



A Survey to Check the Level of Knowledge About Anaphylactic Reaction in Radiological Procedures among Radio Technologist/Radiographer, India.

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KEYWORDS

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bronchospasm,
intravenous
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ABSTRACT:

Aim: The aim of the study is to assess the level of knowledge among radio technologists in India regarding anaphylactic reactions in radiological procedures, taking into consideration their academic qualifications.

Materials and Methods: A Google Forms survey was designed and distributed to radio technologists/radiographers working in hospitals, diagnostic centre, physician's offices and outpatient care centre. The survey included questions related to the understanding of anaphylactic reactions, their recognition, prevention, and management during radiological procedures. The survey also collected demographic data, including the highest educational qualification of the participants.

Result: Radiographer must improve their understanding of epinephrine's role in severe contrast-induced allergic reactions. These reactions, though rare, span from mild Urticaria to life-threatening anaphylaxis, mainly from intravenous iodinated contrast media. While MRI gadolinium-based contrast reactions are less frequent, they require careful management. Recognizable symptoms include Urticaria, nausea, bronchospasm, and systemic hypotension, often occurring within the first twenty minutes post-administration. Prompt recognition and treatment are vital for patient outcomes. Radiology departments must maintain updated emergency trays with epinephrine, antihistamines, and other essentials. Collaboration with the hospital's emergency response team is crucial for severe reactions. Preparedness and cooperation ensure effective management when emergencies arise.

Conclusion: Radiographers' understanding of epinephrine's role in severe contrast-induced allergic reactions requires improvement. Prompt recognition and treatment are essential for patient outcomes. Close collaboration with the hospital's emergency response team and maintaining updated emergency trays are critical for effective management.

Introduction

Radiographic contrast media are a group of imaging techniques such as radiography and computed tomography (CT). The recent nearly new radio agent are placed on the drug debasement of a 2,4,6-tri-iodinated benzene ring and are indispensable in the practice of radiology, for both diagnostic and

therapeutic purposes. Iodine-based contrast media are usually classified as ionic or non-ionic and as monomeric and dimeric and are commonly used to visualize vessels, tissues, organs, and the urinary tract. They are obliging in metamorphose between typical and inveterate region. They are generally secure, and adverse effects are generally mild and bounded. [1, 2, 3]

Contrast media is a chemical substance that is used to improve the visual of internal body parts in radio



medical imaging. The contrast media uses different administered like IV, IA, Orally and into the body cavity mostly IV is a higher use of contrast media but during the previous years the no. of radiographic examinations increased so the contrast media requirement is increasing because the CM shows the better lesion characterization, different modality like x-ray, Fluoroscopy, CT, MRI, ultrasound examination. Iodinated contrast media is divided into 2 group's namely high osmolar and low osmolar. The Osmolarity of the contrast agent can be resolved by the number of particles in contrast. [1,2,3]

The ions of the ionic contrast agent can freely move in the solution. Their Osmolarity is higher in comparison to non-ionic contrast agents and they are highly active while reacting to another chemical. [1, 2, 3] They have 5-8 times the Osmolarity of blood plasma. The mild and moderate contrast reaction is more in ionic contrast agents (6%-8%) compared to the non-ionic contrast agent (0.2%), but the rate of severe reaction stays the same for both the contrast agent. [22]

The ions of non-ionic contrast agents cannot freely move in the solution. They do not separate in the solution rapidly while reacting to other chemicals. Their Osmolarity is lower compared to high osmolar contrast media. In recent years, the use of low osmolar contrast agents has increased due to the low rate of reactions. This contrast agent is an iodine-based contrast agent. They have 2-3 times the Osmolarity of blood serum.[3,17] Contrast media often have a higher viscosity (number of molecules per kilogram of water) and an increased Osmolality (number of molecules per kilograms of water) than blood, plasma, or cerebrospinal fluid. Osmolality and viscosity both contribute to the emergence of contrast reactions.[2,9]

In fact, compared to iodinated contrast for CT and other radiographic exams, gadolinium-based MRI contrast agents have been found to have a higher safety profile for intravenous administration.[13,14,15]

Urticaria, nausea, and vomiting are examples of acute reactions; anaphylaxis, a rare occurrence, also occurs in these types of reactions.[6]

Ultrasound contrast agent is widely used in Europe and Asia, whereas in the United States it is not so popular due to the arising of some regulatory problem. The FDA approved the use of Lumason a contrast agent made up of sulfur hexafluoride lipid type a microspheres. [3,12]

Radiographic contrast medium can have side effects that range from a minor annoyance, like itching, to a serious emergency. An undesirable effect of using intravenous or intra-arterial contrast material is known as contrast-induced nephropathy (CIN). Anaphylactic reactions, delayed allergic reactions, and cutaneous reactions are further types of adverse reactions. [4,5,7]

ORAL CONTRAST REACTIONS Rarely, anaphylactic reactions to oral contrast media have been reported, but these are generally isolated cases.

Anaphylactic reactions are divided into three categories.

1. Mild
2. Moderate
3. Severe

Mild, moderate, and severe reactions can be distinguished, as well as immediate and delayed ones. While mild to moderate reactions typically self-limit and only need supportive care, moderate to severe reactions necessitate immediate medical attention. Within two weeks of the contrast administration date, delayed effects such as rashes, headaches, diarrhea, joint pains, fever, chills, and dizziness may manifest. A typical adverse effect of contrast responses that manifests as reduced renal function two weeks after contrast delivery is renal toxicity.[2,11,24,25]

They are self-limiting and require less attention while treating them. They occur usually within 1 hour of injecting the contrast media. Their symptoms can be seen as, nausea, itching, vomiting, etc. [2,23]

They can be immediate to late responsive and requires attention while their treatment but there is no need for hospitalization. Their symptoms can be seen as Tachycardia /bradycardia, Bronchospasm, Wheezing,



Hypertension, Laryngeal edema, Mild hypotension, etc. [2, 8, 9, 25].

These reactions are dangerous and can be life-threatening. These are a kind of delayed reaction and the patient requires immediate treatment and hospitalization. Their symptoms can be seen as Laryngeal edema (severe or rapidly progressing), Convulsions [irregular movement of the body], Unresponsiveness, Cardiopulmonary arrest, etc. [2, 8, 9, 21]

Complications of radio agent value from a mild inconvenience, such as sting, to a dangerous extremity. [1, 19, 21] Contrast-induced nephropathy (CIN) is a well-known adverse reaction associated with the use of intravenous or intra-arterial contrast material. Other forms of untimely response include late sensitive response, anaphylactic reactions, and cutaneous reactions. [7, 10, 20, 21]

Old sensitive response to radio agent grow the chance of progress adverse reactions to contrast agents. Pre-treatment of patients who have such risk factors with a corticosteroid and diphenhydramine decreases the chance of allergic reactions, including anaphylaxis or life-threatening emergency. [16,18] Of the former, either prednisone (50 mg orally, 13, 7, and 1 h before contrast injection), hydrocortisone (200 mg intravenously, 1 h before contrast injection), or methylprednisolone (32 mg orally, 12 and 2 h before contrast media injection) is used. Diphenhydramine (50 mg intravenously/intramuscularly/orally, 1 h before contrast injection) is also used [2,21].

Perception of different potentiality and screening for their attending before the use of radio agent permit for rapid concession of poor response and prompt medication. [3] This study aimed at assessing the Level of Knowledge About Anaphylactic Reactions in Radiological Procedures Among Radio Technologist/radiographers in India.

Methodology

Study Population

The area of the study is the entire India for comprehensive study however for primary data

collection from radiologists/faculty/radiographers and trainees.

Study Area

The data was collected from people working in departments of radiology, and from which a sample of 210 radiologic technologists working in various healthcare institutions, including hospitals, diagnostic centers, and imaging clinics, within the state is studied.

Study Design

The study was designed as an observational and evaluative study based on a questionnaire Google Forms survey to assess the knowledge of radiographers regarding anaphylactic reactions in patients due to injected contrast media.

Sample Size

The minimum size of the study was set at 210 participants, and it was increased according to the number of Google Forms submitted.

Methodology

A Google Forms survey was designed and distributed to radio technologists/radiographers working in hospitals, diagnostic centre, physician's offices and outpatient care centre. The survey included questions related to the understanding of anaphylactic reactions, their recognition, prevention, and management during radiological procedures. The survey also collected demographic data, including the highest educational qualification of the participants.

Result

The total number of participants 210, Out of 210 participants, 142 participants i.e. (67.6%) were Male, and 68 participants i.e. (32.4%) were females. (**Table no. 1**), (**Figure 1**)

Total 210 participants, 136 participants i.e. (64.8) were between 20 years to 25 years of age, 54 participants i.e. (25.7%) were between 25 years to 30 years of age, 12 participants i.e. (5.7%) were between 30 years to 35 years of age, 8 participants i.e. (3.8%) were between 35 years to 40 years of age. (**Table no. 2**), (**Figure 2**)



Out of 210 participants, 144 participants i.e. (68.6%) were bachelors, 21 participants i.e. (10%) were diploma, 5 participants i.e. (2.4%) were doctorate, and 40 participants i.e. (19%) were masters. (**Table no. 3**), (**Figure 3**)

Shows the knowledge regarding anaphylactic reaction in Out of 210 participants, 26 participants i.e. (12.4%) said No, and 184 participants i.e. (87.6%) said yes. (**Table no.4**), (**Figure 4**)

What mild hyper reactions from contrast are? Out of 210 participants, 39 participants i.e. (18.6%) say 2 Types, 43 participants i.e. (20.5%) say 3 types, 120 participants i.e. (57.1%) say 4 types, 8 participants i.e. (3.8%) say 6 types. Shows how many types of anaphylactic reactions are there. (**Table no.5**), (**Figure 5**)

Which type of anaphylactic reaction is nausea? Out of 210 participants, 17 participants i.e. (8%) say anaemia, 12 participants i.e.(5.7%) say Bone cancer, 104 participants i.e. (49.5%) say Mild bronchospasm, 77 participants i.e.(36.7%) say pain. (**Table no.6**), (**Figure 6**)

Study out of 210 participants, 154 participants i.e. (73.3%) says mild reaction, 32 participants i.e. (15.2%) say moderate reaction, 22 participants i.e. (10.5%) say severe reaction, 2 participants i.e. (1%).(**Table no.7**), (**Figure 7**)

Study Out of 210 participants, 100 participants i.e. (47.7%) say mild,, 68 participants i.e. (32.4%) say moderate, 21 participants i.e. (10%) say severe, 21 participants i.e. (10%) say very severely. (**Table no.8**), (**Figure 8**)

Table no. 9. . (Figure 9)Shows which of the following drug is used in anesthetic to promote loss of feeling/sensation? Out of 210 participants, 35 participants i.e. (16.7%) say the drug is Albenadazole, 69 participants i.e. (32.9%) say the drug is Dexona, 30 participants i.e. (14.3%) say the drug is Ibuprofen, 76 participants i.e. (36.2%) say the drug is Thiopental Sodium.

Figure 10 and Table no. 10.Show which emergency drug is used to show the contrast media side effect of bronchospasm. Out of 210 participants, 40 participants i.e. (19%) say the drug is Acetaminophen, 66 participants i.e. (31.4%) say the drug is Dexona, 54 participants i.e. (25.7%) say Doxycycline, 50 participants i.e. (23.8%) say the drug is Terbutaline.

Table no. 11. Shows which type of anaphylactic reaction is cardiopulmonary arrest. Out of 210 participants, 16 participants i.e. (7.6%) say mild side effects, 38 participants i.e. (18.1%) say moderate side effects, 21 participants i.e. (10 %) say none of these, 135 participants i.e. (64.3%) say severe side effects.

Table no. 12. Shows what contrast media side effect needs treatment. Out of 210 participants, 33 participants i.e. (15.7%) say mild side effects, 76 participants i.e. (36.2%) say moderate side effects, 70 participants i.e. (33.3 %) say severe side effects, and 31 participants i.e. (14.8%) say very severe side effects.

Table no. 13 shows the score in which category of contrast media we have to hospitalize the patient. Out of 210 participants, out of 210 participants, 26 participants i.e. (12.4%) say mild side effects, 47 participants i.e. (22.4%) say moderate side effects, 90 participants i.e. (42.9 %) say severe side effects, and 47 participants i.e. (22.4%) say very severe side effects.

Table no. 14 shows during contrast media side effects of the seizure. Which emergency drug is used? Out of 210 participants, 18 participants i.e. (8.6%) say Albendazole drug is used, 38 participant's i.e. (18.1%) say Ciprofloxacin drug is used, 118 participants i.e. (56.2%) say Diazepam, 36 participants i.e. (17.1) say Insulin is used.

Table no. 15 Shows which emergency drug is used during excessive /prolonged sedation contrast and the side effects of hypertension. Out of 210 participants, 34 participants i.e. (16.2%) say Cefixime drug is given, 52 participants i.e. (24.8%) say Flumazenil drug is given, 76 participants i.e. (36.2%) say Naproxen drug is given, 48 participants i.e. (22.9%) say Tadalafil drug is given,

Table no. 16 Shows in which part of the body the nephropathy reaction occurs. Out of 210 participants, 6



participants i.e. (2.9%) say eyes, 14 participants i.e. (6.7%) say heart, 178 participants i.e. (84.8%) say kidney, 12 participants i.e. (5.7%) say liver.

Discussion

The present study was conducted in working in departments of radiology UP, India. A total of 210 participants were there in the study. The study was conducted on “A observation to check the quantity of knowledge about Anaphylactic response in Radiological procedure among radio technologists/ radiographers, India, 2023.

A total of 210 participants participated in the study making an effective response rate. About 67.6% of participants were Male and 32.4% of participants were females. Most of the participants i.e., 64.8% were between 20 years to 25 years of age and very less participants were between 35 years to 40 years of age i.e., 3.8%. and the educational qualification was also good for the participants as the majority of the participants were bachelors i.e., 68.6%, and very less participants were diplomas i.e., 2.4%.

The study was also conducted to assess the knowledge of the participants regarding the anaphylactic reaction and the types of anaphylactic reactions in which 87.6% of participants said yes, they have knowledge regarding the anaphylactic reaction rest of 12.4% of participants said nowhere as they were also asked about the types of anaphylactic reaction in which 18.6% participants say 2 types, 20.5% participants say 3 types, 20.5% participants say 4 types and 3.8% say 6 types.

As the knowledge of the participants was also assessed regarding what type of mild hyper reactions are caused by contrast 8% of participants say anemia, 5.7% of participants say Bone cancer, 49.5% of participants say Mild bronchospasm and 36.7% say pain.

The anaphylactic reaction causes many changes in many symptoms so the knowledge was assessed about the reaction made by certain symptoms like nausea, vomiting, and cardiopulmonary arrest. 73.3% of participants say mild reaction, 15.2% of participants say moderate reaction and 10.5% of participants say severe reaction. During vomiting 44.8% of participants say

mild, 2.9% of participants say mild, 32.4% say moderate, and 10% say very severe. During cardiopulmonary arrest 7.6% of participants say mild side effects, 18.1% say moderate side effects, and 64.3% of participants say severe side effects.

The participants were asked about the drug used in anesthetic to promote loss of feeling/sensation. 16.7% of participants stated that the drug is Albendazole, 32.9% of participants say the drug is Dexona, 14.3% of participants say the drug is Ibuprofen, and 36.2% of participants say the drug is Thiopental Sodium.

The participant's knowledge was checked regarding the emergency drug used to show the contrast media side effect of bronchospasm, and seizure. For bronchospasm 19% say the drug is Acetaminophen, 31.4% of participants say the drug is Dexon, 25.7% participants say Doxycycline and 23.8% participants say the drug is Terbutaline whereas regarding seizure the participants stated that 8.6% say Albendazole drug is used, 38 participants' i.e. (18.1%) say Ciprofloxacin drug is used, 118 participants i.e. (56.2%) say Diazepam, 36 participants i.e. (17.1) say Insulin is used.

The Participants were asked if they have any knowledge regarding the score in which category of contrast media, we have to hospitalize the patient. 57.1% participants say the score is 0.00/2, 42.9% participants say the score is 2.00/2.

The participants' knowledge was assessed in which part of the body the nephropathy reaction occurs and during excessive /prolonged sedation contrast and side effects of hypertension which emergency drug is used. 2.9% of participants say yes, 6.7% of participants say, heart, 84.8% of participants say kidney and 5.7% of participants say liver. During excessive /prolonged sedation contrast and side effects of hypertension, the participants stated that 16.2% say Cefixime drug is given, 52 24.8% say Flumazenil drug is given, 36.2% say Naproxen drug is given, 22.9% say Tadalafil drug is given [26].



Conflict of interest: None.

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Tables and Figures

Table no. 1. Shows the gender of the participants.

		Number of Participants	Percent	Valid Percent	Cumulative Percent
Gender	Female	68	32.4	32.4	32.4
	Male	142	67.6	67.6	100.0
	Total	210	100.0	100.0	

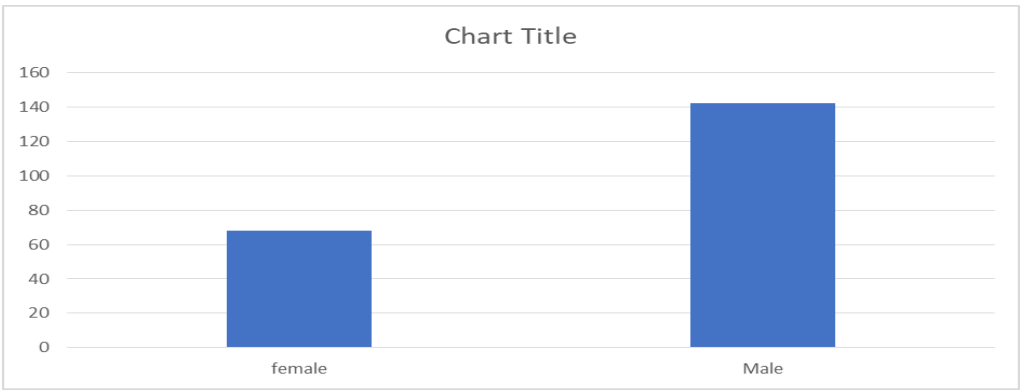


Figure 1. Shows the gender of the participants.



Table no. 2. Shows the age group of the participants.

		Number of Participants	Percent	Valid Percent	Cumulative Percent
Age	20 years to 25 years	136	64.8	64.8	64.8
	25 years to 30 years	54	25.7	25.7	90.5
	30 years to 35 years	12	5.7	5.7	96.2
	35 years to 40 years	8	3.8	3.8	100.0
	Total	210	100.0	100.0	

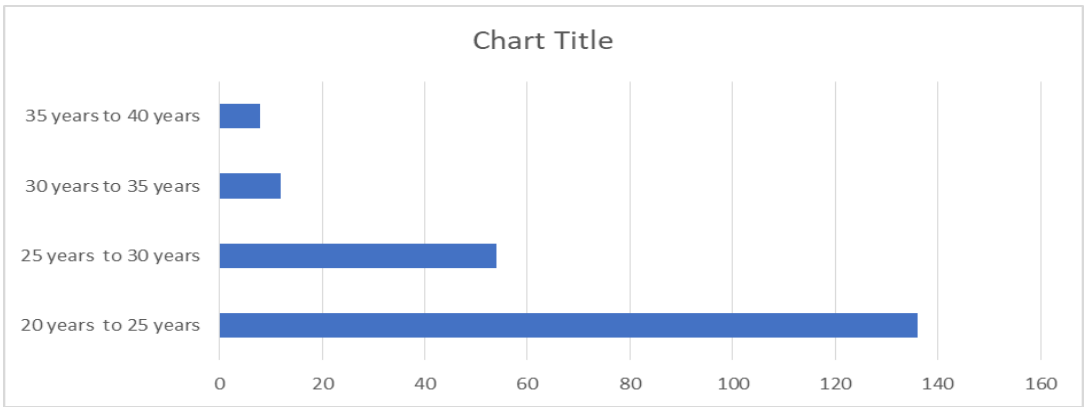


Figure 2. Shows the age group of the participants.

Table no. 3. Shows the qualification of the participants.

		Number of Participants	Percent	Valid Percent	Cumulative Percent
Qualification	Bachelor	144	68.6	68.6	68.6
	Diploma	21	10.0	10.0	78.6
	Doctorate	5	2.4	2.4	81.0
	Masters	40	19.0	19.0	100.0
	Total	210	100.0	100.0	

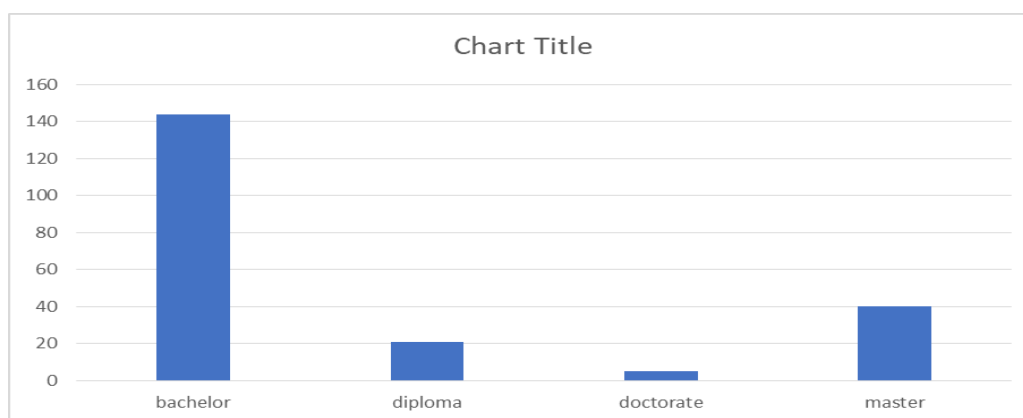


Figure 3. Shows the qualification of the participants.

Table no. 4. Shows the knowledge regarding the anaphylactic reaction.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Yes/No	No	26	12.4	12.4	12.4
	Yes	184	87.6	87.6	100.0
	Total	210	100.0	100.0	

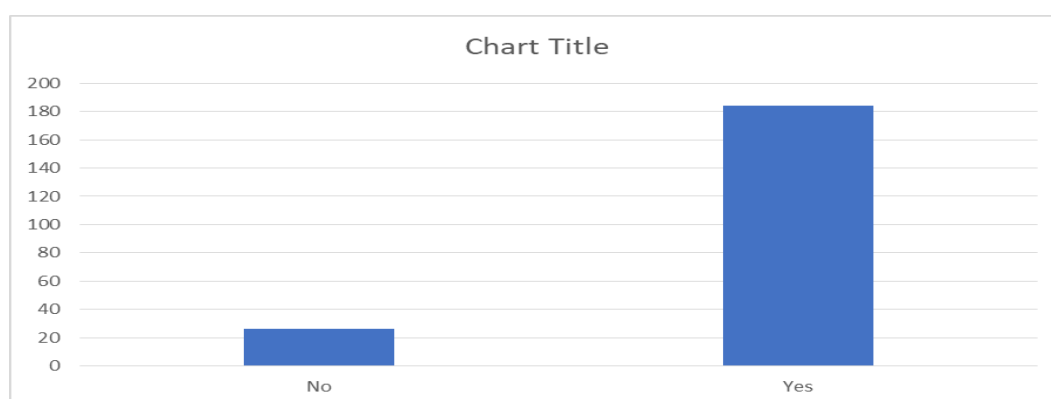


Figure 4. Shows the knowledge regarding the anaphylactic reaction

Table no. 5. Shows how many types of anaphylactic reactions are there.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Type	2	39	18.6	18.6	18.6
	3	43	20.5	20.5	39.0



	4	120	57.1	57.1	96.2
	6	8	3.8	3.8	100.0
	Total	210	100.0	100.0	

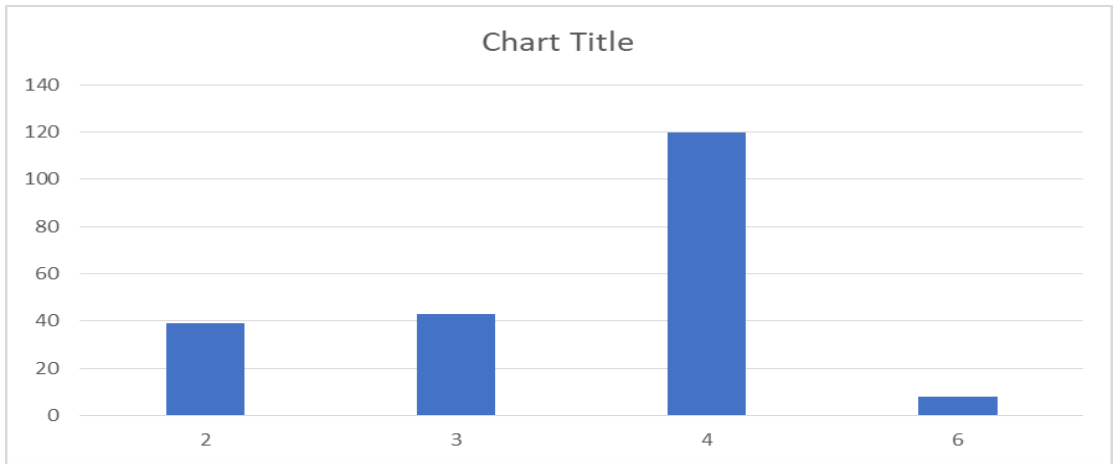


Figure 5. Shows how many types of anaphylactic reactions are there.

Table no. 6. Shows what mild hyper reaction from contrast is.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Reactions	Anemia	17	8.1	8.1	8.1
	Bone cancer	12	5.7	5.7	13.8
	Mild Bronchospasm	104	49.5	49.5	63.3
	Pain	77	36.7	36.7	100.0
	Total	210	100.0	100.0	

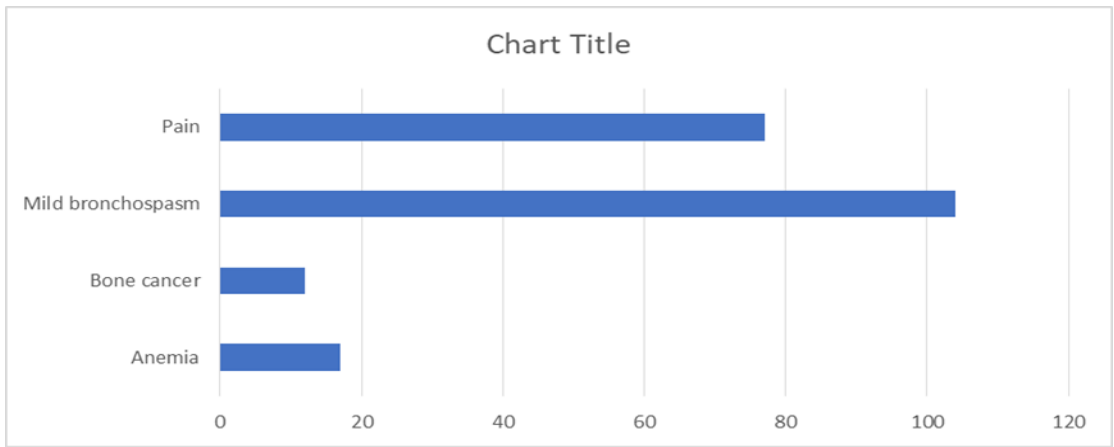


Figure 6. Shows what mild hyper reactions from contrast are.

Table no. 7. Shows which type of anaphylactic reaction is nausea.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Reaction	Mild	154	73.3	73.3	73.3
	Moderate	32	15.2	15.2	88.6
	Severe	22	10.5	10.5	99.0
	Very severe	2	1.0	1.0	100.0
	Total	210	100.0	100.0	

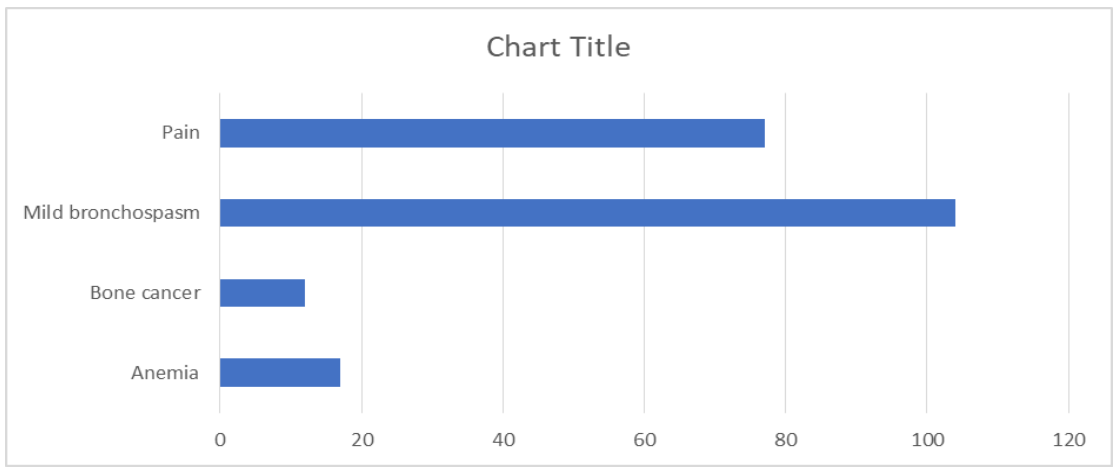
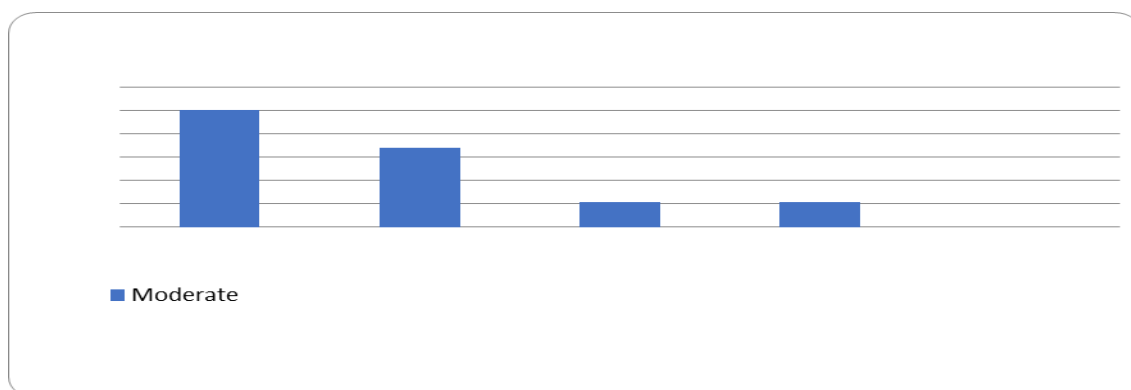


Figure 7. Shows which type of anaphylactic reaction is nausea.

**Table no. 8.** Shows which type of anaphylactic reaction is vomiting.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Reaction	mild	100	47.7	47.7	47.7
	Moderate	68	32.4	32.4	80.0
	Severe	21	10.0	10.0	90.0
	Very severe	21	10.0	10.0	100.0
	Total	210	100.0	100.0	

**Figure 8.** Shows which type of anaphylactic reaction is vomiting.**Table no. 9.** Shows which of the following drugs is used in anesthetic to promote loss of feeling/sensation.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Drug	Albendazole	35	16.7	16.7	16.7
	Dexona	69	32.9	32.9	49.5
	Ibuprofen	30	14.3	14.3	63.8
	Thiopental sodium	76	36.2	36.2	100.0
	Total	210	100.0	100.0	

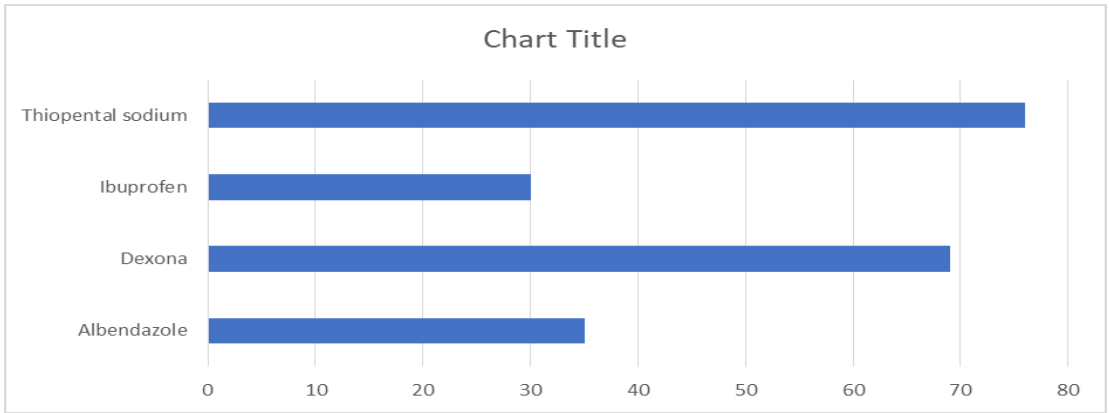


Figure 9. Shows which of the following drug is used in anesthetic to promote loss of feeling/sensation.

Table no. 10. Shows which emergency drug is used to show the contrast media side effect of bronchospasm.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Valid	Acetaminophen	40	19.0	19.0	19.0
	Dexona	66	31.4	31.4	50.5
	Doxycycline	54	25.7	25.7	76.2
	Terbutaline	50	23.8	23.8	100.0
	Total	210	100.0	100.0	

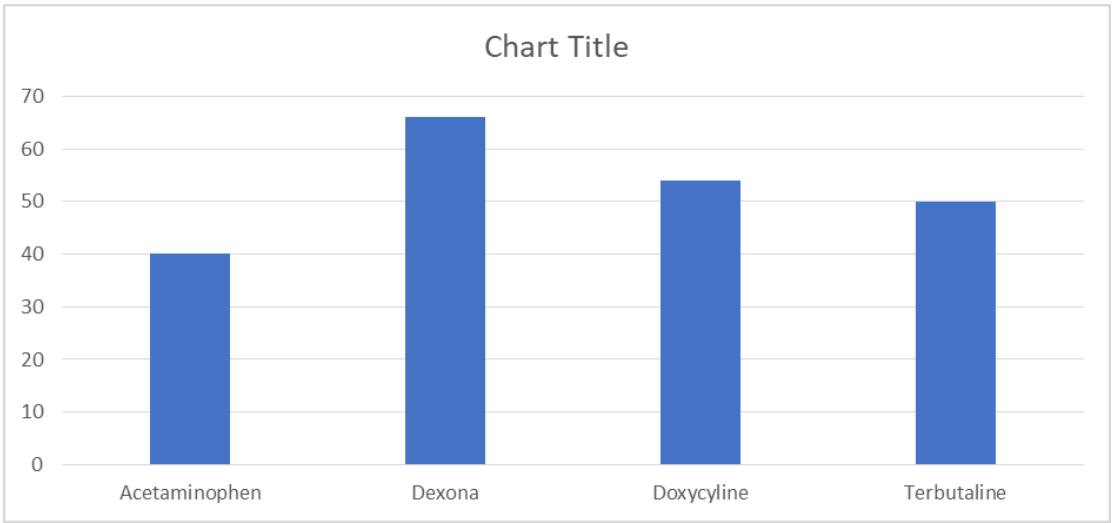


Figure 10. Shows which emergency drug is used to show the contrast media side effect of bronchospasm.

**Table no. 11.** Shows which type of anaphylactic reaction is cardiopulmonary arrest.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Reaction	Mild	16	7.6	7.6	7.6
	Moderate	38	18.1	18.1	25.7
	None of these	21	10.0	10.0	35.7
	Severe	135	64.3	64.3	100.0
	Total	210	100.0	100.0	

Table no. 12. Shows what contrast media side effects need treatment.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Side effect	Mild	33	15.7	15.7	15.7
	Moderate	76	36.2	36.2	51.9
	Severe	70	33.3	33.3	85.2
	very severe	31	14.8	14.8	100.0
	Total	210	100.0	100.0	

Table no. 13 shows the score in which category of contrast media we have to hospitalize the patient.

		Number of participants	Percent	Valid Percent	Cumulative Percent
category of contrast media we have to hospitalize the patient.	Mild	26	12.4	12.4	12.4
	Moderate	47	22.4	22.4	34.8
	Severe	90	42.9	42.9	77.6
	very severe	47	22.4	22.4	100.0
	Total	210	100.0	100.0	



Table no. 14 shows during contrast media side effects of the seizure. Which emergency drug is used?

		Number of participants	Percent	Valid Percent	Cumulative Percent
Drug	Albendazole	18	8.6	8.6	8.6
	Ciprofloxacin	38	18.1	18.1	26.7
	Diazepam	118	56.2	56.2	82.9
	Insulin	36	17.1	17.1	100.0
	Total	210	100.0	100.0	

Table no. 15 Shows which emergency drug is used during excessive /prolonged sedation contrast and the side effects of hypertension.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Drug	Cefixime	34	16.2	16.2	16.2
	Flumazenil	52	24.8	24.8	41.0
	Naproxen	76	36.2	36.2	77.1
	Tadalafil	48	22.9	22.9	100.0
	Total	210	100.0	100.0	

Table no. 16 Shows in which part of the body the nephropathy reaction occurs.

		Number of participants	Percent	Valid Percent	Cumulative Percent
Body part	Eyes	6	2.9	2.9	2.9
	Heart	14	6.7	6.7	9.5
	Kidney	178	84.8	84.8	94.3
	Liver	12	5.7	5.7	100.0
	Total	210	100.0	100.0	