaphylaxis in Kuwait. Anaphylaxis is a serious allergic reaction that may lead to death. Delay or failure to administer intramuscular epinephrine, the treatment of choice, is associated with increased severity of the reaction and death. The study has shown that the knowledge on anaphylaxis management is suboptimal among general pediatricians in Kuwait.

Method

This was a cross-sectional survey among general pediatricians working in the four general hospitals in Kuwait; Amiri, Mubaral AlKabir, Adan and Farwania. Each hospital has a pediatric department and pediatric emergency room, which act as secondary and tertiary referral centers. All the hospitals are involved in teaching, both medical students and the residents of Kuwait Board of Pediatrics.

The questionnaire was based on international guidelines on anaphylaxis (WHO, AAAAI) and comprised of 18 questions. The first 8 questions focused on demographic data of pediatricians (age, sex, nationality, highest medical degree, place and hospital of practice, number of years in practice). The other 10 questions were regarding data on the acute management of anaphylaxis, including the first medication used, dose, concentration and the route of administration. Data on other treatment, as well as about patient disposition following recovery, discharge medications, prescription of epinephrine auto-injector and referral were also collected.

The Ethics Committee of The Faculty of Medicine, Kuwait University, approved the study.

The questionnaire was personally distributed to all the pediatricians to complete in the four hospitals and an informed consent was obtained orally. The study period was from April 2015 to December 2015.

In the survey, 110 pediatricians completed the questionnaire from all the four hospitals.

Statistics

The data management, analysis and graphical presentation were carried out using the computer software 'Statistical Package for Social Sciences, SPSS version 23.0' (IBM Corp, Armonk, NY, USA). The descriptive statistics has been presented as number and percentages for categorical variables. The quantitative or continuous variable age and years of experience were ascertained for normal distribution assumption, applying the Kolmogorov-Smirnov test, and presented as; mean+standard deviation (SD) or median with interquartile (IQ), and range. Chi-square or Fishers exact test was applied to find any association or significant differences between categorical variables. Logistic regression model was used to predict the influencing factors in prescribing right medication, and presented with Odds Ratio (OR) and 95% Confidence Interval (CI). The two-tailed probability value 'p'<0.05 was considered statistically significant.

Results

In all, 110 general pediatricians completed the questionnaire; with a response rate of 50.4%.

Demographics

The demographic data of the study sample is presented in Table 1. The number of respondents among the four hospitals is almost homogeneous. Of the total, 53 are males (48.2%) and 57 are females (51%). Almost one third of the respondents are Kuwaiti pediatricians reflecting the ratio of Kuwaitis to non-Kuwaitis in general population of the country. Around 79% of the respondents were younger than 40 years of age.

Master degree refers to masters or first part of any postgraduate program/board. Ph.D. stands for Ph.D. or any completed board certificate or equivalent. Forty percent had Bachelor's and are enrolled in a training program. Almost two thirds (61.8%) had 5 years or less experience, with a wide range between 1 and 35 years.

Acute Management of Anaphylaxis

Epinephrine as the first medication was correctly chosen by 69.1%. Despite the written guidelines, 18% would

Table 1. *Demographic characteristics (N=110)*

Characteristics		
Age (years)	**No.**	**%**
25-29	24	21.8
30-34	29	26.4
35-39	34	30.9
≥ 40	23	20.9
Mean ± SD (Range)	34.95 ± 7.26	(25-65)
Gender		
Male	53	48.2
Female	57	51.8
Nationality		
Kuwaiti	37	33.6
Non-Kuwaiti	73	66.4
Education		
Bachelor Degree	44	40.0
Master Degree	43	39.1
Board/PhD	23	20.9
No. of years in practice		
≤ 5 years	68	61.8
6-10 Years	26	23.6
>10 Years	16	14.5
Mean ± SD/Median(Range)	6.4 ± 7.0	4 (1-35)
Place of Practice		
Pediatric Wards	64	58.2
Pediatric Emergency	14	12.7
Pediatric ICU	5	4.5
Pediatric Clinic	6	5.5
Multiple Places	21	19.1

still use corticosteroids as the first medication (Table 2). Specifically, when they were asked about their choice of the dose and the route of epinephrine; 64.5% correctly chose the dose of 0.01 mg/kg/dose and 60% decided to give it intramuscularly.

However, out of all respondents, only 33 (30%) were able to prescribe the epinephrine correctly (IM epinephrine as the first medication in the right dose)

As for the second line treatment, the respondents had the option to choose more than one intervention, and around 41.8% chose combination of any of the following: antihistamines (anti H1 and/or antiH2), corticosteroids and bronchodilators.

To assess the factors influencing the choice of epinephrine as the first medication, multiple logistic regressions was applied (Table 3). The hospital of practice significantly correlated with choosing the right first medication. Those who practice in Mubarak, Farwania and Adan Hospitals, were less likely to choose epinephrine as the first medication than those in Amiri Hospital ORs 0.094, 95% CI (0.020-0.587), 0.108, 95% CI (0.410-5.000), 0.066, 95% CI (0.012-0.370), respectively.

The place of practice was also important. Pediatricians practicing in multiple places (i.e., Wards, ER, clinics) were significantly less likely to choose epinephrine as the first medication OR 0.213, CI(0.016-0.745), p=0.016 compared to those practicing in the ward.

Patient disposition and discharge medications: After recovery from the acute attack, around 83% of our sample would correctly observe for potential biphasic reaction, as only 17.2% would discharge the patient prior to 4 h (Table 4).

The majority would prescribe antihistamines on discharge. Prescription of epinephrine auto-injector was mentioned by 65.5% of the sample and 72.7% decided to refer the patient to an allergist.

Discussion

The use of intramuscular epinephrine is essential first step in managing anaphylaxis. The risk of fatality increases with delay or inappropriate use of epinephrine [1,2]. It is essential for physicians dealing with emergencies to be able to identify and appropriately treat anaphylactic reactions. Many previous studies have shown suboptimal use of epinephrine [9-14].

In this study around 70% correctly chose epinephrine as the first line treatment, which is similar to other chart review studies, however only 30% were able to give it in the right dosage and route [15,16].

On the other hand, the rate we found is better than other studies [9-12]; This could be related to the fact that most of our sample are young, therefore, they are more likely to be involved in training courses, or they completed their

Table 2. *Medication and route of administration*

	No.	**%**
First Prescription		
Epinephrine	76	69.1
Glucocorticoids	20	18.2
Antihistamines(H1)	11	10.0
Others[1]	3	2.7
Second Prescription		
Glucocorticoids	27	24.5
Antihistamines (H1)	24	21.8
Epinephrine	7	6.4
Bronchodilators	6	5.5
Combinations[2]	46	41.8
What Dose of epinephrine would you give		
0.01 mg/Kg	71	64.5
0.1 mg/Kg	28	25.5
≥ 0.15 ml as single dose[3]	11	10.0
Route of Administration		
IM	66	60.0
IV	14	12.7
SC	22	20.0
Combinations	8	7.3

[1]Include bronchodilators and antiH2
[2]Any of the above with/without bronchodilators and antiH2
[3]Options were 0.15, 0.3, 0.5 ml

Table 3. *Multiple logistic regression of right medication against demographics*

Variable	% Rt. Medication	OR	95% CI	p-value
Education				
Bachelor Degree (Ref)	29 (65.9)	-	-	-
Master's Degree	31 (72.1)	1.725	0.568-5.239	0.336
Board/Ph.D.	16 (69.6)	1.237	0.320-4.787	0.758
Years of Practice				
≤ 5 years (Ref)	48 (70.6)	-	-	-
6-10 years	19 (73.1)	2.236	0.618-8.086	0.220
>10 years	9 (56.3)	1.170	0.297-4.600	0.822
Place of Practice				
Pediatric Wards (Ref)	48 (75.0)	-	-	-
Pediatric Emergency	10 (71.4)	0.462	0.093-2.302	0.346
Pediatric ICU	4 (80.0)	1.773	0.159-19.753	0.641
Pediatric Clinic	4 (66.7)	0.790	0.107-5.815	0.817
Multiple Places	10 (47.6)	0.213	0.061-0.748	0.016
Hospital of Practice				
Amiri (Ref)	28 (93.3)	-	-	-
Mubarak	16 (61.5)	0.094	0.020-0.587	0.009
Farwania	20 (64.5)	0.108	0.410-5.000	0.010
Adan	12 (52.2)	0.066	0.012-0.370	0.002

Table 4. *Patient's disposition*

	No.	%
Patient referred to		
Allergist	80	72.7
General Pediatrician	19	17.3
None	11	10.0
Action on Acute Attack		
Admitted	41	37.3
Observed for <4 h	14	12.7
Observed for 4-8 h	30	27.3
Observed for >8 h	20	18.2
Discharged	5	4.5
Prescription on Discharge		
Glucocorticoids	18	16.4
Antihistamines (H1)	50	45.5
Glucocorticoids and Antihistamines (H1)	25	22.7
Others	17	15.5
Would you prescribe epinephrine auto-injector		
Yes	72	65.5
No	38	34.5

board recently; and more up-to-date with their knowledge of recent guidelines. Moreover, there are written protocols in many of our emergency departments, which help to maintain the knowledge. In contrast to ours, the studies mentioned above are based on chart reviews, which also take into account the ability to diagnose anaphylaxis. These studies might reflect daily practice more precisely. In our study, identifying patients with anaphylaxis was not studied. This fact might affect the results. Other studies, where the information gathered was based on questionnaires, found that 93-95% would use epinephrine as the treatment of choice, which is better than ours [13,14].

Many studies have shown that corticosteroids and antihistamines were used more frequently, throughout the treatment of anaphylaxis, than epinephrine, which is similar to our findings [16,17].

Factors associated with using IM epinephrine were examined in previous studies [10,13]. One has found that being a registrar and having completed APLS course were important factors [10]; the other study, reported the hospital of practice with residency program and the volume of cases were significant association. In ours, the hospital of practice was a significant factor. However, the four hospitals are involved in teaching students and residents. All the hospitals are both secondary and tertiary referring centers. One explanation is that academic activities in the hospitals might be different. There is a weekly mock code in Amiri Hospital. Mubarak Hospital has written guidelines in the emergency department.

Following recovery from the acute attack, the majority of our respondents decided that patients need admission or observation for more than 4 h, similar to previous results [9,13]. This is important as the risk of biphasic reaction in maximum in the first 8 h.

The most important measure for future management is to ensure that the patient is equipped with an automatic epinephrine injector and trained in its use [18]. In a Canadian study, it was shown that the majority of parents of children with peanut allergy fear using the epinephrine auto-injector; the most frequently cited fears were hurting the child, incorrect use or bad outcome [19]. Therefore, physicians dealing with such parents need to be able to provide appropriate teaching on epinephrine auto-injector.

The majority of our respondents prescribed epinephrine auto-injectors to their patients and referred them to an allergist (65.5% and 72.2%, respectively). Data on their ability to provide appropriate teaching is not available though.

This is the first study on anaphylaxis in Kuwait. The field of allergy in new in the country and is developing. Having data on the knowledge on the treatment of this emergency is valuable tool for planning emergency room protocols, training courses for the staff involved.

We covered equivalent representation from the four hospitals involved. Our survey gathered information about the details of both the management of the acute attack as well as patient disposition.

Our study is limited by the fact that the data is based on a questionnaire. Answering a questionnaire might not be an accurate reflection of the real life practice. Moreover, our questionnaire did not include questions to establish the diagnosis of anaphylaxis, which is the most important and difficult step in making the decision to administer epinephrine. Another limitation is the relatively low response rate. We aimed at more than half.

Anaphylaxis is not as common as other emergencies in pediatrics. The severity of presentation plays an important role in the determination of the lines of management [20].

Intramuscular epinephrine is the treatment of choice of anaphylaxis. It has both alpha and beta- adrenergic actions resulting in an increase in cardiac output, peripheral vasoconstriction, a decrease in mucosal edema and mediator release. It is lifesaving and should be administered promptly. Despite the international guidelines, its use is suboptimal. Corticosteroids action takes 4-6 h and should be considered as second line treatment to prevent relapse. Training courses should be carried out regularly to ensure physician confidence of using appropriate treatment and to improve patients' outcome.

Conclusion

Intramuscular epinephrine is the treatment of choice of anaphylaxis. It is lifesaving and should be administered promptly. Despite the international guidelines, its use is still suboptimal among pediatricians in Kuwait. Programs to improve pediatricians' abilities to recognize and treat anaphylaxis are essential.

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Ethical Approval

The work was approved by the Ethics Committee at the Faculty of Medicine, Kuwait University.

References

1. Kemp SF, Lockey RF, Simons FE. Epinephrine: The drug of choice for anaphylaxis. A statement of the World Allergy Organization. Allergy 2008; 63: 1061-1070.
2. Sampson HA, Munoz-Furlong A, Campbell RL, et al. Second symposium on the definition and management of anaphylaxis: Summary report-Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network Symposium. Ann Emerg Med 2006; 47: 373-380.
3. Simons FE. Anaphylaxis: Recent advances in assessment and treatment. J Allergy Clin Immunol 2009; 124: 625-636.
4. Simons FE, Ardusso LR, Dimov V, et al. World allergy organization anaphylaxis guidelines: 2013 update of the evidence base. Int Arch Allergy Immunol 2013; 162: 193-204.
5. Tole JW, Lieberman P. Biphasic anaphylaxis: review of incidence, clinical predictors and observation recommendations. Immunol Allergy Clin North Am 2007; 27: 309-326.
6. Braganza SC, Acworth JP, McKinnon DR, et al. Paediatric emergency department anaphylaxis: different patterns from adults. Arch Dis Child 2006; 91: 159-163.
7. Muraro A, Roberts G, Worm M, et al. Anaphylaxis: guidelines from the European Academy of Allergy and Clinical Immunology. Allergy 2014; 69: 1026-1045.
8. O'Leary FM, Hokin B, Enright K, et al. Treatment of a simulated child with anaphylaxis: An in situ two-arm study. J Paediatr Child Health 2013; 49: 541-547.
9. Panesar SS, Javad S, de Silva D, et al. The epidemiology of anaphylaxis in Europe: A systematic review. Allergy 2013; 68: 1353-1361.
10. Simons FE, Ardusso LR, Bilo MB, et al. International consensus on (ICON) anaphylaxis. World Allergy Organ J 2014; 7: 9.
11. Arroabarren E, Lasa EM, Olaciregui I, et al. Improving anaphylaxis management in a pediatric emergency department. Pediatr Allergy Immunol 2011; 22: 708-714.
12. Ben-Shoshan M, La Vieille S, Eisman H, et al. Anaphylaxis treated in a Canadian pediatric hospital: Incidence, clinical characteristics, triggers and management. J Allergy Clin Immunol.
13. Beyer K, Eckermann O, Hompes S, et al. Anaphylaxis in an emergency setting - elicitors, therapy and incidence of severe allergic reactions. Allergy 2012; 67: 1451-1456.
14. Grossman SL, Baumann BM, Garcia Pena BM, et al. Anaphylaxis knowledge and practice preferences of pediatric emergency medicine physicians: A national survey. J Pediatr 2013; 163: 841-846.
15. Wang J, Young MC, Nowak-Wegrzyn A. International survey of knowledge of food-induced anaphylaxis. Pediatr Allergy Immunol 2014; 25: 644-650.
16. Chad L, Ben-Shoshan M, Asai Y, et al. A majority of parents of children with peanut allergy fear using the epinephrine auto-injector. Allergy 2013; 68: 1605-1609.

17. Huang F, Chawla K, Jarvinen KM, Nowak-Wegrzyn A. Anaphylaxis in a New York City pediatric emergency department: triggers, treatments and outcomes. J Allergy Clin Immunol 2012; 129: 162-168.

18. Klemans RJ, Le TM, Sigurdsson V, et al. Management of acute food allergic reactions by general practitioners. Eur Ann Allergy Clin Immunol 2013; 45: 43-51.

19. Lauritano EC, Novi A, Santoro MC, et al. Incidence, clinical features and management of acute allergic reactions: The experience of a single, Italian Emergency Department. Eur Rev Med Pharmacol Sci 2013; 17: 39-44.

20. Lieberman P. Treatment of patients who present after an episode of anaphylaxis. Ann Allergy Asthma Immunol 2013; 111: 170-175.

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