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## Knowledge and awareness of management of anaphylaxis among clinical medical students

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### ABSTRACT

**BACKGROUND:** Anaphylaxis can happen in people having Allergies, Asthma and a family history of Anaphylaxis. It is an acute potentially life threatening hypersensitivity reaction, involving the release of mediators from mast cells, basophils, and recruited inflammatory cells.

**AIM:** The aims and objectives of this study were to assess the knowledge of medical students, regarding anaphylaxis and to ascertain the knowledge regarding dose, route of administration, and concentration of the drugs used for its management.

**METHODOLOGY:** The present Descriptive cross sectional Questionnaire study was conducted in 2021 over an online setting among 137 clinical medical students. A well-structured questionnaire consisting of 21 close ended questions was set. The data was uploaded and collected from the online google forms. The statistical analysis was done by descriptive statistics to summarize demographic data and chi square test to analyze survey data.  $p < 0.05$  was considered statistically significant and confidence level set as 95%.

**RESULT:** In the present study, 94.16% of the population were aware of Anaphylaxis. 27.74% of the population had encountered patients with anaphylactic reaction. 45.26% of the population gave a test dose on a routine basis. 61.31% of the population responded that they have a first aid kit in their work space to manage allergic reactions.

**CONCLUSION:** Majority of the study population had a first aid kit in their work space to manage any allergic reaction, while Epinephrine was the first choice of drug in case of anaphylaxis. There is moderate awareness among medical students about Anaphylaxis and its management.

**KEY WORDS:** Awareness, Knowledge, Anaphylaxis, Management, Medical students.

## **INTRODUCTION**

Anaphylaxis is defined as “an acute potentially life threatening hypersensitivity reaction, involving the release of mediators from mast cells, basophils, and recruited inflammatory cells”[1]. The frequency of anaphylaxis is approximately 50–2000 episodes/100,000 persons and has a lifetime prevalence of 0.05–2.0%. Allergic reaction is a most commonly encountered health issue among children[2,3]. Between 10% and 18% of children with a history of food allergy experience various allergic reactions to food, including anaphylaxis at school [4,5,6]. Multisystem Mast cells are the key effector cell of the biological response to anaphylaxis with the release of various mediators of inflammation [7].

Anaphylaxis can happen in people having Allergies, Asthma and a family history of Anaphylaxis. Most clinical presentations of anaphylaxis is a systemic syndrome involving stridor, wheezing, hypotension, urticaria, angioedema, skin itching, and erythema. In absence of treatment, the reaction may rapidly progress with increasingly severe manifestations with a potentially fatal outcome [8]. Vasoactive mediators actively released by mast cells, which are immunoglobulin E-mediated, cause systemic anaphylaxis [9]. Warmth and itch mainly in the axilla and groin area combined with anxiety and panic can be the early visual symptoms. Skin testing and serology such as tryptase levels help in initial diagnosis of anaphylaxis at the clinical level [10]. If it goes unnoticed or untreated, the reaction may gradually progress into urticarial rash, and inflammation of the neck and face leading to spasm of the bronchi and laryngeal edema [11].

Several studies conducted previously reveals that there is a lack of knowledge regarding dose and route of administration of adrenaline and confusion in selecting the first line drug for treating the emergency condition among health care professionals [12]. The aims and objectives of this study were to assess the knowledge of interns and medical students, regarding anaphylaxis and to ascertain the knowledge regarding dose, route of administration, and concentration of the drugs used for its management.

## **METHODOLOGY**

The present Descriptive cross sectional Questionnaire study was carried out in the year 2021 through an online setting. The study population included clinical medical students. Approval was taken from the institutional review board. A total of 137 active participants of clinical medical students were selected randomly and included in the study.

A well-structured questionnaire was prepared through literature review in English language, which consisted of a set of self-evaluation questions. The questionnaire consisted of 21 close ended questions, which was to be surveyed among participants. Questionnaire also included demographic details of the participants. The validity checking of the questions was done by faculty members of the institution. The questionnaire data was created through online google forms and the data was

collected from the participants through online filling. The data manipulated in the google forms was then analyzed and cleaned up to an excel sheet. The method of representation of results are pie charts and bar graphs.

The statistical software used was IBM SPSS software. The statistical analysis was done by descriptive statistics to summarize demographic data and chi square test to analyze survey data.  $p < 0.05$  was considered statistically significant and confidence level set as 95%.

## RESULT

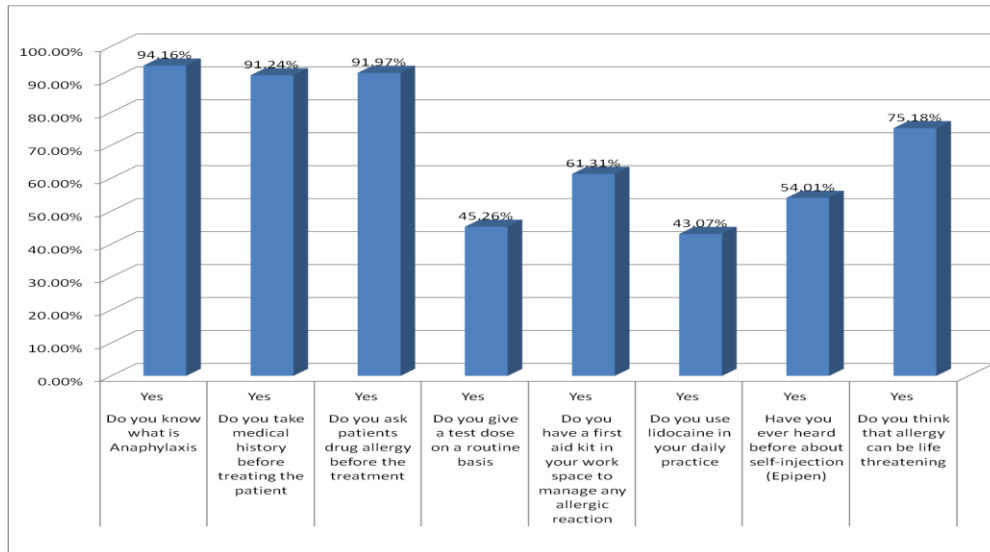
**TABLE 1:** Table showing percentage of responses

S. No	Questions	Options	Response %
1	Gender	<ul style="list-style-type: none"> <li>● Male</li> <li>● Female</li> </ul>	33.58% 66.42%
2	Year of study	<ul style="list-style-type: none"> <li>● 2nd year</li> <li>● 3rd year</li> <li>● 4th year</li> <li>● 5th year</li> <li>● Internship</li> </ul>	43.07% 34.31% 13.87% 0.73% 8.03%
3	Do you know what is Anaphylaxis?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> <li>● Maybe</li> </ul>	94.16% 2.19% 3.65%
4	Do you take medical history before treating the patient?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> <li>● Maybe</li> </ul>	91.24% 5.11% 3.65%
5	Do you ask patients about drug allergy before the treatment?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> <li>● Maybe</li> </ul>	91.97% 5.11% 2.92%
6	Have you encountered patients with anaphylactic reaction?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> <li>● Maybe</li> </ul>	27.74% 64.96% 7.30%
7	Do you give a test dose on a routine basis?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> </ul>	45.26% 32.12%

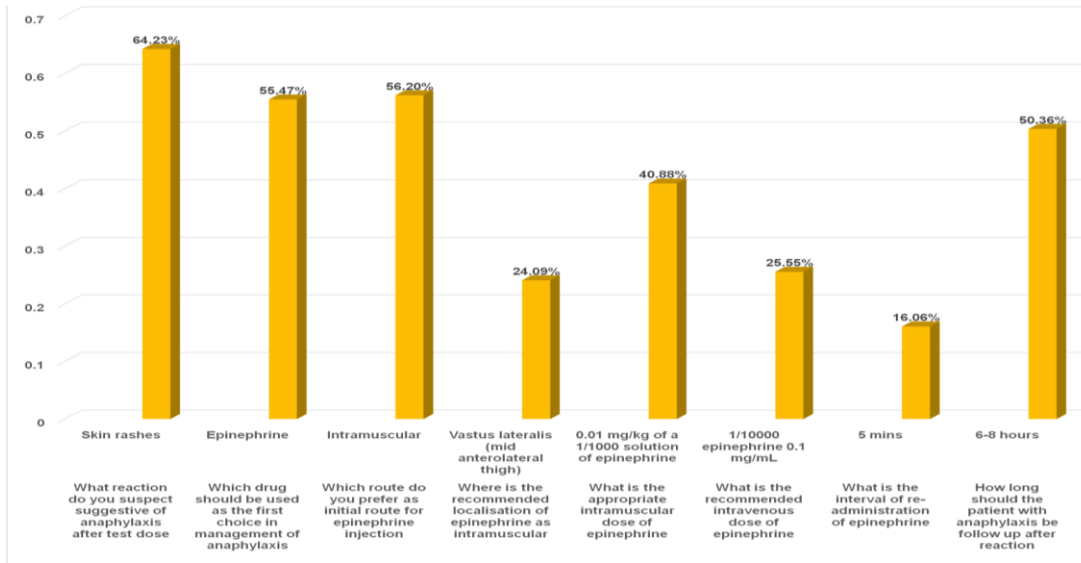
		<ul style="list-style-type: none"> <li>● Maybe</li> </ul>	22.63%
8	What reaction do you suspect suggestive of anaphylaxis after test dose?	<ul style="list-style-type: none"> <li>● Skin rashes</li> <li>● Itching</li> <li>● Dyspnea</li> <li>● Sudden fainting</li> </ul>	64.23% 20.44% 8.76% 6.57%
9	Which symptoms below remind you of anaphylaxis during your treatment?	<ul style="list-style-type: none"> <li>● Nausea and vomiting</li> <li>● Shortness of breath</li> <li>● Skin rash</li> <li>● Skin swelling</li> <li>● Hypotension</li> <li>● Collapse</li> <li>● Any of the above</li> <li>● I don't know</li> </ul>	8.76% 8.03% 12.41% 4.38% 2.92% 0.73% 56.20% 6.57%
10	Substances that can cause anaphylaxis	<ul style="list-style-type: none"> <li>● Drugs / Medications</li> <li>● Insect/ ant/ bee sting</li> <li>● Seafood</li> <li>● Pollen</li> <li>● Nuts</li> <li>● Egg</li> <li>● wheat</li> <li>● Strawberries</li> <li>● Rubber products like Gauntlet</li> <li>● Sport activities</li> <li>● Any of the above</li> <li>● I don't know</li> </ul>	13.87% 9.49% 1.46% 2.92% 2.19% 0.73% 0.00% 0.00% 1.46% 0.73% 63.50% 3.65%
11	Do you have a first aid kit in your work space to manage any allergic reaction?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> <li>● Maybe</li> </ul>	61.31% 19.71% 18.98%
12	Do you use lidocaine in your daily practice?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> <li>● Maybe</li> </ul>	43.07% 33.58% 23.36%
13	Which drug should be used as the first choice in management of anaphylaxis?	<ul style="list-style-type: none"> <li>● Epinephrine</li> <li>● Antihistamine</li> <li>● Corticosteroids</li> </ul>	55.47% 29.93% 5.84%

		<ul style="list-style-type: none"> <li>● Glucagon</li> <li>● Salbutamol</li> </ul>	4.38% 4.38%
14	Which route do you prefer as the initial route for epinephrine injection?	<ul style="list-style-type: none"> <li>● Intramuscular</li> <li>● Subcutaneous</li> <li>● Intravenous</li> <li>● I don't know</li> </ul>	56.20% 10.95% 18.98% 13.87%
15	Have you ever heard before about self-injection (Epipen)?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> </ul>	54.01% 45.99%
16	Where is the recommended localisation of epinephrine as intramuscular?	<ul style="list-style-type: none"> <li>● Deltoid muscle (mid- anterolateral upper arm)</li> <li>● Vastus lateralis (mid- anterolateral thigh)</li> <li>● Gluteus maximus (buttocks)</li> <li>● I don't know</li> </ul>	44.53% 24.09% 8.76% 22.63%
17	What is the appropriate intramuscular dose of epinephrine?	<ul style="list-style-type: none"> <li>● 0.01 mg/kg of a 1/1000 solution of epinephrine</li> <li>● 0.01 mg/kg of a 1/100 solution of epinephrine</li> <li>● 0.01 mg/kg of a 1/10.000 solution of epinephrine</li> <li>● I don't know</li> </ul>	40.88% 17.52% 9.49% 32.12%
18	What is the recommended intravenous dose of epinephrine?	<ul style="list-style-type: none"> <li>● 1/10000 epinephrine 0.1 mg/mL</li> <li>● No dilution</li> <li>● 1/1000 epinephrine 1 mg/mL</li> <li>● 1/100000 epinephrine 0.01 mg/mL</li> <li>● I don't know</li> </ul>	25.55% 4.38% 24.09% 4.38% 41.61%

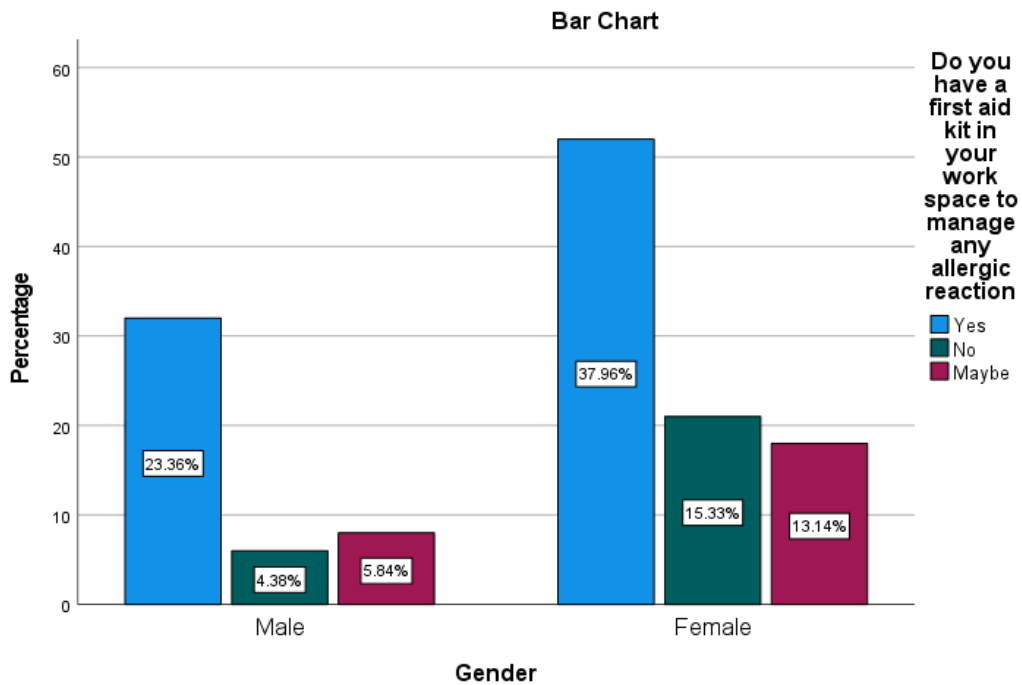
19	What is the interval of re-administration of epinephrine?	<ul style="list-style-type: none"> <li>● Cannot be re-administered</li> <li>● 5 mins</li> <li>● 30 mins</li> <li>● 1 hour</li> <li>● I don't know</li> </ul>	<p>13.87%</p> <p>16.06%</p> <p>13.87%</p> <p>5.84%</p> <p>50.36%</p>
20	How long should the patient with anaphylaxis be followed up after reaction?	<ul style="list-style-type: none"> <li>● 6-8 hours</li> <li>● 1-2 hours</li> <li>● 6-8 hours</li> <li>● No need for a follow up</li> </ul>	<p>50.36%</p> <p>9.49%</p> <p>40.15%</p> <p>0.00%</p>
21	Do you think that allergy can be life threatening?	<ul style="list-style-type: none"> <li>● Yes</li> <li>● No</li> <li>● I don't know</li> </ul>	<p>75.18%</p> <p>11.68%</p> <p>13.14%</p>



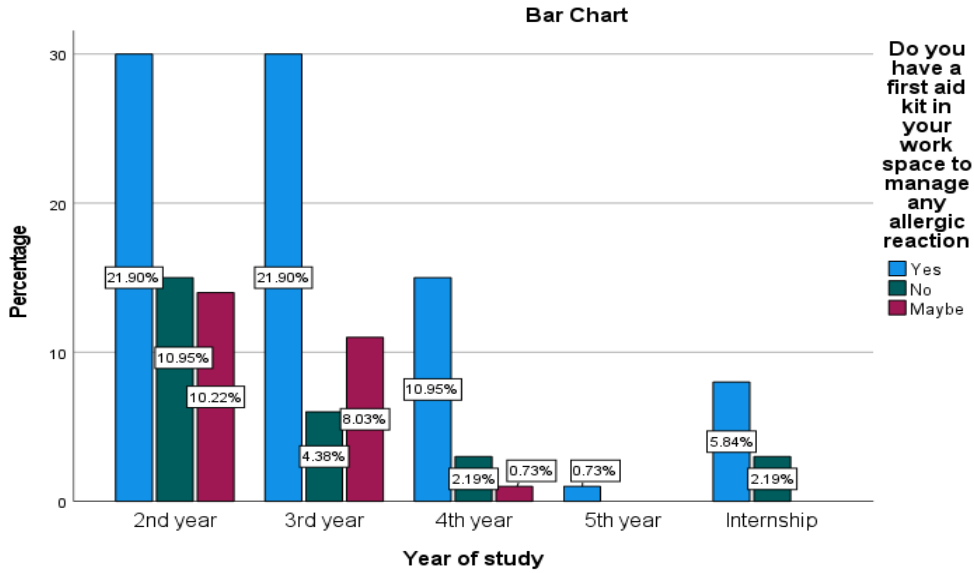
**Figure 1: Bar graph showing percentage of correct or positive answers given by respondents for awareness related questions.**



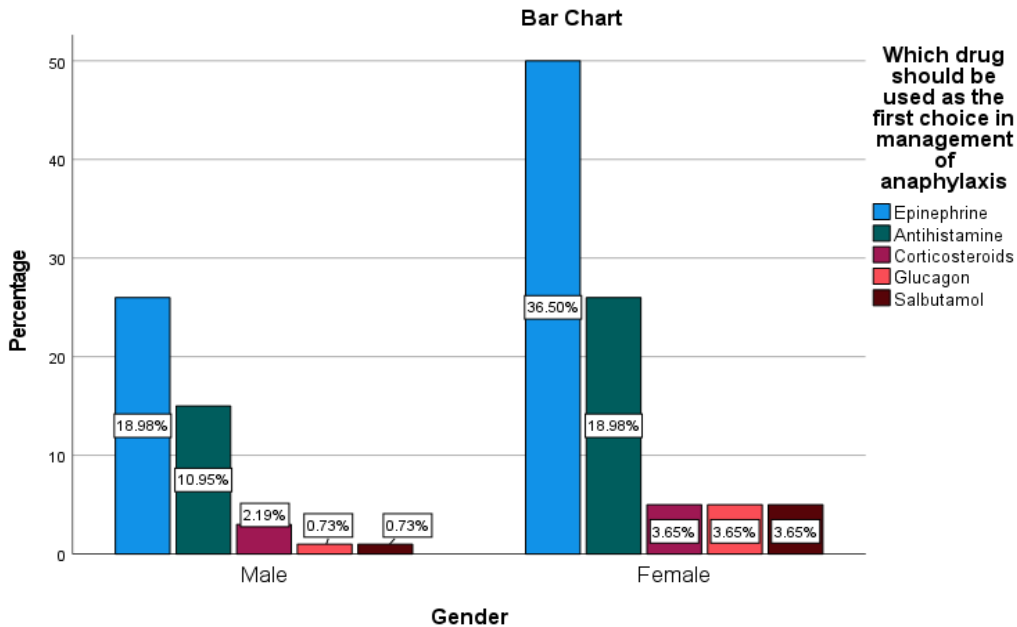
**Figure 2: Bar graph showing percentage of correct or positive answers given by respondents for knowledge and attitude related questions.**



**Figure 3: Bar graph showing chi square analysis of comparison of medical students of different genders on availability of first aid kit in work space to manage any allergic reaction.**

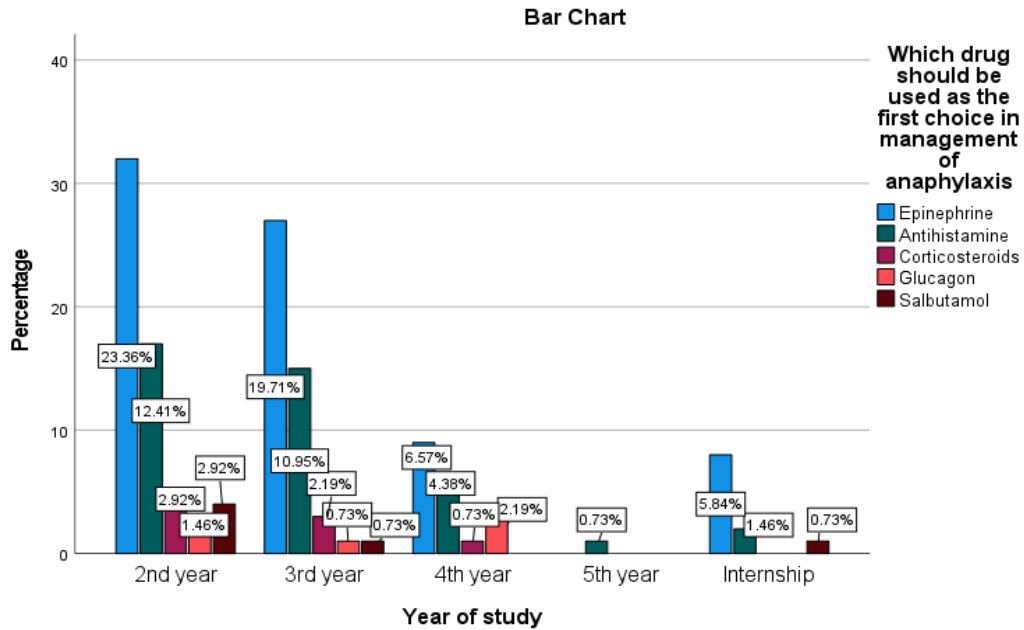


**Figure 4: Bar graph showing chi square analysis of comparison of medical students of different years of study on availability of first aid kit in work space to manage any allergic reaction.**

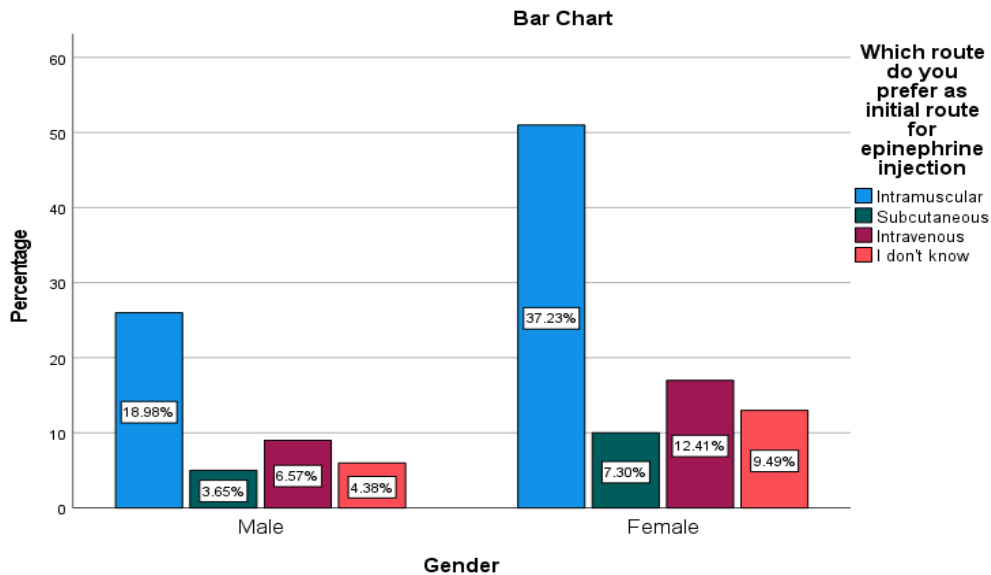


**Figure 5: Bar graph showing chi square analysis of comparison of medical students of different genders on drugs of choice for management of anaphylaxis.**

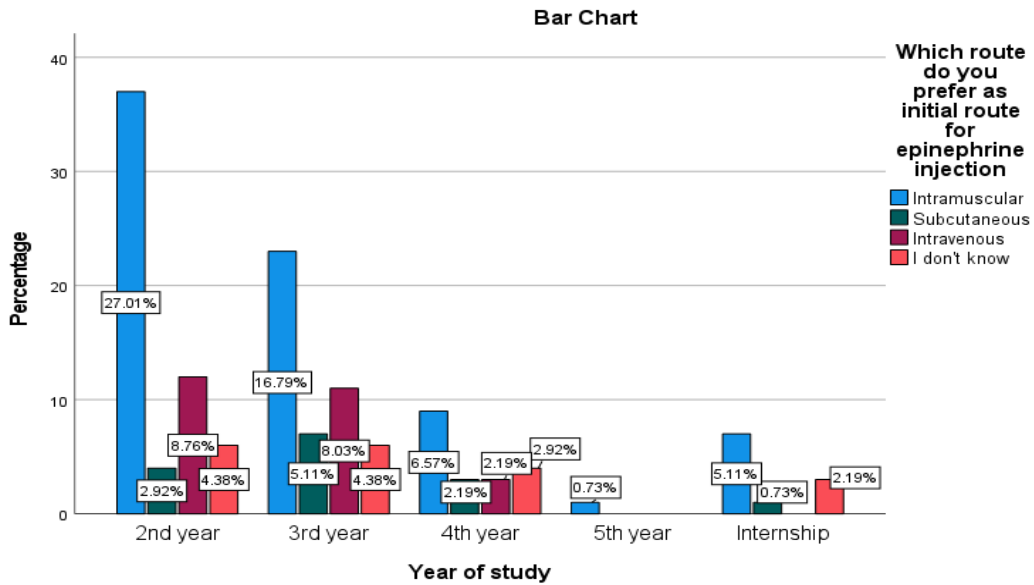




**Figure 6: Bar graph showing chi square analysis of comparison of medical students of different years of study on drugs of choice for management of anaphylaxis.**



**Figure 7: Bar graph showing chi square analysis of comparison of medical students of different genders on choice of the initial route for epinephrine injection.**



**Figure 8: Bar graph showing chi square analysis of comparison of medical students of different years of study on choice of the initial route for epinephrine injection.**

**RESULT SUMMARY**

On collecting and analyzing the data obtained, in our study 66.42% of the population were female and 33.58% of the population were male. 43.07% of population belong to 2nd year medical students, 34.31% of population belong to 3rd year medical students, 13.87% of population belong to 4th year medical students, 0.73% of population belong to 5th year medical students and 8.03% of population belong to Interns.[TABLE 1]

94.16% of the population were aware of Anaphylaxis. 91.24% of the population took medical history before treating patients. 91.97% of the population asked for details regarding any drug allergies. 27.74% of the population had encountered patients with anaphylactic reaction. 45.26% of the population gave a test dose on a routine basis. 64.23% of the population suspected skin rashes to be the reaction to anaphylaxis after the test dose.[TABLE 1]

56.20% had responded that any of the signs like Nausea and vomiting, Shortness of breath, Skin rash, Skin swelling, Hypotension, Collapse can be the symptoms of anaphylaxis. 63.50% had responded that any of substances like Drugs/medications, Insects/ant/bee-sting, Seafood, Pollen, Nuts, Egg, Wheat, Strawberries, Rubber products, Sport activities can cause anaphylaxis. 61.31% of the population responded that they have first aid kit in their work space to manage allergic reactions. 43.07% of the population used lidocaine in their daily practice. 55.47% of the population

used Epinephrine as the first drug of choice in management of anaphylaxis. 56.20% of the population preferred Intramuscular route for epinephrine injection.[TABLE 1] [FIGURE 1,2]

54.01% of the population have heard about self injection. 24.09% of the population recommended Vastus lateralis (mid-anterolateral thigh)muscle for localisation of epinephrine. 40.88% of the population were aware that 0.01mg/kg of a 1/1000 solution of epinephrine was the appropriate intramuscular dose of epinephrine. 25.55% of the population were aware that 1/10000 epinephrine 0.1mg/mL was the recommended intravenous dose of epinephrine. 16.06% of the population were aware that 5mins was the interval for re- administration of epinephrine. 50.36% of the population were aware that 6-8hours was the time for a follow up of the patient after anaphylaxis. 75.18% of the population were aware that allergy was life threatening.[TABLE 1] [FIGURE 1,2]

## DISCUSSION

In the present study, 94.16% were aware about Anaphylaxis[Table 1]. In an article done by Khalid Ayed Asiri et al, only 24.2% of teachers were aware about anaphylaxis [13], which shows that there was a significant level of awareness among Medical students in our study. On comparing genders, maximum awareness was seen among females (63.50%), where p value was 0.041, which was statistically significant. On comparing year of study, maximum awareness was seen among second year students (40.88%), where p value was 0.09, which was statistically insignificant.

91.24% of the study population took medical history before treating patients.[TABLE 1] On comparing genders, females (60.58%) were more aware and took medical history, where p value was 0.710, which was statistically insignificant. On comparing year of study, second year students (37.96%) were more aware and took medical history, where p value was 0.315, which was statistically insignificant.

91.97% of the population in our study ask about any drug allergy before treating patients[Table 1]. Similar findings were observed in studies done by Madhuram Krishnamurthy et al, where 94% of dental practitioners in chennai ask about drug allergies [14]. This shows that there is significant awareness on collecting details of allergies of each patient. On comparing genders, females (61.31%) were more aware to collect details, where p value was 0.816, which was statistically insignificant. On comparing year of study, second year students (40.15%) were more aware to collect details, where p value was 0.041, which was statistically significant.

27.74% of our study population had encountered patients with anaphylaxis[TABLE 1]. Similar findings were observed in studies done by Khalid Ayed Asiri et al, where only 21.4% of teachers had encountered students with anaphylaxis[13]. One study showed an opposite finding, Madhuram Krishnamurthy et al, where 63% of their study population had seen patients with systemic adverse reactions due to local anesthetic[14]. On comparing genders, females (16.79%), had encountered more patients with anaphylactic reaction, where p value was 0.482, which was statistically

insignificant. On comparing year of study, third year students (10.95%), had encountered more patients with anaphylactic reaction, where p value was 0.046, which was statistically significant.

45.26% of our study population gave a test dose on a routine basis [TABLE 1]. In an article done by Madhuram Krishnamurthy et al, where only 3% of dental practitioners in chennai gave a routine test dose [14], which shows that there was a moderate level of awareness about giving a test dose in our study population. On comparing genders, females (31.39%), gave test dose on a routine basis, where p value was 0.801, which was statistically insignificant. On comparing year of study, second year students (18.98%) gave test dose on a routine basis, where p value was 0.784, which was statistically insignificant.

64.23% of our study population suggested skin rashes to be a suggestive reaction of anaphylaxis after a test dose [TABLE 1]. Similar findings were observed in studies done by Madhuram Krishnamurthy et al, where 56% of dental practitioners in chennai suspected skin rashes to be the reaction of anaphylaxis after a test dose was given [14]. On comparing genders, females (39.42%) suspected skin rashes to be the reaction of anaphylaxis after a test dose was given, where p value was 0.173, which was statistically insignificant. On comparing year of study, second year students (27.01%) suspected skin rashes to be the reaction of anaphylaxis after a test dose was given, where p value was 0.826, which was statistically insignificant.

56.20% of our study population were aware that any of the signs like Nausea and vomiting, Shortness of breath, Skin rash, Skin swelling, Hypotension, Collapse were the symptoms of anaphylaxis [TABLE 1]. On comparing genders, females (36.50%) were more aware about the signs of anaphylaxis, where p value was 0.568, which was statistically insignificant. On comparing year of study, second year students (25.55%) were aware about the signs of anaphylaxis, where p value was 0.984, which was statistically insignificant.

63.50% of our study population were aware that any of substances like Drugs/medications, Insects/ant/bee-sting, Seafood, Pollen, Nuts, Egg, Wheat, Strawberries, Rubber products, Sport activities was the cause of anaphylaxis [TABLE 1]. On comparing genders, females (40.88%) were more aware about the substances causing anaphylaxis, where p value was 0.380, which was statistically insignificant. On comparing year of study, second year students (30.66%) were aware about the substances causing anaphylaxis, where p value was 0.738, which was statistically insignificant.

61.31% of the population had a first aid kit in their work space to manage allergic reactions [TABLE 1]. In an article done by Khalid Ayed Asiri et al, only 11.7% of their population thought that they had a first aid kit to manage anaphylaxis [13]. In another article, done by Madhuram Krishnamurthy et al, the availability of emergency kits at the dental office was at a lower level (26%), which could be attributed to the ignorance and general lack of interest of dentists towards

the preparedness for medical emergencies[14]. On comparing genders, females (37.96%) had a first aid kit in their work space, where p value was 0.298, which was statistically insignificant [FIGURE 3]. On comparing year of study, second year (21.90%) and third year(21.90%) students were aware about keeping a first aid kit in their work space, where p value was 0.220, which was statistically insignificant [FIGURE 4].

43.07% of our study population used lidocaine in their daily practice [TABLE 1]. Similar findings were observed in studies done by Keerthana Balaji et al, where 76% of their study population used Lidocaine as a preferred LA [15]. On comparing genders, females (26.28%) used lidocaine in their daily practice, where p value was 0.397, which was statistically insignificant. On comparing year of study, third year students (18.98%) used Lidocaine in their daily practice, where p value was 0.262, which was statistically insignificant.

55.47% of our study population used Epinephrine as their first choice of drug during anaphylaxis [TABLE 1]. Similar findings were observed in studies done by Keerthana Balaji et al, where 69% of their study population used Epinephrine as their first choice of drug during anaphylaxis [15]. The study done by Madhuran Krishnamurthy et al showed opposite findings, where 11% of dentists admitted use of other alternatives as the first choice in the management of anaphylaxis[14]. On comparing genders, females (36.50%) used Epinephrine as their first choice of drug in case of anaphylaxis, where p value was 0.777, which was statistically insignificant [FIGURE 5]. On comparing year of study, second year students (23.36%) used Epinephrine as their first choice of drug in case of anaphylaxis, where p value was 0.591, which was statistically insignificant [FIGURE 6].

56.20% of our study population preferred the Intramuscular route for epinephrine injection [TABLE 1]. In another study done by Madhuran Krishnamurthy et al, only 28% of their population preferred the Intramuscular route for epinephrine injection[14], which shows that there was a significant level of awareness among Medical students in our study. On comparing genders, females (37.23%) preferred the Intramuscular route for epinephrine injection, where p value was 0.997, which was statistically insignificant [FIGURE 7]. On comparing year of study, second year students (27.01%) preferred the Intramuscular route for epinephrine injection, where p value was 0.654, which was statistically insignificant [FIGURE 8].

54.01% of our study population were aware about Epipen[TABLE 1]. Similar findings were observed in studies done by Khalid Ayed Asiri et al, where (37.2%) of their study population were aware about Epipen [13]. On comparing genders, females (32.85%) were more aware about Epipen, where p value was 0.132, which was statistically insignificant. On comparing year of study, second year students (21.90%) were more aware about Epipen, where p value was 0.733, which was statistically insignificant.

24.09% of our study population recommended Vastus lateralis (mid-anterolateral thigh) muscle for localisation of epinephrine[**TABLE 1**]. On comparing genders, females (15.33%) recommended Vastus lateralis muscle for localisation of epinephrine, where p value was 0.809, which was statistically insignificant. On comparing year of study, second year students (10.95%) recommended Vastus lateralis muscle for localisation of epinephrine, where p value was 0.777, which was statistically insignificant.

40.88% of our study population were aware that 0.01mg/kg of a 1/1000 solution of epinephrine was the intramuscular dose of epinephrine[**TABLE 1**]. The study done by Shalini Adiga et al, showed opposite findings, where 9% of their study population were aware about the correct IM dose[**16**]. On comparing genders, females (25.55%) were aware of recommended IM dose of epinephrine, where p value was 0.711, which was statistically insignificant. On comparing year of study, third year students (16.06%) were aware of the recommended IM dose of epinephrine, where p value was 0.649, which was statistically insignificant.

25.55% of our study population were aware that 1/10000 epinephrine 0.1mg/mL was the intravenous dose of epinephrine[**TABLE 1**]. The study done by Shalini Adiga et al, showed opposite findings, where 1.83% of their study population were aware about the correct IV dose[**16**]. On comparing genders, females (17.52%) were aware of the recommended IV dose of epinephrine, where p value was 0.861, which was statistically insignificant. On comparing year of study, third year students (9.49%) were aware of the recommended IV dose of epinephrine, where p value was 0.326, which was statistically insignificant.

Only 16.06% of our study population were aware that 5 mins was the interval for re- administration of epinephrine[**TABLE 1**]. The study done by Shalini Adiga et al, showed opposite findings, where 43.11% of their study population were aware that 5 mins was the interval for re-administration of Epinephrine[**16**]. On comparing genders, females (9.49%) were aware about the interval of re-administration of Epinephrine, where p value was 0.310, which was statistically insignificant. On comparing year of study, second year students (7.30%) were aware about the interval of re-administration of Epinephrine, where p value was 0.900, which was statistically insignificant.

50.36% of our study population were aware that 6-8hours was the time for a follow up of the patient after anaphylaxis[**TABLE 1**]. On comparing genders, females (31.39%) were aware about the time needed for a follow up after anaphylaxis, where p value was 0.512, which was statistically insignificant. On comparing year of study, second year students (23.36%) were aware about the time needed for a follow up after anaphylaxis, where p value was 0.192, which was statistically insignificant.

75.18% of our study population were aware that allergy was life threatening[**TABLE 1**]. On comparing genders, females (46.72%) were aware that allergy can be life threatening, where p value was 0.026, which was statistically significant. On comparing year of study, second year students (33.58%), were aware that allergy can be life threatening, where p value was 0.853, which was statistically insignificant.

## CONCLUSION

The present study concluded that there was a moderate level of awareness about Anaphylaxis among our study population. The maximum awareness was seen among females than males. Interestingly 2nd year medical students showed more awareness than other year students. Majority of our study population had a first aid kit in their work space to manage any allergic reaction, while Epinephrine was the first choice of drug in case of anaphylaxis. In our study there was no equal distribution between years of study, hence future studies with more sample size and an equal distribution of samples between each group is needed, for better analysis. Students should take initiative to have more knowledge about the management of allergies in general and more awareness programs and training sessions should be held in accordance to improve the knowledge.

**CONFLICT OF INTEREST:** Nil

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### **LIST OF FIGURE LEGENDS**

**Figure 1:** Bar graph showing percentage of correct or positive answers given by respondents for awareness related questions.

**Figure 2:** Bar graph showing percentage of correct or positive answers given by respondents for knowledge and attitude related questions.

**Figure 3:** Bar graph showing chi square analysis of comparison of medical students of different genders on availability of first aid kit in work space to manage any allergic reaction.

**Figure 4:** Bar graph showing chi square analysis of comparison of medical students of different years of study on availability of first aid kit in work space to manage any allergic reaction.

**Figure 5:** Bar graph showing chi square analysis of comparison of medical students of different genders on drugs of choice for management of anaphylaxis.

**Figure 6:** Bar graph showing chi square analysis of comparison of medical students of different years of study on drugs of choice for management of anaphylaxis.

**Figure 7:** Bar graph showing chi square analysis of comparison of medical students of different genders on choice of the initial route for epinephrine injection.

**Figure 8:** Bar graph showing chi square analysis of comparison of medical students of different years of study on choice of the initial route for epinephrine injection.