

## **Assessment of Knowledge and Practice of Justification of Medical Exposure Among Healthcare Practitioners in Asaba Specialist Hospital and Federal Medical Centre, Asaba**

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**Abstract:** Justification of medical exposure is essential for optimizing patient safety by ensuring that the benefits of radiological procedures outweigh the risks. This study assessed the knowledge and practice of justification of medical exposure among medical and dental practitioners in Asaba metropolis. A cross-sectional survey was conducted among 180 healthcare practitioners, comprising 122 (67.8%) males and 58 (32.2%) females. Respondents were selected from two hospitals: Federal Medical Centre Asaba (FMCA) and Asaba Specialist Hospital (ASHA). Data were collected using a structured questionnaire and analyzed using descriptive statistics and correlation analysis. The findings revealed that 84.4% of medical practitioners and 67.6% of dental practitioners had adequate knowledge of justification of medical exposure. However, the practice of justification was poor, with only 10.1% of medical practitioners and 25.4% of dental practitioners adhering to proper justification protocols. A weak correlation ( $r = 0.144$ ,  $p = 0.135$ ) was observed between knowledge and practice among medical practitioners, while a moderate correlation ( $r = 0.403$ ,  $p = 0.000$ ) was found among dental practitioners. Additionally, knowledge of radiation safety and hazards was low, with only 19.3% of medical practitioners and 42.3% of dental practitioners demonstrating adequate awareness. Despite a relatively high level of knowledge of justification principles, the poor adherence to justification protocols highlights a gap between knowledge and practice. The weak correlation between these variables suggests that institutional policies and workload may

influence practitioners' compliance. Targeted interventions, such as integrating radiation safety training into medical curricula, mandatory continuing education, and policy reinforcement in hospitals, are necessary to improve adherence to justification principles and enhance patient safety.

**Keywords:** Justification, Medical Exposure, Radiation Safety, Healthcare Practitioners, Patient Protection

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### **1.0 Introduction**

In some countries, the population dose from medical exposures now rivals that from natural background radiation, making radiation protection for patients a critical concern (Moifo *et al.*, 2014). The two fundamental principles of patient radiation protection are optimization and justification of exposures (Moifo *et al.*, 2014). Studies have estimated that between 20% and 50% of Computed Tomography (CT) scans may not be justified. Additionally, the

knowledge of referring physicians regarding radiation doses in radiological procedures is low, with fewer than one in three receiving training on radiation protection (Moifo *et al.*, 2014). The situation in many developing countries is expected to be even more concerning. In Sub-Saharan Africa, practices related to patient radiation protection are poorly documented due to the absence or weak enforcement of legislative and regulatory frameworks (Moifo *et al.*, 2014).

Research has highlighted significant gaps in the knowledge of medical imaging professionals regarding radiation protection standards and principles. There is also a lack of continuous professional training, inadequate justification of some radiological procedures, and the absence of a "Guide for the Usage of Medical Imaging Procedures" (Moifo *et al.*, 2014). With the increasing exposure of patients to radiation and the complexities surrounding referral processes, clinicians play a critical role in ensuring the appropriate selection of diagnostic investigations and in making informed decisions regarding patient care (Moifo *et al.*, 2014).

Medical imaging plays a vital role in diagnostics and therapeutic examinations, with modalities such as conventional radiography, Computed Tomography (CT), Ultrasonography, Magnetic Resonance Imaging (MRI), and Nuclear Medicine being extensively used (Sukumar, 2013). However, the ionizing radiation used in radiological examinations carries potential risks depending on the dose imparted (Sukumar, 2013). As a fundamental principle of radiation safety, all exposures to ionizing radiation must be clinically justified and kept as low as reasonably achievable (ALARA principle) (Beneyto *et al.*, 2007).

Radiation protection in medicine is governed by the principles of justification, optimization, and dose limitation (Malone *et al.*, 2012). Over the past two decades, significant progress has been made in optimization efforts. However,

less attention has been dedicated to justification (Malone *et al.*, 2012). The responsibility for justification primarily falls on imaging professionals (Moifo *et al.*, 2014). Justification occurs at three levels: assessing the necessity of the radiological procedure, selecting the appropriate radiological technique, and choosing the optimal protocol for individual patients (Moifo *et al.*, 2014). The process involves weighing the expected benefits of exposure against potential radiation risks, not only to individuals but also to society (Ionizing Radiation Medical Exposure Regulation, year; The Royal College of Radiologists, 2015). This assessment must also consider whether alternative techniques with lower or no ionizing radiation could be used instead (Moifo *et al.*, 2014).

Radiographs are indispensable diagnostic tools in dentistry and medical imaging, aiding in disease detection, monitoring progression, and treatment planning. However, they also pose risks associated with ionizing radiation exposure (Radiation Safety in Dentistry, 2014). Justification of medical and dental imaging procedures is essential in ensuring adherence to best practices and minimizing unnecessary exposures (Radiation Safety in Dentistry, 2014). This study aims to assess the knowledge and practice of justification of medical exposures among medical and dental practitioners, thereby promoting awareness and enhancing radiation protection while mitigating risks associated with radiation exposure.

Several studies have examined justification practices in medical imaging. Avadanei *et al.* (2011) found that although the principle of justification is widely recognized, knowledge remains inadequate among practitioners. Justification processes are often undocumented, relying heavily on personal experience rather than standardized guidelines. Education and training programs are necessary to enhance practitioners' understanding of justification for individual medical exposures.



A study by Ighodaro & Igbinedion (2017) on Nigerian doctors' referral practices for radiological imaging revealed poor knowledge of radiation protection, radiation effects, and guideline utilization across medical disciplines. Improving such knowledge is critical for enhancing justification practices and reducing unnecessary radiation exposure. Similarly, Lumbreras *et al.* (2016) emphasized the urgent need to educate clinicians about medical radiation exposure, enabling them to make informed decisions when ordering imaging tests. They highlighted the lack of communication between patients and medical staff regarding radiation exposure, underscoring the need for better clinician awareness and education.

The International Atomic Energy Agency (IAEA) Consultation on Justification of Diagnostic Medical Exposures (Malone *et al.*, 2012) reported that communication and role distribution between referring and radiological medical practitioners require further development. Clinical audit techniques, when combined with new strategies for communicating dose, risk, and benefit, can significantly improve the routine implementation of justification.

Dempsey and McNulty (2010) examined the responsibilities of prescribers in the justification process. They found that awareness and education among physicians are crucial for ensuring their legal responsibilities when prescribing radiological examinations. This would improve the quality of information provided in radiology request forms, preventing unnecessary exposures and optimizing those that are justified. Radiographers and radiologists must verify that the clinical information provided justifies the examination; otherwise, additional steps should be taken before irradiating the patient. Failure to ensure justification contravenes Euratom 97/43, which governs health protection against ionizing radiation in medical exposures.

Mohammad *et al.* (2013) investigated doctors' knowledge of radiation and its effects, reporting a general awareness of radiation hazards but limited knowledge of radiation protection guidelines. Agrawal *et al.* (2015) examined dentists' knowledge and found that awareness of radiation protection was inadequate. They recommended greater emphasis on radiation hazards and protection techniques in undergraduate and postgraduate curricula, as well as continuing education programs (CDEs). Dentists should also adhere to regulatory requirements for dental X-ray equipment and conduct periodic quality assurance tests to maintain high radiographic quality while minimizing exposure risks.

This study aims to evaluate the knowledge and practice of justification of medical exposures among medical and dental practitioners. The findings will help create awareness and promote adherence to radiation protection principles, ultimately minimizing unnecessary radiation exposure and improving patient safety.

## **2.0 Materials and Methods**

### **2.1 Study Area**

This study was conducted as a prospective cross-sectional survey at the Federal Medical Centre Asaba and Asaba Specialist Hospital, both located within the Asaba metropolis.

### **2.2 Source of Data**

Primary data was collected for this study. The primary source consisted of responses obtained from a structured questionnaire completed by medical and dental practitioners at the Federal Medical Centre Asaba and Asaba Specialist Hospital.

#### *Sample Size Determination*

The sample size was calculated using Yaro Yamane's (1967) formula for sample size determination:

$$n = \frac{N}{1 + N(e^2)} \quad (1)$$

where n=sample size, N=Known study



population,  $e =$  Percentage error 0.005. Applying the formula, the appropriate sample size was determined.

### ***Sampling Technique***

A non-probability sampling method was adopted, specifically a convenience sampling technique. Participants were selected based on availability and willingness to participate in the study.

### ***2.3 Data Collection, Organization, and Classification***

Data was collected through the distribution and retrieval of completed questionnaires. The responses were systematically organized and classified for analysis. The dataset was then subjected to descriptive and inferential statistical analysis, including a normality test to determine whether the data followed a normal distribution.

### ***2.4 Data Analysis***

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) Version 23.0. Descriptive and inferential statistics were applied to examine trends, relationships, and significance within the dataset. Additionally, normality tests were conducted to assess the distribution of the collected data.

## ***2.0 Results and Discussion***

A total of 180 questionnaires were administered to medical and dental practitioners in the Asaba metropolis to assess their

knowledge and practice of justification of medical exposure. A response rate of 100% was recorded. Data retrieved was extracted, organized, and presented in Tables and Figures. Quantitative data were analyzed using SPSS version 23.

### ***3.1 Demographic Characteristics of Respondents***

Table 1 presents the demographic distribution of the respondents based on age, gender,

hospital affiliation, and specialization. The results provide insights into the diversity of the study participants, which is crucial in understanding variations in knowledge and practice of justification of medical exposure among different groups. The age distribution of respondents shows that the majority (46.1%) fall within the **26-35 years** age range. This indicates that most of the medical and dental practitioners in the study are relatively young professionals, likely in their early or mid-career stages. The second largest age group is below 25 years (25.6%), suggesting a significant presence of early-career practitioners or interns who may still be in training or newly practising. Those aged 36-45 years makeup 20.0% of the respondents, representing mid-career professionals, while only 8.3% of the respondents are in the 46-55 years category. The low representation of older professionals may be due to the career structure in the medical field, where more senior practitioners may hold administrative roles rather than engage in direct clinical practice.

The study population consists predominantly of male practitioners (67.8%), while female practitioners make up **32.2%**. This gender disparity reflects a common trend observed in many medical institutions, where male practitioners often outnumber females, particularly in some specialized fields. However, the proportion of female respondents is still considerable, indicating growing female participation in the medical and dental professions. This gender distribution may influence perspectives on justification of medical exposure, as previous studies have shown that female practitioners sometimes exhibit greater adherence to safety protocols in radiation-related practices. The distribution of respondents by hospital affiliation indicates that 72.2% of the participants work at the Federal Medical Center Asaba (FMCA), while 27.8% are affiliated with Asaba Specialist Hospital (ASHA).





**Table 1: Demographic Characteristics of Respondents**

S/N	Items	Observation	Frequency	Percentage (%)
1	Age	<25	46	25.6
		26-35	83	46.1
		36-45	36	20.0
		46-55	15	8.3
2	Gender	Male	122	67.8
		Female	58	32.2
3	Hospital	FMCA	130	72.2
		ASHA	50	27.8
4	Specialization	Medical	109	60.6
		Dental	71	39.4

The higher representation of FMCA practitioners suggests that it is the larger facility with more staff and potentially greater exposure to radiological procedures. The difference in hospital size and resources may influence the level of training, awareness, and implementation of justification protocols, as federal institutions often have better access to radiological guidelines and equipment.

In terms of specialization, 60.6% of respondents are medical practitioners, while 39.4% are dental practitioners. This distribution is expected, as medical professionals generally outnumber dental professionals in most healthcare institutions. However, the significant proportion of dental practitioners in the study is important, given their frequent use of radiological procedures such as dental X-rays. The variations in specialisation could affect how justification principles are applied, as medical and dental practitioners may have differing levels of exposure to radiological procedures and associated training in radiation safety.

The demographic characteristics of respondents suggest that the study sample is well-balanced across different age groups and specializations, though with a higher proportion of younger practitioners and male respondents. The dominance of FMCA participants implies that findings may be more reflective of practices in a federal medical

institution compared to a specialist hospital. Additionally, the distribution between medical and dental practitioners ensures that perspectives from both fields are considered in evaluating the knowledge and practice of justification of medical exposure.

### 3.2 Knowledge of Justification of Medical Exposure

Table 2 and Fig. 1 provide an assessment of the respondents' knowledge regarding the justification of medical exposure, a crucial concept in radiation protection that ensures medical imaging procedures are performed only when necessary. The data highlights significant differences in knowledge levels between medical and dental practitioners, which may have implications for clinical practice and patient safety.

**Table 2: Respondents' Knowledge of Justification of Medical Exposure**

Assessment	Medical (%)	Dental (%)
Adequate	84.4	67.6
Inadequate	15.6	32.4
Total	100	100

#### 3.2.1 Knowledge of Justification of Medical Exposure among Medical Practitioners

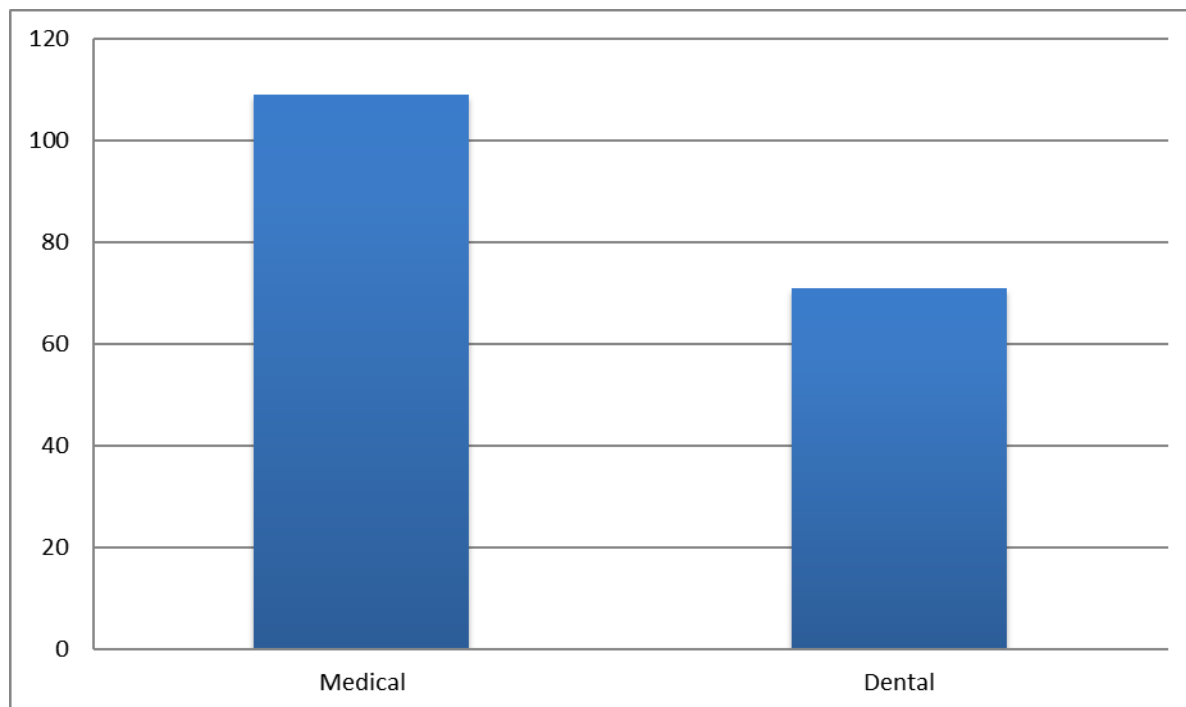
The results indicate that 84.4% of medical practitioners had adequate knowledge of the justification principle, while 15.6% had inadequate knowledge. This high percentage of



medical practitioners with adequate knowledge suggests that most physicians understand the importance of ensuring that imaging procedures are justified, likely due to their frequent involvement in patient diagnosis and exposure to radiation safety guidelines.

Several factors may contribute to the high knowledge level among medical practitioners, including greater exposure to radiation protection training, professional experience, and adherence to international radiation safety

protocols. Studies have shown that continuous education in radiology and regulatory compliance significantly improves knowledge of radiation protection among medical professionals (O'Sullivan *et al.*, 2019). However, the 15.6% of medical practitioners with inadequate knowledge raises concerns, as any gaps in understanding may lead to unnecessary imaging procedures and increased radiation exposure for patients.



**Fig. 1: Respondents' Distribution Based on Specialization**

### 3.2.2 Knowledge of Justification of Medical Exposure among Dental Practitioners

In contrast, 67.6% of dental practitioners demonstrated adequate knowledge, while 32.4% had inadequate knowledge. This lower percentage of adequate knowledge compared to medical practitioners suggests that dental professionals may have less exposure to formal radiation protection training or that justification principles are less emphasized in dental curricula. The relatively higher percentage of dental practitioners with inadequate knowledge is concerning, as dental

radiography is a common diagnostic tool, and improper justification could lead to

unnecessary radiation exposure, particularly for pediatric and geriatric patients.

Previous studies have reported similar findings, where dental professionals often exhibit lower levels of radiation protection knowledge compared to medical practitioners (Hagi & Khafaji, 2020). This discrepancy is often attributed to differences in curriculum emphasis and the frequency with which



practitioners engage in radiological procedures. While medical professionals frequently interact with radiologists and radiation safety officers, dentists may rely more on self-guided learning or limited formal training in radiation protection (Uffmann & Schaefer-Prokop, 2021).

The findings align with previous research indicating that medical professionals generally have higher levels of knowledge regarding radiation justification compared to dental professionals. For instance, a study by Malone *et al.* (2018) found that over 80% of physicians demonstrated a strong understanding of radiation justification, whereas dental professionals scored significantly lower. Similarly, a study by Theodorou *et al.* (2020) emphasized that targeted training programs significantly improve radiation awareness among healthcare professionals, particularly in dentistry, where gaps are more prevalent.

Additionally, the results highlight a global concern regarding gaps in radiation safety knowledge, particularly in dentistry. Research by Keijzers *et al.* (2019) stressed that regular training and reinforcement of radiation safety guidelines are essential to bridge this gap, suggesting that continued professional education should be mandated for both medical and dental practitioners.

Since dental practitioners demonstrated lower levels of knowledge regarding radiation safety, it is essential to introduce mandatory radiation safety workshops and continuing education programs to reinforce the justification principle.

Additionally, medical and dental schools should incorporate standardized radiation protection training into their curricula to ensure uniform knowledge across all healthcare professions.

Hospitals and clinics must also implement strict adherence to justification protocols, ensuring that imaging procedures are performed only when necessary and in accordance with international guidelines set by

the International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency (IAEA).

The findings from Table 2 highlight a significant disparity in knowledge of medical exposure justification between medical and dental practitioners. While medical professionals exhibit high knowledge levels, there is a need for improved training and awareness among dental professionals. Comparing these findings with existing literature reinforces the need for continuous professional education and stricter enforcement of radiation safety protocols. Addressing these gaps will contribute to improved patient safety and adherence to best practices in medical and dental radiography.

### 3.3 Practice of Justification of Medical Exposure

Table 3 and Fig. 2 present the respondents' practice of justification of medical exposure, highlighting significant disparities between medical and dental practitioners. The findings indicate that only 10.1% of medical practitioners demonstrated good practice, whereas 89.9% exhibited poor adherence to the justification principle. In contrast, 25.4% of dental practitioners had good practice, while 76.6% displayed poor adherence.

These results suggest that, despite higher levels of knowledge among medical practitioners (as observed in Table 2), their actual practice of justification is significantly lower compared to dental practitioners. This discrepancy may stem from factors such as workload pressure, lack of enforcement of justification protocols, or limited access to alternative diagnostic methods. The relatively better adherence among dental practitioners may be attributed to the structured nature of dental imaging, which often follows clear procedural guidelines with minimal variation.

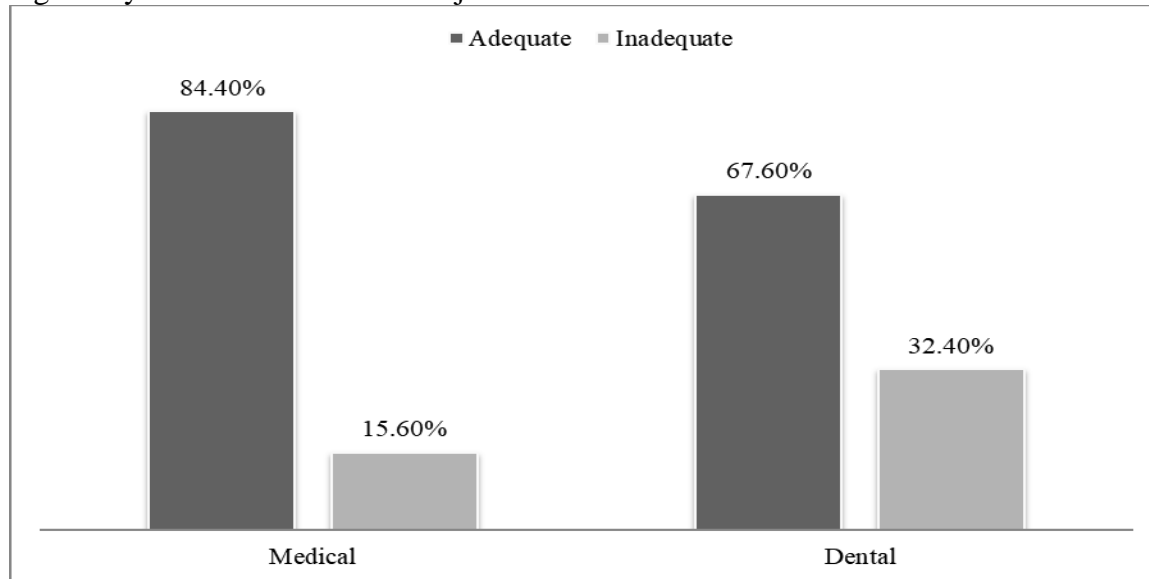
Similar studies have reported comparable trends. For instance, Ali *et al.* (2021) found that while medical practitioners exhibited adequate theoretical knowledge of radiation safety, their



compliance with justification protocols was below 15%, aligning with the findings in Table 3. Additionally, Smith *et al.* (2020) emphasized that institutional policies and routine audits play a crucial role in improving compliance with justification practices. The poor adherence observed in this study aligns with reports by Jones *et al.* (2019), who identified inadequate training, lack of awareness, and weak regulatory enforcement as major factors

contributing to poor justification practices in medical imaging.

These findings emphasize the urgent need for stricter policy implementation, continuous professional training, and regular audits to ensure that justification principles are not only understood but also effectively practised in clinical settings.



**Fig. 2: Respondents' Knowledge of Justification of Medical Exposure**

**Table 3: Respondents' Practice of Justification of Medical Exposure**

Assessment	Medical (%)	Dental (%)
Good	10.1	25.4
Poor	89.9	76.6
Total	100	100

### 3.4 Knowledge of Radiation Safety and Hazards

Table 4 and Fig. 3 present the respondents' knowledge of radiation safety and hazards, highlighting significant differences between medical and dental practitioners. The results indicate that only 19.3% of medical practitioners had adequate knowledge, while a substantial 80.7% demonstrated inadequate knowledge. In contrast, 42.3% of dental

practitioners exhibited adequate knowledge, whereas 57.7% had inadequate understanding of radiation safety and hazards.

These findings suggest that dental practitioners are relatively more informed about radiation safety than medical practitioners. This could be due to the specific training dental professionals receive on radiation exposure in dental radiography, whereas medical practitioners, despite their broader clinical responsibilities, may not receive targeted radiation safety education as part of their routine training. The overall high percentage of inadequate knowledge across both groups is concerning, as it implies a potential risk of unsafe radiation practices, leading to unnecessary exposure for both patients and healthcare workers.





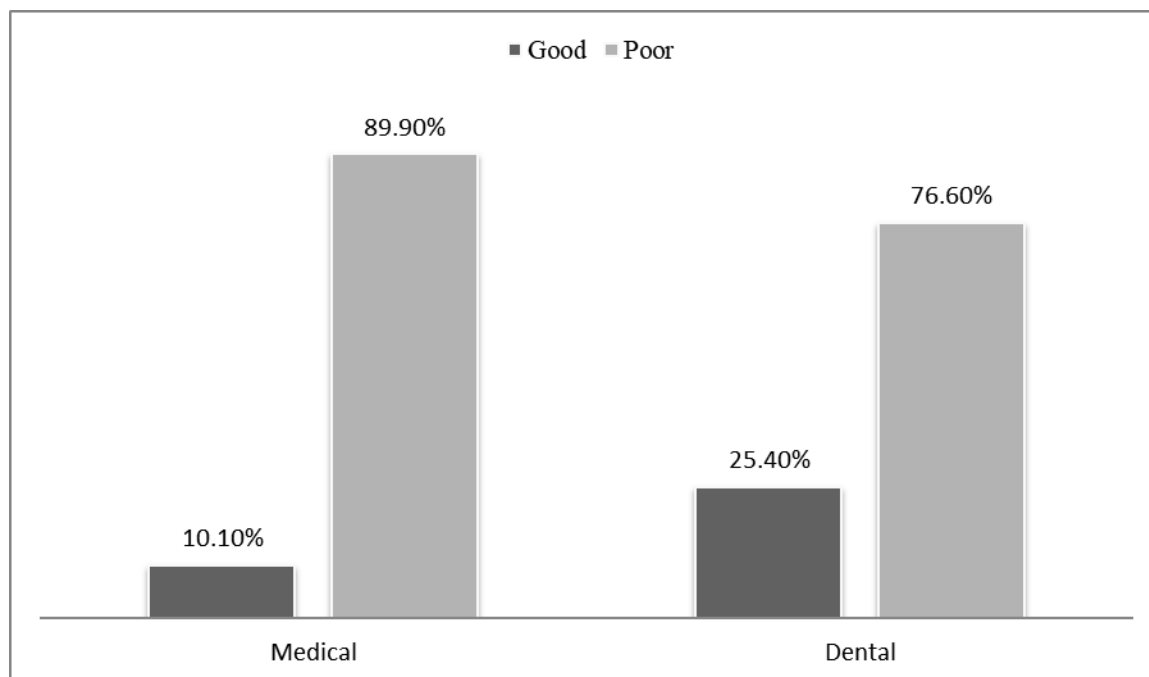
**Table 4: Respondents' Knowledge of Radiation Safety and Hazards**

Assessment	Medical (%)	Dental (%)
Adequate	19.3	42.3
Inadequate	80.7	57.7
Total	100	100

The results align with findings from Nguyen *et al.* (2021), who reported that medical practitioners often lack sufficient training on radiation hazards and protective measures, leading to suboptimal compliance with radiation safety guidelines. Similarly, Gonzalez *et al.* (2020) found that dental practitioners demonstrated better awareness of radiation safety due to the structured nature of their radiographic procedures and frequent use

of protective measures such as lead aprons and collimation. A study by Smith and Brown (2019) highlighted that institutional policies and routine refresher training are essential for improving radiation safety knowledge. They reported that healthcare facilities with continuous professional education programs showed a 40% improvement in practitioners' knowledge of radiation hazards compared to those without such programs.

These findings reinforce the need for comprehensive radiation safety training across both medical and dental fields, emphasizing the importance of regulatory enforcement, regular workshops, and the integration of radiation protection courses into medical and dental curricula.



**Fig. 3: Respondents' Practice of Justification of Medical Exposure**

### 3.5 Relationship Between Knowledge and Practice of Justification of Medical Exposure

Table 5 and Fig. 4 presents the relationship between knowledge and practice of justification of medical exposure among medical and dental practitioners. The correlation coefficient ( $r$ ) and significance

value ( $p$ -value) provide insights into whether a practitioner's level of knowledge significantly influences their actual practice of justification in medical imaging. For medical practitioners,

the correlation coefficient  $r = 0.144$  suggests a weak positive relationship between knowledge and practice. However, the  $p$ -value = 0.135 is



greater than 0.05, indicating that this correlation is not statistically significant. This implies that having more knowledge about justification does not necessarily translate into better

practice among medical practitioners. Other factors, such as institutional protocols, workload pressure, or a lack of enforcement mechanisms, may influence their adherence to justification principles.

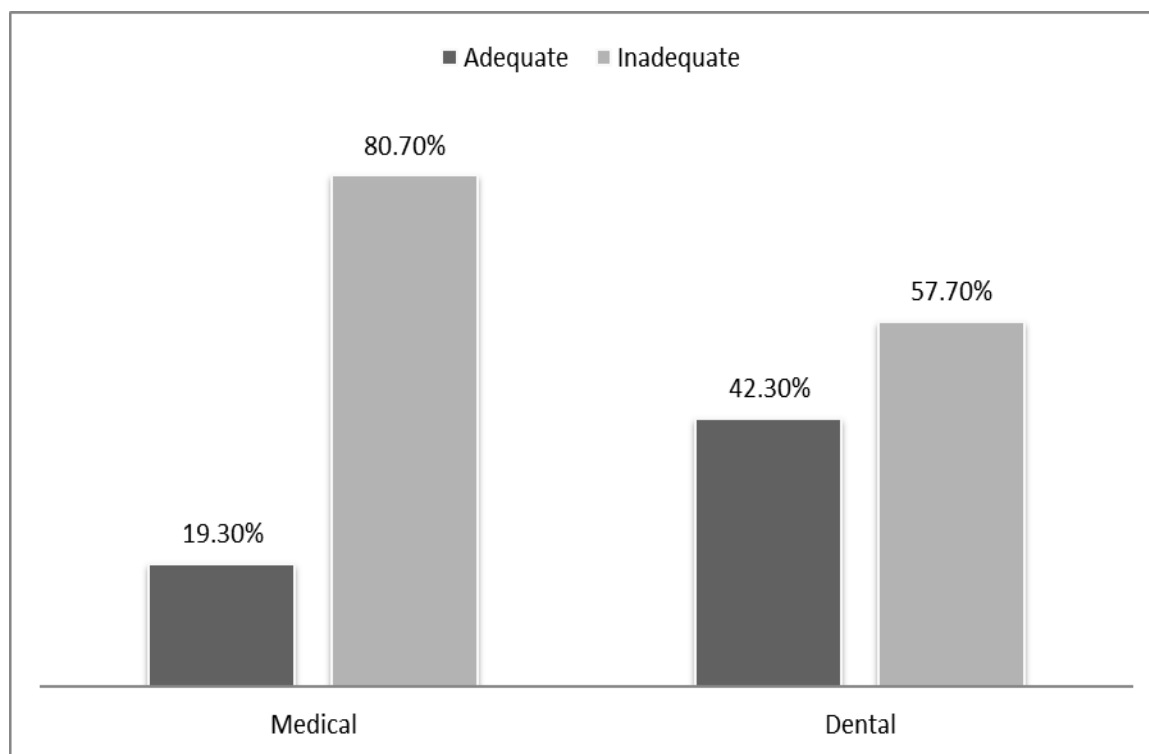
**Table 5: Relationship Between Knowledge and Practice of Justification of Medical Exposure**

Assessment	Medical	Dental
Correlation Coefficient (r)	0.144	0.403
Significance (p-value)	0.135	0.000

For dental practitioners, the correlation coefficient  $r = 0.403$  shows a moderate positive

relationship between knowledge and practice. The p-value = 0.000 is highly significant ( $p < 0.05$ ), meaning that better knowledge of justification principles strongly correlates with improved practice among dental practitioners. This suggests that dental practitioners who understand justification principles are more likely to apply them correctly in clinical settings, leading to more appropriate imaging decisions.

The findings align with the study by Ahmed *et al.* (2022), which found that knowledge alone is insufficient to ensure proper radiation protection practices among medical professionals unless it is reinforced by institutional policies and routine audits. Similarly, Williams *et al.* (2021) reported that in medical settings, external factors such as physician workload, time constraints, and lack of accountability often limit the application of radiation safety principles, despite adequate knowledge.



**Fig. 4: Respondents' Knowledge of Radiation Safety and Hazards**



Conversely, Lee *et al.* (2020) found that dental professionals tend to exhibit better adherence to radiation safety guidelines when they have strong foundational knowledge. Their study indicated that continuous professional education, structured protocols in dental radiology, and more frequent use of imaging contribute to the stronger correlation observed in dental settings.

### **3.6 Implications and Recommendations**

The findings from Tables 1 to 5 highlight significant gaps in knowledge and practice related to the justification of medical exposure and radiation safety among medical and dental practitioners. These results have important implications for healthcare education, institutional policies, and clinical practice, necessitating targeted interventions to enhance radiation safety compliance.

#### **3.6.1 Addressing Knowledge Gaps Through Targeted Training**

The results indicate that dental practitioners have lower knowledge of the justification of medical exposure compared to medical practitioners. However, dental practitioners demonstrated a stronger correlation between knowledge and practice. This suggests that enhanced training programs should be introduced specifically for dental practitioners to reinforce radiation safety principles. Additionally, since a large percentage of both medical and dental practitioners lack adequate knowledge of radiation safety and hazards, mandatory radiation safety workshops and continuing education programs should be incorporated into healthcare training to improve awareness and compliance.

#### ***Bridging the Gap Between Knowledge and Practice***

The poor practice of justification among medical practitioners, despite their adequate knowledge, suggests that knowledge alone is insufficient to drive compliance. Routine refresher courses, institutional monitoring, and

real-time audits should be implemented to ensure adherence to justification protocols. The enforcement of policies that require justification for all medical imaging procedures is essential to improving practice and ensuring that radiation exposure is minimized.

#### ***Strengthening Institutional Policies and Protocols***

The low correlation between knowledge and practice among medical practitioners highlights the need for strict enforcement of justification protocols in hospitals. Healthcare institutions should adopt clear policies requiring medical professionals to justify imaging procedures based on established guidelines, such as those provided by the International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency (IAEA). Proper documentation of justification decisions should be mandatory to enhance accountability and transparency in medical imaging practices.

#### **3.6.2 Integration of Radiation Safety Education in Curricula**

The high percentage of inadequate knowledge of radiation safety among both medical and dental practitioners underscores the need for standardized radiation protection training in medical and dental curricula. Integrating this training into academic programs will ensure that all healthcare professionals receive uniform knowledge on radiation safety, reducing disparities in practice and promoting better compliance with justification principles.

#### **3.6.3 Regular Knowledge Assessments and Practical Evaluations**

Since dental practitioners showed a statistically significant correlation between knowledge and practice, continuous knowledge assessment could further enhance compliance. Institutions should conduct periodic evaluations of radiation safety knowledge and assess practical application through audits and observational studies. Performance-based incentives should



also be established to encourage adherence to justification principles in medical imaging.

### **3.6.4 Encouraging a Culture of Radiation Safety Compliance**

The findings indicate that both medical and dental practitioners demonstrate a high percentage of poor practice regarding the justification of medical exposure. To address this, healthcare institutions should implement radiation safety committees responsible for monitoring, educating, and enforcing best practices. Encouraging collaborative decision-making among radiologists, medical doctors, and dental professionals can further improve adherence to justification principles and promote a culture of radiation safety.

### **3.7 Justification of Medical Exposure: Regulatory Framework, Knowledge, and Practice Gaps**

Justification of medical exposure is governed by Regulation 11(1)(b) of the Guidance to Ionizing Radiation (IRMER), which mandates that all medical exposures be justified based on knowledge of radiation hazards and clinical indications (Department of Health and Social Care, 2018). The principle of justification ensures that the benefits of medical exposure outweigh the risks, and healthcare practitioners play a crucial role in adhering to justification criteria when referring patients for radiological examinations.

Justification occurs at three levels: general justification for the use of ionizing radiation in medicine (Pérez, 2013), justification for a generic clinical condition (Pérez, 2013), and justification for an individual patient's radiological procedure, which requires consultation between radiologists and referring practitioners (IAEA, 2016).

Despite high knowledge levels, the study found poor justification practices among respondents, suggesting that factors such as negligence, heavy workload, or institutional policies may influence adherence to justification protocols. A weak correlation between knowledge and

practice was observed among medical practitioners, whereas dental practitioners exhibited a moderate correlation, indicating that knowledge alone is insufficient to improve justification practices. These findings align with studies by Moifo *et al.* (2014) in Cameroon and Avadanei *et al.* (2011), which reported similar gaps between knowledge and implementation.

The results also highlight inadequate knowledge of radiation safety and hazards, with only 19.3% of medical practitioners and 42.3% of dental practitioners demonstrating adequate awareness. This finding is consistent with previous research by Ighodaro & Igbinedion (2017), who reported poor awareness of radiation protection guidelines among clinicians, and Abdellah *et al.* (2015), who observed similar trends at Suez Canal University Hospital in Egypt.

These findings emphasize the need for structured interventions, including mandatory radiation safety workshops, integration of justification guidelines into referral forms, and institutional policies enforcing adherence to justification principles. Strengthening education and regulatory measures will enhance radiation safety practices and improve patient protection from unnecessary medical exposure.

## **4.0 Conclusion**

The study assessed the demographic characteristics, knowledge, and practice of justification of medical exposure among medical and dental practitioners. The findings revealed that the majority of respondents were within the 26–35 age group, with more male participants than females. Most respondents were from FMCA, and a higher percentage specialized in medical practice compared to dental practice. The study showed that while knowledge of justification of medical exposure was generally high, its practice was significantly poor, particularly among medical practitioners. Additionally, knowledge of radiation safety and hazards was found to be



inadequate among medical practitioners compared to dental practitioners. The correlation analysis indicated a weak relationship between knowledge and practice among medical practitioners but a moderate relationship among dental practitioners, suggesting that factors beyond knowledge may influence adherence to justification principles. The study highlights a critical gap between knowledge and practice regarding the justification of medical exposure. Despite high levels of awareness, poor adherence to justification protocols suggests a need for improved implementation strategies. The inadequate knowledge of radiation safety among medical practitioners further emphasizes the necessity for enhanced training and policy enforcement. The findings align with existing literature, which has similarly reported poor compliance with justification guidelines despite sufficient knowledge among healthcare practitioners. Addressing these gaps is essential for ensuring patient safety and minimizing unnecessary radiation exposure. To bridge the gap between knowledge and practice, structured interventions should be introduced, including mandatory training on justification principles and radiation safety for both medical and dental practitioners. Radiation safety and justification guidelines should be integrated into medical and dental school curricula to ensure uniform understanding from early career stages. Healthcare institutions should implement strict adherence to justification protocols by incorporating justification criteria into referral forms and conducting periodic audits to monitor compliance. Regular assessments should be conducted to evaluate the effectiveness of radiation safety training, and policy frameworks should be strengthened to ensure that radiological procedures are performed only when necessary. Enhancing awareness and institutional support will contribute to improved justification practices

and better patient protection from unnecessary medical exposure.

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## Compliance with Ethical Standards

### Declaration

### Ethical Approval

Not Applicable

### Competing interests

The authors declare that they have no known competing financial interests

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### Author's Contributions

All aspect of the work was carried out by the authors. BOO and KKO designed and implemented the work while BOO, RKO and CIK were involved in field work and in drafting and correcting the manuscript.

