

**ASSESSMENT ON APPROACHES OF RADIOGRAPHERS TO  
IODINATED CONTRAST MEDIA REACTIONS IN  
RADIOGRAPHIC EXAMINATIONS IN BENIN CITY**



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**BENIN CITY**

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**RESEARCH PROJECT**

**SUBMITTED IN PARTIAL FULFILLMENT FOR THE REQUIREMENT  
OF THE AWARD OF BACHELOR DEGREE IN MEDICAL  
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**DEPARTMENT OF MEDICAL RADIOGRAPHY  
SCHOOL OF BASIC MEDICAL SCIENCES  
UNIVERSITY OF BENIN**

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**OCTOBER 2025**

## **CERTIFICATION**

This is to certify that this student **IDIAGHE FRANCES OSAYAMEN** with matriculation number **BMS2005190** has successfully carried out the project on **ASSESSMENT ON APPROACHES OF RADIOGRAPHERS TO IODINATED CONTRAST MEDIA REACTIONS IN BENIN CITY** in partial fulfilment of the requirements for the Bachelor of Science degree in Radiography, School of Basic Medical Sciences, College of Medicine, University of Benin under our supervision.

\_\_\_\_\_  
**RAD. MBIAKU VALENTINE**  
**PROJECT SUPERVISOR**

\_\_\_\_\_  
**DATE**

\_\_\_\_\_  
**MRS F.O. IGBINEDION**  
**Ag. HEAD OF DEPARTMENT**

\_\_\_\_\_  
**DATE**

\_\_\_\_\_  
**EXTERNAL EXAMINER**

\_\_\_\_\_  
**DATE**

## **DEDICATION**

To the Almighty God, whose grace, wisdom, and strength have been my constant guide throughout this journey.

I also dedicate this work to my beloved parents and my siblings whose love, sacrifices, and unwavering support have been my greatest motivation. Your faith in me has given me the strength to persevere.

This accomplishment is a reflection of all you have poured into me.

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## **ABSTRACT**

This study helped on the Assessment on approaches of radiographers to contrast media reactions and also in management of these reactions. The research aimed to explore the diverse perspectives and rich experiences setting aside all pre-conceived notions thus evaluating radiographers in their response, recognition and effective management of hypersensitive reactions associated with contrast media imaging. A qualitative research method was used, utilizing semi-structured interviews and meetings to gather data from a sample of 50 participants. These participants were selected through purposive sampling to ensure and cover a wide range of clinical expertise and experiences. Thematic analysis from data analysis was implemented, where interview was systematically transcribed, coded, categorized and interpreted to identify recurring themes. The study successfully identified factors which influences radiographer's management and also highlighted the importance of some factors such as ongoing education. The study also suggests the need for recommendations in optimizing radiographer's practices to improve patient safety.

Key components: Radiographers, contrast media, contrast media reactions

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the Study

The concept of contrast is the building block of imaging. Radiographic contrast is defined as the degree of blackness in a radiographic image. It helps in identifying and distinguishing adjacent structures in a radiographic image. It is dependent on factors such as the X-ray beam, image receptor, scatter radiation and mostly on subject contrast, as it takes into account density and atomic number of these tissue (Bushberg et. al., 2017) thus possessing its attenuating ability by the particular anatomy in view leading to tissues with higher atomic number absorbing more X-rays such as bones and lower atomic number absorbing less X-rays such as air.

While some anatomical structures have inherent contrast that makes them visualized clearly such as bones as earlier stated, others have naturally poor delineation such as blood vessels. Radiographs easily define bones, muscles and fat, but identification of a blockage in the ureters leading to the affected kidney's hydronephrosis using a plain X-ray is quite limited. So to increase the contrasts of these very similar tissues, an agent is introduced to either change the appearance of the target tissue, the background tissue or both, thus maximizing inherent contrast on target anatomical structures. The material added to delineate or better discern these subtle findings when studies are done covering the same anatomical structures is called Contrast media (Alkhalifa et al., 2019).

Contrast media examinations were brought in due to limitations in visualising soft tissues. It dates back to late 19<sup>th</sup> century when the first X-ray image was produced by the Father of Radiography, Wilhelm Conrad Roentgen in 1895 and was used in specialised procedures such as angiography in

1920 and has been revolutionized for modern day use in various modalities. Various types of contrast media are used in medical imaging such as computed tomography and magnetic resonance imaging additionally other less commonly utilized contrast media such as carbon dioxide (CO<sub>2</sub>) can be used in fluoroscopy. A contrast media administration can take various routes, some of which and corresponding examples are; intravenous (intravenous urography for the urinary system for example), oral (barium swallow to visualize the alimentary tract), intra-arterially for angiography (visualization of vessels), rectal (barium enema to visualise the alimentary tract), intrathecal (injected in the subarachnoid space), intra-ductal (saliography), intra-articular (into the joint spaces). This study is limited to iodinated contrast media.

As contrast media have evolved and becoming an important tool in diagnostic medical imaging, however, these procedures still comes with risk and they are termed Contrast Media Reactions (Shehadi & Toniolo, 2016). They are categorised; mild reactions, moderate reactions and severe reactions.

Factors that initiate contrast media reactions include renal failure or compromised renal function impairs the patient's ability to eliminate the contrast medium and may result in a toxic response. Managing contrast reactions is critical as contrast reactions can be life-threatening and involves approaches ranging from observations to mild reactions to emergency responses in severe reactions. As radiographers, we often note the first signs of contrast media reactions, our ability to cope with such emergencies depends on your recognition of the symptoms and your knowledge of the actions and treatment to follow.

This study aims to explore the knowledge, alertness, preparedness and response strategies of radiographers who face these reactions when performing radiographic examinations.

## **1.2 Statement of Problem**

The introduction of contrast media has brought in the enhancement of visualization of anatomical structures to the world of radiography. But just as advancements have been made, so also reactions are being encountered. This raises concerns about radiographers' preparedness in averting or managing a reaction. Thus, there is a risk that as future healthcare professionals, we may be unequipped to detect and effectively manage contrast media reactions.

Therefore, this study helps to access the radiographer approaches to contrast media reactions in Benin city. These findings will help in gaining knowledge, identifying existing gaps and providing educational insights and strategies so as to strengthen our understanding of contrast media reactions.

## **1.3 Research Question**

This study aims to answer these important questions;

1. What are the approaches radiographers use when contrast media reactions in radiographic examinations arise?
2. How effective are these approaches in ensuring patient health and safety are paramount?

## **1.4 Hypotheses**

The following hypotheses are;

H<sub>0</sub>: There is no significant differences in the approaches of radiographers to contrast media reactions.

H<sub>1</sub>: There is a significant difference in the approaches of radiographers to contrast media reactions

## **1.5 Aim of the Study**

The primary aim of this study is to access and evaluate the approaches of radiographers to contrast media reactions during radiographic examinations.

## **1.6 Objectives of the Study**

1. Access knowledge radiographers has regards contrast media reactions.
2. Identify practices by radiographers in management of contrast media reactions.
3. Evaluate the effectiveness of formal training for radiographers in handling contrast media reactions.

## **1.7 Significance of the Study**

The study will help radiographers in gaining practical insights and in identification and highlighting of protocols that needs more improvement thus strengthening the roles they play in contrast media reactions management and enhancing effective measures to ensure patient's safety and overall care.

## **1.8 Scope of the Study**

The study will focus on radiographers working in the hospital and diagnostic centers which are the public or private sectors who uses contrast media for radiographic procedures. It will shed light on the various types of reactions, ranging from mild to severe reactions and also its approaches and management.

## **1.9 Operational Definition of Terms**

**Contrast Media:** Radiopharmaceutical substances that are administered to the patient to help enhance anatomical structures

**Radiographer:** A healthcare professional trained in the dispensing of ionizing waves to perform radiographic imaging examinations and special procedures.

**Contrast media reactions:** The undesirable side effects experienced by a patient in response to the contrast media used for the radiographic examination.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Conceptual Review

##### 2.1.1 Understanding Iodinated Contrast Media

Most organs and blood vessels have x-ray absorption characteristics which are very similar to those of the surrounding soft tissues (Jonathan et al., 2012). This causes their radiographic images to be only faintly distinguishable, if visible at all. With an atomic number of 53 and a mass number of 127, iodine is a heavy element compared to the composition of the body and is of particular advantage as a contrast medium agent because its K-shell binding energy is 33.2keV, which is similar to the average energy of x-ray used in diagnostic radiography of 1 -0.5A° (Jonathan et al., 2012).

Iodine compounds, therefore, absorb radiation to a greater degree than blood or soft tissues, causing any organ or blood vessel containing the contrast agent to be easily delineated and stand out by appearing white or much lighter than the surrounding tissues being imaged.

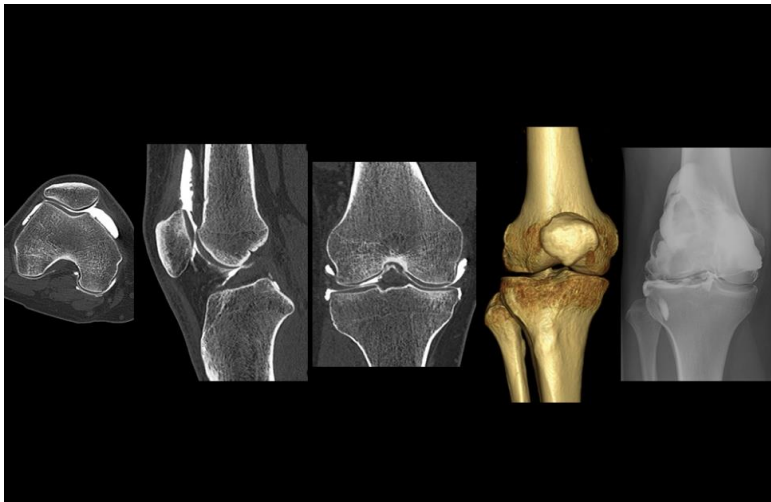


**FIG 2.1:** Normal abdomen anatomy without contrast administration ( Jones J, 2015)



**FIG 2.2:** Image delineating the kidneys, ureters and bladder after iodinated contrast administration

(Niknejad M, 2020)



**FIG 2.3;** Image showing a knee arthrogram using iodinated contrast medium (Micheau & Hoa,

2016)



**FIG 2.4:** This shows an image of the iodinated contrast media agents.

These are contrast media suitable for intrathecal, intra-arterial and mostly intravascular injections and contains varying degree of iodine concentration which is a chemical modification of 2,4,6-triiodinated benzene ring from 2,4,6-triiodobenzoic acid by introducing iodine atoms at the 2, 4 and 6 in the 1 to 6 benzoic atoms in the benzene ring. Thus being the best element used as it contains 3 characteristics; firm binding to the benzene molecule, high contrast density and low toxicity.

The term ‘osmolality’ refers to the number of particles in solution per kilogram of water. The osmolality of human blood is about 300 milliosmoles per kilogram (mOsm/kg), whereas the osmolality of water-soluble contrast media ranges from 300 mOsm/kg to more than 1000 mOsm/kg (Glyn et al., 2022). Osmolality plays a key role in development of contrast media reactions. Injecting an iodinated solution that exceeds the osmolality of human blood, cerebrospinal fluid or plasma (termed a hyperosmolar solution) results in alteration of the osmotic pressure and results to cell shrinkage in trying to reach homeostasis (Rasouli 2017). The contrast medium other terms such as toxicity and viscosity should match with the radiographic examination that is to be done. Liquids with a high viscosity are described as ‘thick’ or ‘sticky’ while those

with a low viscosity may be thought of as “thin” or “watery.” Agents with high iodine concentrations tend to be more viscous and is directly affected by temperature which ultimately affect the injection pressure (Kok et al., 2014). This characteristic is an important consideration in determining the flow rate, injection time, and appropriate needle or cannula size as 18, 20 and 22 gauge is the most preferred for power injections with flowrates of 1-9mls and no rupture of the cannulas used (Schwab et.al, 2019). In relation to the examinations done, a low-osmolar contrast agent is usually preferred because its nonionic and its osmolality is almost equal to that of the blood (iso-osmolar), examples are iopamidol and iohexol. They are less toxic and less likely to stimulate an anaphylactic or allergic response thus making it more comfortable for the patient producing less heat and discomfort (Kawada 2016). They are also desirable for intravenous urography examinations as iohexol or iodixanol is often the choice contrast medium for patients that experience reduced renal function (Golman & Almen 2016). Previously it was high osmolar contrast agents that was used which places the patients at greater risks especially those that had a previous allergy.

These effects are discussed in a later section of this chapter.

### **2.1.2 Types of Contrast Reactions**

The Royal Australian and New Zealand College of Radiologists, its staff, Fellows, members and other individuals involved in the administration of iodinated contrast media to patients undergoing medical imaging procedures, it set out its contrast reactions as;

**Mild reactions;** which includes flushing, nausea, pruritus, vomiting, headache and mild urticarial seen. They are usually self-limited and resolve without specific treatment.

**Moderate reactions;** which are severe vomiting, marked urticarial seen, bronchospasm or facial/laryngeal oedema.

**Severe reactions;** which include signs of definite hypovolemic shock, respiratory arrest, cardiac arrest and convulsions.

### **2.1.3 Causes and Mechanism of Contrast reactions**

The pathogenesis of contrast media reactions is unknown, and various mechanisms may be associated with different clinical features. Radiocontrast media infusions can cause rises in plasma histamine or create enzyme induction through anaphylactoid or idiosyncratic causes (Almen 2016) or cause disruptions to blood homeostasis or disrupt the electrons supporting the nervous, urinary and cardiac systems through nonanaphylactoid or physiochemotoxic causes (Katzberg 2016).

### **2.1.4 Risk Factors for Contrast Reactions**

Osmolality affects the body as a result of the tissue response to osmotic pressure. Because water passes through cell membranes in the direction of the highest particle concentration by a term described as osmosis, media with a higher osmolality tend to cause dehydration of blood cells and surrounding tissues leading to shrinkage of the affected cells (Rasouli et al., 2017). Subsequent circulation causes a reversal of this process, changing the hemo-dynamics and blood flow of the red blood cells and capillary lining. These changes may produce adverse effects on pulmonary artery pressure, blood volume, and cardiac output. Ionization also affects toxicity and is a factor to be considered when using ionic media (Wang et al., 2017). The central nervous system is sensitive to increased levels of ions in the blood, important electrochemical ions such as sodium ( $\text{Na}^+$ ) and potassium ( $\text{K}^+$ ), which may interfere with the normal electrical activity of the body and results in risk that includes the possibility of seizures and cardiac dysfunction. Histamine is an organic nitrogen compound that serves as a neurotransmitter, it triggers immune responses and allergic reactions. When histamine is released in response to a contrast injection, it causes allergic or anaphylactic-like responses (Laroche 2017) which are ultimately a central nervous system

response. Renal failure or compromised renal function impairs the patient's ability to eliminate the contrast medium and may result in a toxic response (Heyman et al. 2013). Patients with diabetes must be identified because this disease predisposes the patient to renal complications. It is especially important to be alert to the possibility that diabetic patients may be taking medications such as Glucophage, which is prescribed to manage an excessively raised blood sugar level-hyperglycaemia because it contains metformin hydrochloride. With inadequate kidney function, metformin could build to dangerous levels in the blood, causing lactic acidosis (Rasuli & Hammond, 2016) and potentially change the blood pH thus diabetic patients may suffer acute renal failure as a result of the contrast medium.

### **2.1.5 Management of Contrast Reactions**

Managing contrast reactions is critical as contrast reactions can be life-threatening and involves approaches ranging from observations (Thomsen et al., 2017) in mild reactions to emergency responses in severe reactions. As radiographers, we often note the first signs of contrast media reactions, our ability to cope with such emergencies depends on your recognition of the symptoms and your knowledge of the actions and treatment to follow. The table below should serve as a guideline on how to acute ranging from acute to severe complications.

Reaction Type, Signs and Symptoms, Response

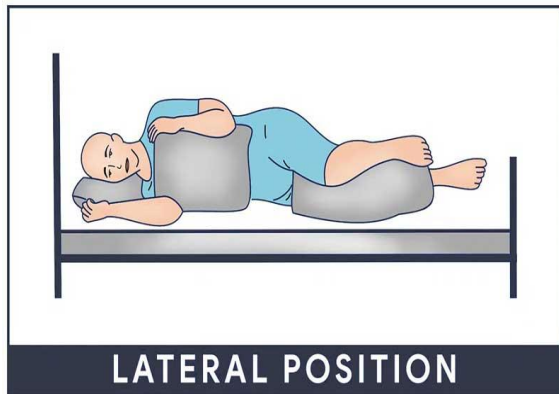
Mild reaction; Feeling of warmth, flushing, metallic taste, nausea, vomiting, coughing

No treatment necessary; symptoms resolve rapidly.

Prevent aspiration of emesis if patient vomits.

Moderate reaction; Erythema, urticarial, bronchospasm, vasovagal reaction, vasodilation, diaphoresis, hypotension, bradycardia

Notify physician; prepare antihistamine or epinephrine if ordered. and place patient in dorsal recumbent position with feet elevated 20 degrees; elevate head slightly if breathing is a problem; prepare intravenous fluids or atropine if ordered.

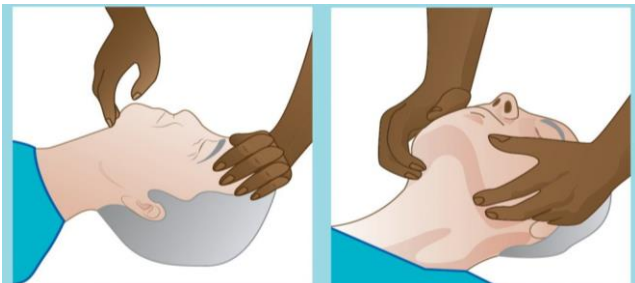


**FIG2.5:** Image showing the patient turned into a lateral position to prevent aspiration of the contrast media.

Severe reaction; anaphylactic shock, respiratory or cardiac arrest, seizures, hypotension.

Onset characterized by warmth, tingling, itching palms, throat constriction, feeling of doom, followed by expiratory wheeze and laryngeal and bronchial edema.

Maintain airway and call a code; treat as for shock, respiratory or cardiac arrest, as symptoms require.



**FIG2.6:** Image shows maintaining airway by lifting chin up and preventing the tongue from falling back to the throat.



**FIG2.7;** Image showing an emergency cart containing epinephrine, defibrillator and fluids.

### **2.1.6 Education, training and quality assurance**

Educational courses on Basic Life Support (BSL), Advanced Cardiac Life Support (ACLS) which teaches us techniques such as cardiopulmonary resuscitation (CPR), airway management and management of critical emergencies such as contrast media reactions. Regular updates from professional bodies such as the Radiographers Registration Board of Nigeria, Association of Radiographers of Nigeria on their guidelines on how to effectively manage a contrast media reactions and even affiliates with international bodies such as American College of Radiology to build a dynamic healthcare relationship and to continue being abreast if any of these guidelines should change. Continuous Program Development (CPD) courses should be provided on contrast media safety and emergency protocols, hands-on drills and simulations should be created to practice effective management therefore enhancing our skills in this area and ensuring that radiographers are well prepared to handle any adverse reactions and provide the appropriate care.

### **2.2 Empirical Review**

Studies have shown that administration of contrast media ranges from minor physiological disturbances as minor reactions to severe and life-threatening reactions. An instance is seen by Sodagarfi et al. who conducted a study and reported that a number of 302,858 contrast injections

were given, the incidences of mild, moderate, and severe reactions seen were approximately 0.44%, 0.04%, and 0.006%, respectively.

Another observational study was conducted in India and reported that in 800 patients were seen allergic reactions (1.4%), and that all reactions occurred within 30 minutes of administration. Because hypersensitivity reactions to contrast media are infrequent, healthcare professionals working in imaging and radiology departments have limited experience of handling these situations.

Another study by Katayama, et al, 1990 reported a prevalence rate of 0.2 to 12.7% depending on the type and nature of the contrast medium used. The type of contrast media used may be ionic or non-ionic, with nature depending on factors such as osmolality or ionisation. Some radiographic examinations cannot use ionic contrast media due to the severity of adverse reactions and was confirmed through a study done by Meth & Maibach, 2006 and stated examples such as myelography, and angiographic or intra-arterial radiological procedures. In conjunction, Katayama et al, 1990 previous and further researches has shown that the use of ionic high osmolality contrast media has been associated with higher incidence of contrast media reactions in 5 to 15% among those administered with that particular media. For non-ionic contrast media, Cochran et al, 2001 undertook a study and reported an overall incidence of 0.2% contrast media reactions among a patient group administered with non-ionic contrast media in one institution which was far less to the reactions seen to ionic contrast media in another institution. A corroborative study was undertaken by Wang et al, 2008 and reported an incidence of 0.6% upon a review of 84,925 patients who received Iohexol or Iopromide, all of which are non ionic contrast media.

Studies were done in how radiographers handle contrast media reactions, using confidence as a criteria 292 radiographers participated in the survey. 72% of the respondents answered in the

middle of the four-point scales taking that feel confident in handling contrast media reactions. A study conducted by Trygg et al., 2013 shows 65% radiographers in Sweden answered that they did not have routines for training regularly regarding hypersensitivity reaction. Another study was done in Denmark by Bohlers et. al, 2025 using 205 radiographers. 195 have witnessed contrast media reactions with 188 experiencing minor reactions and 91 experiencing severe reactions. A statement of “feeling confident in handling contrast media reactions” was met with 38% strongly agreed, 39% agreed, 6% strongly disagreed and 18% disagreed. 144 wished to be more competent and confident in handling contrast media reactions, 99 believed that protocols could be optimized for competencies and 111 provided suggestions for continuous development.

A corroborative study was done by Bjällmark et. al, 2023, 90% reported having observed a patient experiencing severe reactions to contrast media, while 10% had not experienced it thus there was a correlation between years working as a radiographer and experiencing severity to contrast media reactions.

### **2.2.1 The Radiographer’s Responsibility**

Because procedures involving intravenous, intra-arterial, or any route administration of iodine contrast clearly involve risk, an informed consent is usually required, and a careful history is essential. Empirical studies have consistently highlighted the importance of accurately taking patients history. Patients may have allergic reactions to contrast agents because of a sensitivity to iodine or some other component of the contrast medium. As stated earlier, compromised renal function the patient’s ability to eliminate the contrast medium and may result in a toxic response so as a pre-examination to confirm the health status, radiographers must check the blood chemistry section of a patient’s chart to ensure that the electrolyte, urea nitrogen and creatinine levels (E/U/Cr) and estimate Glomerular filtration rate (eGFR) are within normal limits. A key institution such as The National Kidney Disease Education (NKDEP) through the National Kidney

Foundation (NKF) in advocating the normal ranges for adults is considered to be approximately 6 to 20 mg/dl for E/U and 0.6 to 1.5 mg/dl for creatinine and Creatinine levels of 2.0 mg/dl or greater indicates an abnormal range in which may be a contraindication for the administration of iodinated contrast agents (Pagana et. al, 2019), thus averting the possibility of nephrotoxicity. Other patient's history factors to take into account includes; History of heart disease or hypertension, if iodine contrast studies within the past 48 hours and If yes, check to determine when, which agent, concentration, and dose, any history of allergy, history of asthma, previous allergic reaction to contrast medium and If yes, what agent and what reaction? And lastly current medications if its antihypertensive or antidiabetic.

### **2.2.2 Prevention and Minimization of Reactions**

Evidence has shown that because most allergic responses occur within a very short time after injection, considering an intravenous contrast medium as an example, it can be administered slowly by means of a diluted, high-volume IV infusion, or in the form of a bolus injection. A bolus refers to a substantial IV dose delivered rapidly either using a syringe attached to a cannula or butterfly set. The contrast enhancement for CT scans may involve a bolus, an infusion, or both. Pressure injectors can be programmed to supply a rapid bolus at first, followed by a slower infusion of the remaining contrast, a minute amount of the contrast medium may be injected intravenously, followed by a pause during which the patient is carefully observed has helped to reduce immediate allergic reactions as current rates of acute reactions have been reported to be 0.2% to 0.7% (Li X et. al)

If no symptoms are noted, the injection is then continued.

Studies has also shown the importance of vital signs which are four core signs; body temperature, pulse rate, blood pressure and respiratory rate. Monitoring these signs are critical in helping to

predict cardiac arrest and prevent death within 48 hours or during and after contrast media administration (Rothschild et al. 2018).

### **2.2.3 Empirical summary**

As the eye of medicine and the first line of contact to our patients, radiographers are to be prepared to recognize changes even subtle ones as often times they get to first see these during contrast administration to patients before the radiologist or attending physician. Contrast reaction management includes not only knowing the different types of reactions, signs and symptoms but also knowing the appropriate emergency procedures to follow. Documenting the patient's reaction to these contrast agents is also a form of safety protocols radiographers need to do.

Pre-procedural steps include assessment of the patient's medical history including allergies, renal function tests, medications which are either anti-hypertensive or diabetic medications. As radiographers, ensure informed consent is obtained and patient is properly hydrated, an emergency cart that includes medication for several reactions and ensuring medications are available are also crucial in the radiology department.

Ongoing education and training and simulations are essential to radiographers, as these has been effectively documented in helping radiographers stay up to date with the latest advances in imaging technology and ensures radiographers improve their rapid response, maintain their competence and provide the best possible care to optimize patient safety and outcomes.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Research Settings**

The research was conducted in public hospitals and private diagnostic centers in Benin city, Edo state Nigeria that utilizes contrast media for radiographic procedures.

These settings will provide a diverse range of experiences and practices among radiographers, thus giving room for a comprehensive understanding of their approaches to managing contrast media reactions from medium settings to large settings.

#### **3.2 Study Design**

A qualitative study design method was implemented.

This design is chosen to gather insights into the practices and perceptions of radiographers regarding these reactions.

#### **3.3 Target Population**

The target population includes radiographers working in both public and private medical facilities from July to September 2025. Participants will be selected based on their experience with a focus on those who have been in practice for at least 0 to 2 years to at most 11+ years to ensure they have encountered contrast media reaction scenarios. And also entry-final year students.

#### **3.4 Sampling Techniques**

A stratified random sampling technique was used to ensure representation from different types of healthcare facilities (private vs. public).

#### **3.5 Sample size**

The sample size was determined based on a power analysis, aiming for 50 participants for the interviews to achieve saturation in qualitative data.

Stratified random sampling involves dividing the population into subgroups (strata).

The subgroups are 15 qualified radiographers, 10 newly graduated radiographers and 25 students.

### **3.6 Instrument for Data Collection**

For the qualitative component, semi-structured interviews which includes focus groups and open-ended questions will be conducted using an online platform such as WhatsApp and Zoom and also met on time and place best preferable for the participants. This will allow participants to elaborate on their experiences.

An inductive approach will be used with open ended guidelines such as;

Highest level of academic qualification related to radiography  
Knowledge and awareness of contrast media reactions  
Clinical proficiency in managing contrast media reactions  
Assistance/assisting inter health professionals in contrast media reaction management.

Employment status and whether they solely perform contrast media examinations  
Additional such as confidence level, adverse effects it had on them or desensitisation

### **3.7 Validity of the Instrument**

The validity of the questions was established through my supervisor (a radiographer) expert review and pilot testing with another small group of radiographers. Feedback helped in refining and identifying the questions for clarity and relevance. The interview guide was reviewed by experts in patient safety, public health and radiography.

### **3.8 Reliability of Instrument**

The qualitative interviews were recorded and transcribed verbatim and analysed to identify recurring themes and patterns and inter-rater reliability will be established by having other researchers analyze the data independently. A coefficient value of 0.70 or higher will be considered acceptable.

### **3.9 Method of Data Collection**

Data collection will take place over a three-month period from July to September. Interviews will be conducted either face-to-face or via electronic means such as video calls or audio calls, depending on participant preference. To ensure consistency during each interview, the researcher will undertake time keeping, note takings and question moderation for clarification and understanding.

### **3.10 Method of Data Analysis**

Qualitative data from interviews will be analyzed thematically, extraction of key themes and categories will be conducted independently and collaboratively allowing for the identification of common and generated themes and insights related to radiographers' approaches to contrast media reactions.

### **3.11 Ethical Considerations**

1. **Ethical approval;** This will be gotten from University of Benin Teaching Hospital ethics committee board.
2. **Informed consent;** Participants are given informed consent prior to their participation.
3. **Confidentiality;** All data will be anonymized to protect their identities.
4. The study is solely for academic purposes and will adhere to guidelines regarding the treatment of human subjects, ensuring that participants are treated with respect and dignity throughout the research process.

## CHAPTER FOUR

### DATA PRESENTATIONS, ANALYSIS AND INTERPRETATION

#### 4.1 Presentation of results

A qualitative approach was used to address this study's research objective. Data collection was undertaken using online platforms such as Zoom, WhatsApp calls and in-person meetings to conduct semi-structured interviews with 25 Radiographers practicing in Benin city and focus group with 25 Radiography entry-final year within a timeline of June to September 2025, these participants were chosen to achieve saturation in qualitative data. Interview had durations of 30minutes with them recorded and field notes were taken during the interviews. These quota sampling helped to gain perspectives from both qualified and newly graduated radiographers and also from the students. Qualitative data from this sample of participants enabled the fulfilment of thematic data saturation.

The practicing radiographer's participants were provided with a participant information statement (PIS) before interview were conducted. It included items of information such as ethical approval, informed consent, a formal invitation to participate in the study, its purpose, any possible risks and benefits involved, participants' confidentiality and how participants' information would be used. All participants were asked a central question, "How is your approach to contrast media reactions?" followed by a series of investigative questions based on their responses (Table 4.1). This central question comes in as a broad question which allows participants to create meaning without predefined categories or definitions thus engaging and enabling the development of rich and descriptive narratives.

Table 4.1: Investigative questions used during the interview.

Could you tell me about your professional background?	How long have you done radiographic examinations using contrast media?
Have you witnessed any recent contrast media reactions?	What are the common reactions you encounter?
What training have you received on managing contrast media reactions?	Do you feel confident in your ability to manage contrast media reactions?
How do you use resources like an emergency kit during contrast media reactions?	What other trainings would you like to receive on contrast media management?
Does your hospital department provide protocols on contrast media reactions and management?	Is there a post-reaction debriefing process, what and who does it involve?

*Source; Researcher's questions (2025)*

For this study and interviews, measures of trustworthiness were followed closely and they include: The interviews, the interview notes, and the literature provided triangulation, it's use increased the study's credibility by providing multiple perspectives as to reduce researcher bias. Verbatim quotations were used to support the findings as statements are dependent on researchers' personal interpretation therefore multiple interpretations of the data could be made, for this reason, verbatim quotations are used to add credibility by providing evidence to support statements.

A sufficiently dense description of the setting and participants allowed for comparisons. Making purposive sampling best preferred method as it ensured that the sample included radiographers who could provide insight into the phenomenon under study.

Epoch or bracketing of bias, is the process of setting aside any preconceived ideas, definitions or notions and personal experiences about a research topic. Thus being a vital aspect for the researcher to demonstrate its participants' views rather than impose preconceived notions and even change the participants' views to the researcher.

The interviews were transcribed verbatim and were reread to support the field notes. A six-step thematic analysis process was created and it involved data familiarization, coding, initial theme generation, reviewing themes with the last step of defining and naming themes The data were then coded, and initial themes were generated with subthemes created (Table 4.2).

Table 4.2: Generated themes and subthemes

Main Themes	Subthemes
Educational role	Basic training in school Highest academic qualifications Certification on Basic Life Support and Advanced Cardiac and Life Support
Management role	Recognition and preparedness Procedural knowledge Institutional protocols
Development role	Post-incident review and growth Coping strategies Professional dedication

The number of participants were 50, with 25 radiography students assigned as a focus group, 10 being newly graduated radiographers with 0 to 2 years' experience and 15 being qualified radiographers with 2 to 12 years experiences who has experienced contrast media radiographic examinations. Three themes and related subthemes were generated, as shown above in Table 4.2.

## **Theme 1: Educational role**

The participants had strong support for the suggestion that educational role and further increased professional knowledge is important in recognizing contrast media reactions and also averting them if they eventually become severe reactions thus increasing patient safety and also adding to professional development.

### **Subtheme 1.1: Basic Training in school**

Participants had differing opinions on this.

“In my class, we are not so enlightened on contrast media management.” (p29, entry final year student)

“I may have taken it in the Hospital and Patient care in Radiography, but much attention wasn’t paid to it and most times directed to the nurses to handle reactions.” (p21, entry final year student)

“The hospital department protocols do not allow radiographers manage contrast media reactions, either the radiology nurse or the radiologist attends to the patient as they say we weren’t taught.” (p26, 0-2yrs experience, public)

“Nurses are trained in these techniques as basics, I think there should be something similar for radiographers” (p18, 5yrs experience, private)

### **Subtheme 1.2: Highest qualifications and additional certifications**

“Attaining a Master’s degree do put you on a leverage to recognize and manage contrast media reactions.” (p13, 6yrs experience, private)

“More courses at advanced and specialist level should be provided to radiographers than being seen as the one who pushes the button.” (p32, 8yrs experience, public)

### **Subtheme 1.3: Certifications on Basic life support**

“Radiographers should have extra certifications in Basic Life Support has this has helped in managing contrast media reactions.” (p33, 7yrs experience, private)

“I think having a basic life support knowledge even contributes to overall patient’s safety if any life-threatening actions should occur in the imagining room” (p45, 3yrs experience, private)

## **Theme 2: Management role**

Participants narratives included recognition and preparedness

### **Subtheme 2.1: Recognition and preparedness**

“If you look at your patient but with eyes of special interest, it’s easier to know when there is a contrast reaction from normal conditions.” (p23, 1yr experience, public)

“Patient reactions differs, so as learning from textbook and seeing reactions in real life are different.” (p27, 4yrs experience, private)

“Knowing the basic drugs or medicine sometimes helps to lessen adverse reactions if it ever occurs.” (p30, 7yrs experience, private)

### **Subtheme 2.2: Procedural knowledge**

“In classes, we are taught to always let the patient lie on their lateral side and I’ve seen it work during clinical postings.” (p21, entry final year student)

“Asking for history of allergies is a very good way in averting contrast media reactions and also to come with a kidney function test result.” (p8, 3yrs experience, private)

“I just tell the patient not to eat on the day of the procedure, very easy to avoid reactions.” (p5, 4yrs experience, public)

### **Subtheme 2.3: Institutional protocols**

“There are radiology nurses at my hospital department who are available during contrast media examinations, so if any reactions occur they are the ones in charge.” (p9, 4yrs experience, public)

“In my private sector, it’s not so common for the radiographers to act unless there is an attending doctor on ground.” (p7, 3yrs experience, private)

### **Theme 3: Development role**

Participants indicated that a need for development in contrast media reactions is sacrosanct.

#### **Subtheme 3.1: Post-incident review and growth**

“I and other radiographers used a past experience of managing contrast media reactions for a week CPD that is Continuous Professional Development, weeks later I came across that a reaction during IVU and managed properly” (p6yrs, 3yrs experience, public)

“Seen it during clinical postings and how the reactions were handled, I and other members on the shift met up with the Radiographer and radiology nurse who helped manage the situation and it made me want to go back to reading Hospital and Patient care more.” (p17, entry final year students)

#### **Subtheme 3.2: Coping strategies**

“Before the advent of these new contrast media, I had a bad experience and every time I think of it, it makes me nervous so I would discuss it with a colleague or the doctor with reviews over the cases and facts which makes me confident to carry out the procedure.” (p13, 7yrs experience, private)

#### **Subtheme 3.3: Professional development**

“I think getting certifications like BLS can also help in management.” (p39, entry final year student)

“Navigating through contrast media reaction management has helped me in a good way because I see how a situation can change quickly and how important it is to get skills that can help in the shortest of time to further avert severe reactions.” (p42, 8yrs experience, private)

“I feel very confident and competent handling contrast media reactions as I’ve had many encounters and worked with many inter-professionals, each with their own way of management”

(p50, 9yrs experience, private)

#### **4.2 Discussion of Findings**

This study demonstrated that contrast media reactions, its awareness and management is highly important in the hierarchy of saving lives foremost, gaining additional or professional skills so as to help the situation and also how to collaborate with inter-health personnel such as the radiology nurses. There is also a need to expand on courses such as Hospital and Patient care in Radiography. The need for further education such as acquiring a Masters or Advanced Level of Care Post Graduate Diploma courses was seen in this study and is due to the radiographer’s evolving roles more now as contrast media examinations which are special procedures done in everyday practice, thus maximizing patient care and safety while strengthening professional status. Procedural steps such as taking into account patient’s history to allergies or any medical conditions that is underlying, or a test done to check the kidney’s filtration rate is a crucial clinical expertise in prevention of severe contrast media reactions thus putting patient’s safety first and reduced complications during these contrast media examinations. There was a further strength found in the study that creation of Continuous Programme Development amongst radiographers will significantly reduce their anxiety whenever they are met with contrast media reactions and thus enable and equip them for adequate recognition and management of contrast media reactions.

## **CHAPTER FIVE**

### **CONCLUSION, RECOMMENDATION, LIMITATIONS AND SUGGESTIONS FOR FURTHER STUDIES**

#### **5.1 Conclusion**

This research provided insight into the assessment on the approaches of radiographers to iodinated contrast media. Exploring the lived experiences, statements and examples regards knowledge, attitudes and practices amongst these participants highlighted the importance of having extra certifications past basic school knowledge, importance of continuous professional education, information and training to ensure radiographers are always kept alerted to contrast media and its adverse reactions. It further addresses how adherence to pre-procedural protocols and effective history taking is important key in ensuring that patients are kept first and safe. Furthermore, it establishes the need for inter and intra-professional relationships as learning from various health care providers will strengthen the radiographers' confidence in effective handling of contrast media reactions, thus optimizing patient safety and ultimately the use of contrast media in radiographic imaging.

#### **5.2 Recommendations**

There should be a need for an advanced level education on patient safety and protocols see in this study as the development of the radiographers utilizing contrast media radiographic examinations increases. There is also the need to strengthen the profession status than just to be seen as “pressing the button”. This will increase role extensions, increased quality of work and patient safety. There also should be inter-professional collaboration as clinical expertise can be shared in strengthening professional skills and ensuring patient safety is kept of high importance.

### **5.3 Limitation**

The limitations in the research acknowledges that variability and bias cannot be controlled which can limit the accuracy, feasibility and generalisability of the study findings. However, this was closely controlled through the study design taking into account participant selection, data collection and data analysis process. Another way to mitigate this is the lead researcher did not have any personal or professional associations with the participants during the selection process therefore minimising any potential for bias.

### **5.4 Suggestions for Further Studies**

Research on nursing courses such as Hospital Practice and Patient care relating to Radiography for management of contrast media reactions should be followed closely. And also contrast media management journals should be reviewed and revised.

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**APPENDIX I**

**Ethical approval**

Ethical approval was obtained from the ethic board of the University of Benin teaching hospital

**HEALTH RESEARCH ETHICS COMMITTEE (HREC)**  
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Registration Number: NHREC-UBTH-HREC/24/12/2022B

**PROTOCOL NUMBER:** ADM/E 22/A/VOL.VII/2025/249

**PROPOSAL TITLE:** "ASSESSMENT ON APPROACHES OF RADIOGRAPHER TO IODINATED CONTRAST MEDIA REACTIONS IN RADIOGRAPHIC EXAMINATIONS IN BENIN CITY"

**PRINCIPAL INVESTIGATOR(S):** IDIAGHE FRANCES OSAYAMEN

**DEPARTMENT/INSTITUTION:** DEPARTMENT OF RADIOGRAPHY, SCHOOL OF BASIC MEDICAL SCIENCES UNIVERSITY OF BENIN, BENIN CITY, EDO STATE

**DATE CONSIDERED:** SEPTEMBER 30<sup>th</sup>, 2025

**DECISION OF THE COMMITTEE:** APPROVED

*THIS APPROVAL DATES 30/9/2025 TO 29/9/2026. IF THERE IS DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY*

**REMARK:**

**CHAIRMAN:** PROF. (MRS) A.N. OFILI

**SUPERVISOR (S):** MR MBIAKU C.V.

**DECLARATION BY INVESTIGATOR(S):**  
**PROTOCOL NUMBER** (please quote in all enquiries)  
Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study. In multiyear research, endeavor to submit your annual re-port to the HREC early in order to obtain renewal of your approval and avoid disruption of your research. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification

**SIGNATURE & DATE:** *Prof. (Mrs) A.N. Ofili* 30/9/2025

Signature & Date.....

**ubthresearchethics@gmail.com** Registration Number: NHREC/24/01/202

## APPENDIX II

### **Informed Consent (participant information statement)**

The informed consent form used is shown below;

**Project title:** Assessment on approaches of radiographers to iodinated contrast media reactions in Benin city.

**Principal investigator:** Idiaghe Frances

**Department:** Radiography and radiation science

#### **Introduction:**

You're invited to participate in this research study. Please carefully read the instructions.

**Procedures:** On agreeing to participate, you will be asked to answer to video or audio calls for oral questionnaire or in-person meetings.

#### **Risks and benefits**

**Risks:** There are minimal risk associated with this study, however questions will be asked regards your experiences and practices but no collection of personal data or identifying information is involved.

**Benefits:** Your participation will help gain insight and improve the understanding of radiographers to manage contrast media reactions which may even contribute to patient safety and care.

**Confidentiality:** All information is strictly kept confidential, your identity and responses are kept anonymous. Data will be safely stored and only the researcher's team will have access to it.

**Voluntary Participation:** Your participation is entirely voluntary and refusal to participate or withdraw from this study is allowed.

#### **Statement of Consent:**

I have read and understood the information provided in the consent form with voluntary participation to achieve this study.

Name of participant:

Signature of researcher:

Date:

Signature of Participant:

Date:

Thank you for your participation.