

Evaluating The Way Of Using The Epinephrine As Anti-Anaphylaxis In Pediatric Age Group In Emergency Departments In University Hospital-Makah At Saudi Arabia 2023

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Abstract:

Background:

Epinephrine is life-saving treatment of anaphylaxis. This study was conducted to Evaluating the way of using the epinephrine as anti- anaphylaxis in pediatric age group in emergency departments in Saudi University Hospital-Makah at Saudi Arabia A staff (physicians and nurses) was asked to fill a structured and validated questionnaire about their use of epinephrine as an anti-anaphylactic treatment. The results showed that the most commonly used doses of epinephrine were 0.3 mg drawn from ampoules followed by use of auto-injectors (EpiPens). A single dose was enough for most patients. Intramuscular injection was the most common route. Epinephrine was kept mostly in the emergency trolley away from light and humidity. Keeping epinephrine in a box attached to the walls but protected from light was a rare practice. The time needed for delivery of epinephrine to patients was mostly 30-60 s, and there was no significant difference between physicians and nurses. **Aim of this study:** Evaluating the way of using the epinephrine as anti-anaphylaxis in pediatric age group in emergency departments in University Hospital-Makah at Saudi Arabia 2023. **Methodology:** A multiple choice self-administered, structured, and validated questionnaire about pattern of use of epinephrine as ant anaphylactic treatment was built up with some reference from previous studies . The questionnaire included questions about doses needed, time of delivery, preparations used, and storage of epinephrine. The study was approved by the Research Ethics Committees in Saudi University Hospital-Makah. **Results:** Use of epinephrine as anti-anaphylactic at a Saudi University Hospital. (A) The doses used; (B) The need for repeated doses; (C) The routes of administration; (D) The time needed for its delivery to patients. (A) Storage of epinephrine; (B) Comparing the speed of its delivery to patients between ED physicians and ED nurses at a Saudi University Hospital .**Conclusion :** the pattern of use of epinephrine as an anti-anaphylactic treatment at the University Hospital is generally similar to the international reports. To our knowledge, there is very few data published in Saudi Arabia handling this issue, thus this study improves knowledge of the medical staff about proper use of epinephrine in anaphylaxis and opens gate for larger studies.

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Introduction:

Anaphylaxis is a potentially fatal allergic reaction, but under diagnosis and under treatment are common.(1) Despite multiple recommendations, intramuscular epinephrine is poorly prescribed in emergency department receiving pediatric anaphylaxis.(2) We found that mild reactions, home location, and first episode are independent predictors of epinephrine under treatment. Continued effort should be made to improve epinephrine treatment of anaphylaxis.(3) Anaphylaxis is a severe, systemic allergic reaction that occurs suddenly after contact with allergy-causing substances. Diagnostic criteria for anaphylaxis were recently published to help clinicians recognize the full spectrum of signs and symptoms of Anaphylaxis(4). An increase in the incidence of anaphylaxis in general, and specifically food-induced anaphylaxis in children in the industrialized world has been suggested by recent studies(5). However, the true incidence of anaphylaxis remains elusive. Studies published prior to the recently proposed criteria often used a definition that was more restrictive, possibly excluding milder cases of anaphylaxis.(6) Appropriate management of anaphylaxis is vital to save patients' lives, in particular pediatric age group.(7) However, the management of anaphylaxis can be daring for many reasons.(8) 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.(9) Anaphylaxis is the most severe form of an allergic reaction. The incidence rate of anaphylaxis enhanced during the last decade.(10) Death may happen in fatal anaphylactic shocks within minutes of the reaction. Hence, it is needed to highlight the significance of effective in particular pediatric emergency management . (6)

Despite the Anaphylaxis is an acute, systemic, and potentially lethal hypersensitivity reaction with multiple organ system involvement.(11) Anaphylaxis can occur after exposure to allergens from a variety of sources, including food, venom, drugs, and immunizations. Virtually all vaccines have the potential to trigger anaphylaxis.(12)

Recently, a committee of the Institute of Medicine (IOM) concluded that epidemiologic and mechanistic evidence convincingly supports a causal relationship between anaphylaxis and several childhood vaccines (measles, mumps, rubella [MMR] vaccine; varicella vaccine; influenza vaccine; hepatitis B vaccine; diphtheria toxoid-, tetanus toxoid-, and a cellular pertussis antigen-containing vaccines; and meningococcal vaccine), favors acceptance of a causal relationship for the human papillomavirus vaccine (HPV; mechanistic evidence only), and is inadequate for hepatitis A vaccine (HAV).(13)

Individual vaccine components that have been implicated in acute vaccine reactions include egg protein, gelatin, milk proteins, and potentially other additives. Natural rubber latex, which can be contained in the syringe plunger, the tips on prefilled syringes, and vial stoppers, is another potential cause of anaphylaxis.(14)

The diagnosis of anaphylaxis is based on history and physical exam and it is very critical considering that there is a broad spectrum of presentations and shock is just an uncommon manifestation in anaphylaxis and relying on it can result in the under diagnosis of anaphylaxis.(15) Defining the exact prevalence of anaphylaxis in children is difficult and it seems that there is under diagnosis and consequently, under correct treatment of this condition. However, on the other hand, based on literature, the prevalence and incidence of anaphylaxis is increasing all over the world.(16) Despite the increasing prevalence of anaphylaxis, there is little information about the characteristics and practice of healthcare providers in treating anaphylaxis (17)

Literature Review

Study by Cardinale, et al .(2020) found that it is likely that the prevalence of severe food-induced anaphylactic reactions will continue to rise. In view of this possibility, we would

like to recommend the following. Epinephrine should be prescribed and kept available for all children and adolescents mediated food allergies, and caretakers should be trained in the appropriate administration of this medication. All children and adolescents with a food allergy who have an allergic reaction should be observed for three to four hours after the reaction in a center capable of dealing with anaphylaxis. Finally, children and adolescents with a food allergy should be evaluated and educated about food allergy by a knowledgeable physician, and the parents of such children should be taught ways of ensuring a rapid response by schools and other public institutions in the event of the accidental ingestion of a food allergen.(18)

Hochstadter, et al.(2016) and Dubus, et al (2019). Reported that we have carefully selected our cases of anaphylaxis following Sampson's criteria . First, we have compared the visits for possible allergic reactions (urticarial and "nonspecific allergy") to those for anaphylaxis, and we have shown that visits for anaphylaxis clearly concerned more severe patients as assessed by the clinical score value and the hospitalization rate. (19,20).

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Another study, reported that when analyzing all the files coded as anaphylaxis, we have observed that anaphylaxis was correctly coded in 86.8% of the cases, better than the 63.1% figure reported by Waserman in the same context (22)

Study by Agbim et al (2022). reported that despite guidelines, Pediatric Patients our received incomplete discharge care. Our objective was to increase the frequency of Allergy referrals and anaphylaxis action plans for patients with anaphylaxis that are discharged from our emergency departments using a quality improvement (QI) framework. Anaphylaxis in infants is under-recognized .(23)

International consensus advises that all patients with anaphylaxis that are discharged from an emergency department (ED) setting receive a written personalized anaphylaxis emergency action plan, an epinephrine auto injector or prescription with teaching on its use, and a referral to an Pediatric allergist .(24) In another study in Australian children, ED diagnosis of anaphylaxis had a sensitivity of 43.2% and specificity of 97.9% (25)

Rationale

Anaphylaxis is a life-threatening condition that is increasing in prevalence in the developed world especially in pediatric age, there is universal expert agreement that rapid intramuscular injection of adrenaline is life-saving and constitutes the first-line treatment of anaphylaxis. The unpredictable nature of anaphylaxis and its rapid progression makes necessary the availability of a portable emergency treatment suitable for self-administration. Thus, anaphylaxis treatment guidelines recommend that at-risk patients are provided with adrenaline auto-injectors (AAIs). Despite these clear recommendations, current emergency treatment of anaphylaxis continues to be inadequate in many cases. Must be to highlight the barriers that exist to the use and that prevent proper management of anaphylaxis. Demonstrated that if the physicians in emergency departments hospitals not have basic knowledge regarding the management of anaphylaxis he will causing a lot of problems.

Aim of the study:

Evaluating the way of using the epinephrine as anti- anaphylaxis in pediatric age group in emergency departments hospital-Makah at Saudi Arabia 2023

Objectives:

To Evaluating the way of using the epinephrine as anti- anaphylaxis in pediatric age group in emergency departments hospital-Makah at Saudi Arabia 2023

Methodology:

Study design:

This study is a cross sectional descriptive study

Study Area

The study will be carried out in the in emergency departments in University Hospital-Makah at Saudi Arabia 2023 a Saudi city located in the middle of the eastern coast. Its population is estimated around 3.2 million, and it is the second largest city after Riyadh. It has grown during the last two decades of the 20th Century, which made the city a center for money and business in the Kingdom of Saudi Arabia and a major and important port for exporting non-oil related goods as well as importing domestic needs.

Study Population

The study will be conducted among the study population constitutes the pediatric age group in emergency departments in University Hospital-Makah at Saudi Arabia . Selection and analysis were restricted to children under 18 years fulfilling criteria for anaphylaxis. During the November 2023 and December 2023 .

Selection criteria:

Inclusion criteria

- Children aged 4 months through 18 years
- All children who came to the Allergy department in referral hospitals
- Criteria for anaphylaxis
- All nationalities
- Both genders.

Exclusion criteria :

- Children don't complain for anaphylaxis
- Children aged more than 18 years
- Parents refuse to participate in research

Sample size All the Children for anaphylaxis the pediatric age group in emergency departments in hospital in Jeddah City, Selection were restricted to children under 18 years fulfilling criteria for anaphylaxis City , The sample size will be calculated by applying Raosoft sample size calculator based on (The margin of error: 5%, Confidence level: 95%, and the response distribution was considered to be 20%) accordingly the Sample size is(100) in in emergency departments in University Hospital-Makah at Saudi Arabia and adding 10 more to decrease margin of error. After adding 5% oversampling, the minimum calculated sample will be (100). Computer generated simple random sampling technique was used to select the study participants.

Sampling technique:

Systematic random sampling technique is adopted. After that, by using random number generator, then simple random sampling technique was applied to select in in emergency departments in University Hospital-Makah at Saudi Arabia. Also, convenience sampling technique will be utilized to select the participants in the study. By using systematic sampling random as dividing the total population by the required sample size; (100) .

Data collection tool

The self-administered questionnaire is designed based on previous studies and frameworks to assess to evaluating the way of using the epinephrine as anti- anaphylaxis in pediatric

age group in emergency departments in University Hospital-Makah at Saudi Arabia, the questionnaire was developed in English. The questions were first pre-tested and were revised and finalized after it was pilot tested. Before completing the survey, participants were required to indicate their consent using a forced response question followed by the survey questionnaires. The survey is estimated to take ~8 min to complete .

To collect the information, a set of questions were constructed and developed. All questions were closed-ended, with tick boxes provided for responses; participants answered the questionnaires from the November 2023 and December 2023.

The questionnaire consisted of questions that

First part

We used a structured and validated questionnaire to collect the data. The questionnaire was taken from the pilot-tested research by representatives of the Department of Emergency Medicine at emergency departments in University Hospital-Makah at Saudi Arabia. The other part was designed by the researcher based on the Anaphylaxis guidelines. The first items comprised of demographic data: age, gender (email or mobile phone number), age, date, city of birth, and smoking (yes/no), other variables were focused on Anaphylaxis diagnosis and management. Items were focused on emergency department's observation, discharge medications, follow-up, and education of patients and health care providers.

Data collection technique:

Researcher will be visits the emergency departments in University Hospital-Makah at Saudi Arabia after getting the approval from the ministry of health. The researcher will be obtained and participant.

After the arrival of the participants to emergency departments in University Hospital-Makah at Saudi Arabia, they should go to the reception first to register and ensure the presence the researcher will be select participants conveniently until the target number achieves and gives the questionnaire for answering. She will be explained the purpose of the study to all participants attending the hospital.

Data entry and analysis:

The Statistical Package for Social Sciences (SPSS) software version 24.0 will be used for data entry and analysis. Descriptive statistics (e.g., number, percentage) and analytic statistics using Chi-Square tests (χ^2) to test for the association and the difference between two categorical variables were applied. A p-value ≤ 0.05 will be considered statistically significant.

Pilot study

A pilot study will be conducted in one emergency department in University Hospital-Makah at Saudi Arabia in the same sector to the target group using the same questionnaire to test the methodology of the study. As a feedback, the questionnaire will be clear and no defect will be detected in the methodology

Ethical considerations

Permission from the Makah joint program of family medicine will be obtained. Permission from the Directorate of Health Affairs . Verbal consents from all participants in the questionnaire were obtained. All information was kept confidential, and results will be submitted to the department as feedback .

Budget: Self-funded

Results

The doses of epinephrine used were 0.3 mg from ampoule (60%), 0.3 mg Epipen (20%), and 0.15 mg from ampoule or Epipen Jr (10% each) (Figure 1A). Only in 12.5% of patients

a second dose was frequently needed while in 47.5% of patients, a second dose was rarely needed (Figure 1B). The most commonly used route was intramuscular (IM) in the shoulder region (40%) followed by intravenous injection (25%). IM in the lateral thigh (vastus lateralis muscle) constituted a 20% while IM in the buttock region was 10%. The least was the IM in the upper front thigh (5%) (Figure 1C). The time needed for delivery of epinephrine to patients was 30-60 s (47.5%), less than 30 s (30%), 61-120 s (17.5%), 121-180 s (2.5%), and more than 180 s (2.5%) (Figure 1D). Epinephrine was kept either in the emergency trolley (72.5%), in a dark place (17.5%), or in a box attached to the walls but protected from light (10%) (Figure 2A). Finally, comparing the speed of delivery of epinephrine to patients between ED physicians and ED nurses revealed no significant differences (Figure 2B).

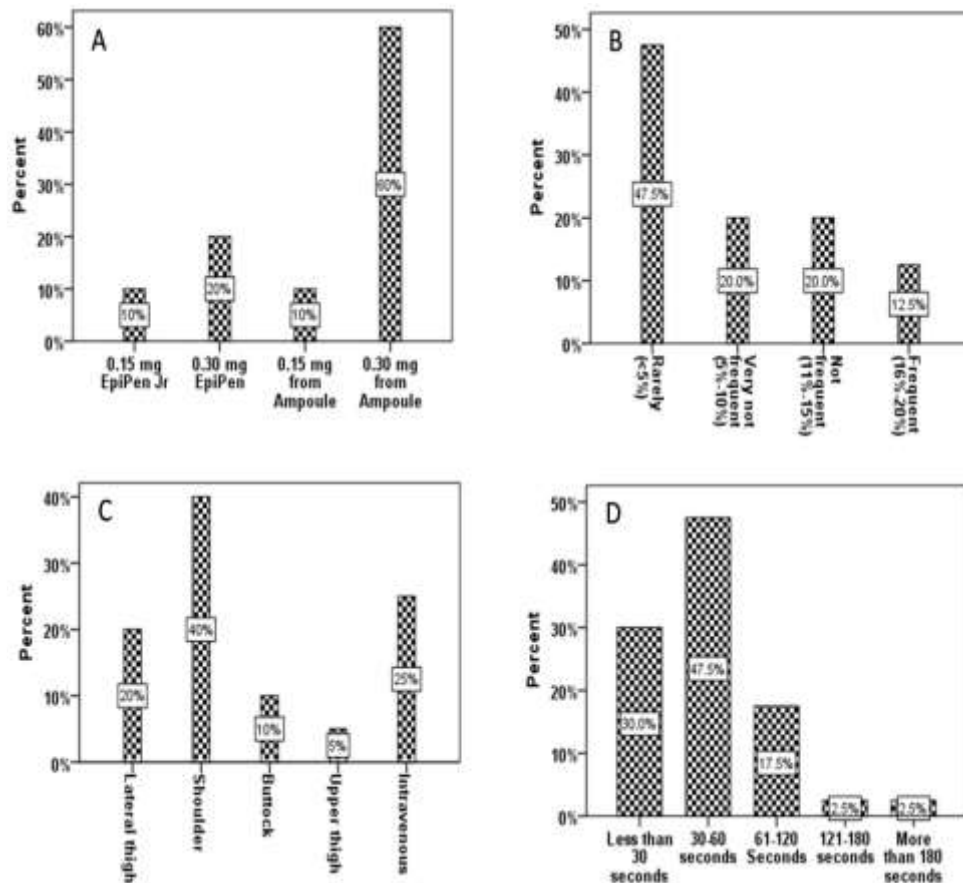


Figure 1. Use of epinephrine as anti-anaphylactic at a Saudi University Hospital . (A) The doses used; (B) The need for repeated doses; (C) The routes of administration; (D) The time needed for its delivery to patients.

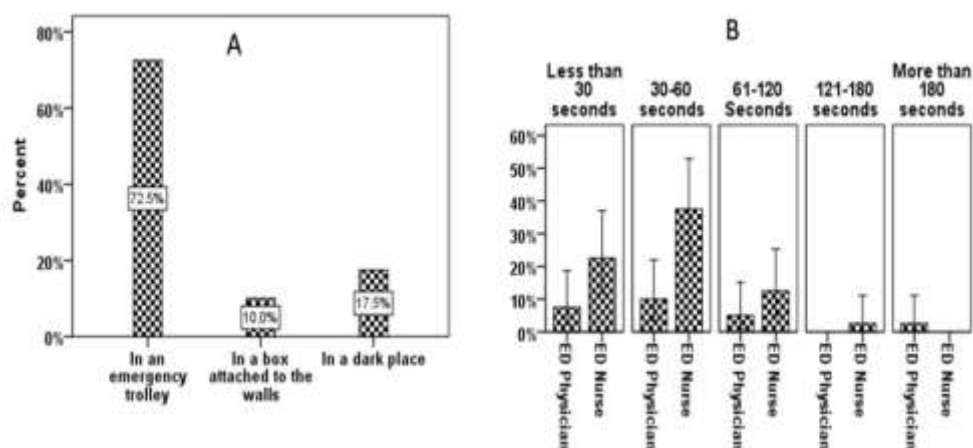


Figure 2. (A) Storage of epinephrine; (B) Comparing the speed of its delivery to patients between ED physicians and ED nurses at a Saudi University Hospital .

Discussion

In management of anaphylaxis, there are few studies that clarify how to translate knowledge into proper practice (22) In the current study, the most commonly used regimen was to give epinephrine (1/1000 solution) intramuscularly in doses starting from 0.01 mg/kg up to 0.5 mg in adults and 0.3 mg in infants. This dosage schedule is considered safe and effective first line therapy in anaphylaxis. It agrees with the international anaphylaxis guidelines of the American Academy of Allergy, Asthma & Immunology, the World Allergy Organization, and the International Consensus ON (ICON) food allergy from the International Collaboration in Asthma, Allergy and Immunology group (26). Intramuscular injection of epinephrine is the most preferred route because it allows the highest plasma level very rapidly compared with other routes (27). If the patient needed repeated doses of epinephrine or went to anaphylactic shock, the intravenous route can be used (28) . Outside hospital, epinephrine auto-injectors (EpiPen) are the mainstay of therapy for anaphylaxis (18). But the EpiPens may not reach the muscle tissue in the vastus lateralis muscle particularly in fatty women due to inadequate needle lengths (29). In these cases of anaphylaxis, the epinephrine auto-injectors are not an ideal choice and epinephrine ampoules must be used (20). The delay in treatment of a real emergency such as anaphylaxis could be fatal (21). In the current study, comparing the speed of delivery of epinephrine between physicians and nurses aimed to detect how rapid each category administers an accurate dose of epinephrine in cases of anaphylaxis where the time factor is immensely critical. No significant differences were detected between ED physicians and ED nurses. This coincides with a previous study in Canada that reported non-significant differences in speed of delivery of epinephrine between physicians, general duty nurses, and emergency department nurses where the ranges were 30-83, 26-71, and 27-33 seconds respectively (29)

In the current study, epinephrine ampoules were stored in the emergency trolley away from light and humidity and the needed dose is drawn immediately before use. Preparing epinephrine in a box and attaching it to the wall of the ER in advance to be ready on demand was a rare practice. This agrees with recommendations of previous studies which reported that drawing epinephrine in a syringe and taping it to a wall in the ER is not preferred to avoid light exposure (30) In conclusion, the pattern of use of epinephrine as ant anaphylactic treatment in University Hospital, Western Saudi Arabia is generally similar to the international reports regarding the doses, route of injection, time needed for delivery of epinephrine to patients, and storage of epinephrine. This study, although small, but it is expected to improve knowledge of the medical staff about proper use of epinephrine in anaphylaxis and to open the gate for larger studies.

Conclusion .

Pediatricians intuitively adapt their epinephrine use to the severity of the anaphylaxis and contribute to epinephrine underuse in pediatric anaphylaxis this study shows that epinephrine was underused in emergency departments face to children with anaphylaxis, but that its prescription was intuitively adapted to the clinical severity, as well as family education.

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