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ORIGINAL ARTICLE

Treatment Of Anaphylaxis In Adults: A Questionnaire Survey At S. Nijalingappa Medical College Hospital, Bagalkot, India

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ABSTRACT

Objective: To identify as to which medications medical students, interns and casualty medical officers are likely to prescribe when treating an adult patient with anaphylaxis, and to ascertain the dose and route of administration of adrenaline that they would use. **Design:** A questionnaire study survey. **Setting:** S. Nijalingappa Medical College (SNMC) and H.S.K. Hospital, Bagalkot (Bagalkot District) and public health centers (PHCs) of the Bagalkot district, Karnataka. **Methods:** The medical students, interns and casualty medical officers of the S.N.M.C and H.S.K. Hospitals and doctors of various grades, working at the public health centers of the Bagalkot district, were asked to anonymously complete a questionnaire detailing a hypothetical case of anaphylaxis. The data were collected from 52 second year medical students, 35 interns and 25 casualty medical officers. **Main outcome measure:** To determine the percentage of the use of adrenaline for the treatment of anaphylaxis in the correct dose, strength and route. **Results:** 90% of the participants said that they would give adrenaline as a first-line treatment to a patient with anaphylaxis, but only 38% knew the correct dose and route of administration. 52% of the doctors who were surveyed stated that they would give adrenaline by the intravenous (IV) route as the first-line treatment. 67.85% and 20.53% of the participants preferred to use corticosteroids and antihistamines respectively. 3.57% said that they would give antibiotics as second line drugs. **Conclusion:** Most of the doctors who were surveyed were not clear about the current anaphylaxis treatment guidelines. In particular, they were unsure of the recommended dose and route of the administration of adrenaline. This confusion applied to all medical students, interns and medical officers. To ensure that the first-line treatment of anaphylaxis is safe, we recommend that intramuscular (IM) adrenaline should be used in the majority of situations like anaphylaxis. We recommend that all doctors should receive regular education concerning the treatment of anaphylaxis.

Key words: Anaphylaxis, Adrenaline

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Introduction

Anaphylaxis is an acute, potentially life-threatening type 1 hypersensitive reaction event, requiring immediate recognition and treatment and it is caused by the release of mediators from mast cells and basophils, following binding with IgE. The term anaphylactoid reaction refers to a non IgE mediated mast cell or basophil activation. The major life-threatening components of anaphylaxis are hypotension, bronchospasm and upper airway angiooedema. The most common of these is cardiovascular

collapse. [1], [2], [3] Anaphylaxis can occur unexpectedly (with a wide variety of causes) in any age group, and all doctors should be aware of the immediate treatment. The most common triggering factors are food substances like peanuts, milk and shellfish, drugs like penicillins and cephalosporins and radio contrast media or idiopathic causes. Anaphylaxis is a medical emergency which may require resuscitation measures such as airway management, supplemental oxygen, large volumes of intravenous fluids, and close monitoring. [4] The administration of epinephrine is the treatment of choice, with antihistamines and steroids often used as adjuncts. Epinephrine (adrenaline) is the primary treatment for anaphylaxis with no absolute contraindication to its use. [4] Whilst adrenaline is life-saving, it is also potentially dangerous. It increases heart rate, myocardial irritability, and inotropy, predisposing the myocardium to potentially serious arrhythmias and ischaemia. [1]

Since junior doctors also can be called upon to treat this emergency condition, we planned to conduct this study in interns working at the S.Nijalingappa Medical College Hospital, Bagalkot and also the casualty medical officers (CMO) working at public health centres in the Bagalkot district, who were the first medical responders. We also included the medical students who were being taught on this subject during the second year of the medical curriculum. The aim of this study was to identify the medications that the medical students, interns and casualty medical officers were likely to prescribe when treating an adult patient with anaphylaxis, and to ascertain the dose and route of the administration of adrenaline that they would use. The use of antihistamines and corticosteroids were also studied.

Material and Methods

A total of 112 participants were enrolled in this study, who were randomly selected, which included second year medical students (n=52), interns (n=35) and the CMOs of S.N.M.C and different PHCs of the Bagalkot district.

They were asked to answer a questionnaire which was distributed to them, which contained details of two hypothetical adult cases of anaphylaxis within a specified time, under supervision.

The questionnaires which were used in a previous study [3],[6]&[7] were modified and used in this study. There was no pressure or mandatory rules for the subjects to participate in the study and all were informed well in advance about their participation in the study. The identity of the subjects who participated was kept confidential, but however, all were informed well in advance regarding their grade and speciality will going to state for study survey purpose.

Results:

Totally, 112 questionnaires were completed by 52 second year medical students, 35 interns of S. Nijalingappa Medical college Hospital and 25 casualty medical officers of S.N.M.C. and various PHCs of the Bagalkot district, in Karnataka state, India.

When questioned as to which first line treatment should be given to a patient with anaphylaxis (Q1), 101 (90.17%) stated that they would give adrenaline. Out of these 101 participants, 43 (38.39%) stated that they would IM adrenaline and 58 (51.78%) participants opted for IV adrenaline. But, 11 (9.82%) participants stated that they would give other drugs ie hydrocortisone and salbutamol nebulization would be used as first line treatments in anaphylaxis. The results which are related to this are tabulated in [Table/Fig 1]. Out of the 43 (38.39%) participants who opted for IM adrenaline as the correct first line treatment 17 (32.69%) included medical students and 23 (65.71%) and 3 (12%) were CMOs. The percentage of participants in each group, opting for different drugs as first line treatments for anaphylaxis is given in Table 1. But, 2% of the total participants selected salbutamol nebulizer, 8.03% chose IV hydrocortisone and 52% of the total participants preferred IV adrenaline as the first line treatment in anaphylaxis.

Group	Salbutamol nebulization	IV hydrocortisone	IM adrenaline	IV fluid	IV adrenaline	Don't know
Medical students-52	1(1.92%)	6(11.53%)	17(32.69%)	0	28(53.84%)	0
Interns-35	0	0	23(65.71%)	0	12(34.28%)	0
CMO-25	1(4%)	3(12%)	3(12%)	0	18(72%)	0
Total-112	2(1.78%)	9(8.03%)	43(38.39%)	0	58(51.78%)	0

[Table/Fig 1]: Percentage of participants opting for different drugs as first line

When asked about the route of adrenaline administration (Q2) and the concentration dilution of adrenaline (Q) which would be preferred in the anaphylaxis condition, only 42 (38%) of the total participants answered the correct dose (0.5mg) and concentration of adrenaline (1:1000) and only 52 (46%) and 42 (38%) of the total participants stated the correct dilution concentration of adrenaline when they were asked separately about the concentration of adrenaline and the route of administration which would be used in anaphylaxis respectively. Though adrenaline has the least oral bioavailability [8], 2 medical students stated that they preferred the oral route of administration. However, 11 (9.82%) of the total participants who answered the questions, did not know about the concentration of adrenaline, which included 4 (7.69%) participants from among the medical students, 6 (17.14%) from among the interns and 1 (4%) from among the CMOs. More than 16-30 participants stated that lower concentrations (1:100000-200000) of adrenaline should be used. Regarding the route of administration, 9 (8.03%) of the total participants mentioned that they preferred the S.C route which would be contraindicated in that case, and 3(12%) of the total CMOs stated that that they preferred the highest concentration of adrenaline, which itself could be a very dangerous.

The results of Q2 and Q3, along with the percentages of the participants in each group opting for the route and concentration of adrenaline which they would use in anaphylaxis, have been given in [Table/Fig 2] and [Table/Fig 3]. Regarding the timing of the second dose of adrenaline, in cases where the anaphylaxis patients had not shown improvement (Q4), surprisingly 15 (13.39%) of the total participants which included 11 medical students, 3 interns and 1 CMO, stated that they did not know, as their answer (when to be repeat the second dose of adrenaline), and 17(15.17%) candidates (8 medical students, 2 interns and 7 CMO) of the total participants mentioned that there was no need of a second dose of adrenaline.

articipants detail		Different routes of administration for adrenaline					
roup umber	Group	IM	IV	SC	Oral	Intra cardiac	Don't know
	Medical students-52	16 (30.76%)	28 (53.84%)	5 (9.61%)	2 (3.84%)	0	1 (1.92%)
	Interns-35	23 (65.71%)	12 (34.28%)	4 (16%)	0	0	0
	CMO 25	3 (12%)	18 (72%)	4 (16%)	0	0	0
	Total-112	42 (37.5%)	58 (52%)	9 (8.03%)	2 (1.78%)	0	1 (0.89%)

[Table/Fig 2]: Percentage of participants opting for different routes

ipants detail		Concentration of adrenaline(0.5 ml) in different dilutions					
r	Group	1:100	1;1000	1:10000	1:100000	1:200000	Don't know
	Medical students-52	0	18 (34.60%)	19 (36.53%)	10 (19.23%)	1 (1.92%)	4 (7.69%)
	Interns-35	0	22 (62.85%)	4 (11.42)	3 (8.57%)	0	6 17.14%
	CMO-25	3 (12%)	12 (48%)	7 (28%)	2 (8%)	0	1 (4%)
	Total 112	3 (2.67%)	52 (46.42%)	30 (26.78%)	15 (13.39%)	1 (0.89%)	11 (9.82%)

[Table/Fig 3]: Percentage of participants opting for different dilutions of adrenaline

However, 56(50%) participants consisting of of 24 medical students, 22 interns 10 CMO, stated the appropriate time, ie; after 5 min, the second dose of adrenaline could be repeated if the patient had not shown improvement after the first dose. The preferences which were opted for the time to consider a second dose of adrenaline in anaphylaxis by different individual groups along with their percentages, is given in [Table/Fig 4]. When asked about the second line of drugs in anaphylaxis (Q5), 76(67.85%) participants and 23 (20.53%) participants said

that they preferred to use corticosteroids and H1 antagonists respectively, and 5(4.46%) of the total participants opted for H2 antagonists (ranitidine),but 4 participants selected antibiotics as the second line of drugs in that case.

ıup	1 min	2 min	5 min	10 min	15 min	Any time	No second dose	Don't know
dical dents-	1 (1.92%)	1 (1.92%)	24 (46.15%)	3 (5.76%)	4 (7.69%)	0	8 (15.38%)	11 (21.15%)
erns-	0	3 (8.57%)	22 (62.85%)	1 (2.85%)	3 (8.57%)	1 (2.85%)	2 (5.71%)	3 (8.57%)
O-	0	0	10 (40.00%)	3 (12.00%)	1 (4.00%)	3 (12.00%)	7 (28.00%)	1 (4.00%)
al	1 (o.89%)	4 (3.57%)	56 (50.00%)	7 (6.25%)	8 (7.14%)	4 (3.57%)	17 (15.17%)	15 (13.39%)

[Table/Fig 4]: Percentage of participants selected time for second dose of adrenaline

The detailed responses (In % also) given by all participants with respect to question 5 has been given in [Table/Fig 5]. When questioned about the guidelines/criteria regarding the management of anaphylaxis (Q6), most of the participants were found to be unaware about the existing guidelines for the management of anaphylaxis.

roup	H2 Blocker	NSAID's	IV Fluids	Antibiotics	Salbutamol nebulization	IV hydrocortisone	H1 Blockers
edical udents- 2	0	0	1	1	2	38 (73.07%)	10 (19.23%)
nterns- 5	2	0	0	1	0	29 (82.85%)	3 (.57%)
MO- 5	3	0	0	2	1	9 (36%)	10 40.00%
otal 12	5 (4.46%)	0	1 (O.89%)	4 (3.57%)	3 (2.67%)	76 (7.85)	23 (20.53%)

[Table/Fig 5]: Percentage of participants preferred for second line drugs

Discussion

The main purpose of this study was to assess the mode of medications that the doctors and medical students would use in the situation of handling an adult hypothetical anaphylaxis case and to know the route, dose concentration, second dose of adrenaline and second line of drugs that they would use in that situation. A previous study on hospital doctors showed that only 5% were able to state the correct dose and the route of administration of adrenaline to be used in anaphylaxis [5] and there existed confusion in the treatment of this emergency condition. [5]-[7] It is essential that doctors working in the emergency department should be aware of the correct drug, the route of administration and the dose of adrenaline.

We assumed that the basic management steps prior to drug administration would have over (completed) ie; stoppage of administration of offending drug causing the reaction, administration of high flow humidified oxygen inhalation, place the patient in supine position, and call for help etc. When faced with a hypothetical adult case of anaphylaxis, 101 (90.17%) participants in this study stated that they would give adrenaline as their first line of treatment. The other 8.03% said that they would give IV hydrocortisone and 2% said that would give salbutamol nebulization. Though these are useful adjutants in the management of anaphylaxis, adrenaline is the life saving drug and it is considered as the pharmacological antagonist of histamine (which is the main chemical mediator in an anaphylactic reaction), as it reverses the pathophysiological processes which are involved in anaphylaxis by acting on all adrenergic receptors (α1 β1- β2 α2). [9] This study has shown that a considerable amount of confusion existed in the matter of giving adrenaline in its correct dose route of administration in the treatment of anaphylaxis. The confusion had affected all grades of doctors and even the medical students who were studying as a part of the examination in that academic year. In this study, 58(51.78%) participants opted for giving adrenaline by the IV route, 9(8.03%) participants chose the S.C route, 2 (1.78%) medical students opted for the oral route and 1 medical student stated that he/she did not know about which route to use for adrenaline administration and so on.

The bioavailability of adrenaline is unpredictable after the oral and the S.C routes in case of anaphylaxis, as it undergoes the rapid first pass effect through the oral route, and when given through the S.C route, there will be a decreased perfusion at the periphery which leads to the slow or limited absorption of the drug and hence, these two routes are contraindicated in this case.[10] Adrenaline by the IM route is preferred in anaphylaxis and it should be injected without delay in the anterolateral aspect of the thigh, as it leads to a more predictable and

rapid absorption of adrenaline, besides avoiding the potential lethal effect of the large bolus of adrenaline by the IV route.[11],[12]

However, bolus IV adrenaline is reserved for life threatening shock, cardiac arrest or for profoundly hypotensive cases who have failed to respond to multiple injections of adrenaline and IV fluid replacement. IV adrenaline should be given by experienced physicians with constant cardiac monitoring [1],[13], which is possible only in the ICCU settings of tertiary care centres. This study has focussed on the fact that many doctors (medical students, interns and casualty medical officers) are unaware regarding the correct dose and the concentration of adrenaline to be used in the treatment of anaphylaxis. In response to question 3, only 52(46.42%) of the total participants (18 medical students, 22 interns and 12 CMOs) stated the correct dose. Surprisingly, 11(9.82%) participants answered that they did not know the correct dose of adrenaline, though they knew that adrenaline had to be given as the first line drug in anaphylaxis treatment.

Alarmingly, 58 participants (52%) stated that they would give an IV dose of adrenaline which could be used only in the emergency management of cardiac arrest. Given that so many participants proposed to give a potentially dangerous dose of IV adrenaline, this finding highlights that there is an intense need to train (educate) the clinical staff to make use of IM adrenaline in most of the cases of anaphylaxis as per the current guidelines. This would ensure that the first line treatment of anaphylaxis was appropriate. 3 participants have opted for the use of a higher concentration (1:100) of adrenaline and 17(15.17%) participants have asserted that the second dose of adrenaline could not be given. However, 56-60(50%-54%) participants from among the total participants stated the correct answer for question 4, that a second dose of adrenaline needed to be administered in severe anaphylaxis. However, the second dose of adrenaline can be repeated every 5-15 min in severe cases of anaphylaxis if the patient had not improved after the first dose of adrenaline[11] All this implies that the clinical staff should be educated (trained) intermittently/repeatedly through continued medical education like programmes.

With respect to the second line of drugs in the management of anaphylaxis (Q5), a majority of the participants opted for IV hydrocortisone and H1 receptor antagonists like diphenhydramine, and H2 receptor blockers like ranitidine. Though these drugs were recommended, there is a little evidence to support their benefit in anaphylaxis. [14] However, the selection of the second line drugs as adjuvants are based on the associated existing cutaneous manifestations like urticaria, angiooedema, pruritis and/or GIT symptoms, etc. Few participants opted for IV fluids, IV antibiotics and salbutamol nebulization as the preferred second line of drugs. This reflects the clinical details described in the problem. However, inhalational beta -2 agonists like salbutamol/formoterol or IV aminophylline infusion can be beneficial if anaphylaxis is associated with bronchospasm, and IV hydrocortisone may reduce the prolonged reactions and relapse.[11] Diuretics, NSAIDs and antibiotics have no role in anaphylaxis treatment. This survey reflects the range of doctors who may be called upon to treat the patients with anaphylaxis and hence, it is necessary that all doctors should know how to treat this medical emergency or otherwise, they have to get trained by attending CME programmes on the management of anaphylaxis.

However, a larger study provides the differences between the grades and specialities for them to be examined in more detail. This type of study may also help to explore the relationship between various guidelines and the proposed adrenaline management.

In addition, more information could be obtained by performing a multricentric study including a survey of general practitioners, nurses and other emergency response personnel.

Conclusion

This study conveys the message that most doctors would prefer the use of adrenaline as a life saving measure when faced with an adult

anaphylaxis case. This survey reflects the knowledge of the students and doctors who may be called to treat the patients with anaphylaxis. Since some sort of confusion exists with some doctors with respect to the adrenaline dose concentration and its route of administration, they need to look into the resuscitation guidelines which are put forward by various sources which are found to be almost similar [5], [6]&[7] for the management of anaphylaxis like cases.

According to the local and national guidelines, it is recommended that adrenaline should be given intramuscularly in case of anaphylaxis treatment as a first line drug and IV adrenaline should be kept as a reserve for life threatening cardiac arrest which should be handled by experts under close monitoring.

The life time risk of anaphylaxis is presumed to be 1% -3% per individual with a mortality rate of 1%. [13] Hence, all of our doctors should be able to diagnose anaphylaxis and treat it efficiently. Finally, all doctors need to know where the treatment guidelines can be found quickly.

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