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AWARENESS AND KNOWLEDGE OF RADIATION EXPOSURE RISKS AMONG PATIENTS AND MEDICAL IMAGING PROFESSIONALS AT INDIRA GANDHI MEMORIAL HOSPITAL, MALDIVES

Ikram Hameed[1,2], Noor Shafini Mohamad[1,3], Ahmad Taufek Abdul Rahman[4,5]*

[1]Centre of Medical Imaging, Faculty of Health Sciences, Universiti Teknologi MARA Selangor, 42300 Bandar Puncak Alam, Selangor, Malaysia
[2]Health Protection Agency, Ministry of Health, Male', 20379 Maldives
[3]Medical Imaging, Faculty of Health and Life Sciences, St Luke's Campus, University of Exeter, EX1 2LU Devon, UK
[4]School of Physics and Material Studies, Faculty of Applied Science, Universiti Teknologi MARA (UiTM), Shah Alam, 40450 Selangor, Malaysia
[5]Centre of Astrophysics and Applied Radiation, Institute of Science, Universiti Teknologi MARA (UiTM), Shah Alam, 40450 Selangor, Malaysia

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Corresponding author: Ahmad Taufek Abdul Rahman
Email addresses: ahmadtaufek@uitm.edu.my (ATAR)

ABSTRACT

Background: The use of ionising radiation in medical imaging has substantially improved diagnostic accuracy and patient care. However, it also poses significant health risks if not managed with appropriate safety measures. In low-resource settings, limited awareness among patients and inconsistent safety practices among healthcare workers exacerbate the risk of unnecessary exposure. The Maldives, like many small island developing states, lacks a comprehensive national radiation safety framework, and limited data exists on the local awareness and institutional compliance with international safety standards.Objective: This study aimed to evaluate the level of awareness, knowledge, and safety behavior concerning radiation exposure among patients and medical imaging professionals, and to assess the compliance of radiation safety infrastructure in a tertiary care hospital in the Maldives.Methods: A descriptive cross-sectional was conducted at Indira Gandhi Memorial Hospital (IGMH), the largest tertiary healthcare facility in the Maldives. Data was collected using structured questionnaires targeting 190 patients and 12 medical imaging professionals, focusing on radiation awareness, prior exposure, and professional practices. A facility audit was performed using a 10-item checklist adapted from WHO and IAEA guidelines to assess compliance with radiation protection measures.Results: Among patients, 90% had never received informational brochures, 70% were unaware of background radiation, and 85.3% were unaware of radiation hazards or doses. Merely 18.4% indicated providing consent before imagining. Although 98.9% acknowledged that X-rays entail ionising radiation, hardly 30% comprehended the necessity of protective clothing. Among radiographers, 91.7% indicated consistent utilization of lead aprons, but merely 16.7% employed thyroid shields. Fifty percent of medical imaging professionals consistently utilized personal dosimeters, 41.7% employed them sporadically, and 8.3% did not use them at all. The audit discovered significant deficiencies in infrastructure, including the lack of a designated Radiation Safety Officer (RSO), insufficient shielding during mobile X-ray operations, and inadequate signage. The institution attained a safety compliance score of 3.2 out of 5, indicating moderate performance.Conclusion: The study emphasizes the substantial deficiencies in radiation safety awareness among patients and the inconsistent adherence to safety practices among medical imaging professionals in the Maldives. Urgent measures are required, such as the establishment of national safety regulations, the appointment of RSOs, the enhancement of infrastructure, the reinforcement of continuing professional development, and the assurance of informed patient communication in accordance with international radiation safety standards....

KEYWORDS *Radiation safety , Medical imaging, Patient awareness, Radiographer practices, Radiation exposure.*

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INTRODUCTION

The utilization of ionizing radiation in medical imaging has transformed diagnostic practices by allowing intricate viewing of cross-sectional anatomy, enhancing illness identification, and promoting prompt action. The inherent radiation exposure hazards, especially stochastic effects like cancer, require stringent radiation safety protocols and regulatory supervision. Large-scale cohort studies have shown a significant correlation between frequent diagnostic radiation exposure and heightened cancer risk, particularly in juvenile populations and vulnerable groups [1–3].

International organizations, including the International Atomic Energy Agency (IAEA), the World Health Organization (WHO) and the International Commission on Radiological Protections (ICRP), have developed various frameworks related to radiation safety and protection of both public and healthcare professionals, such as the IAEA Basic Safety Standards (GSR Part 3), that direct radiation safety protocols in medical environments [4–6]. The principles of rationale, optimization, and dosage limitation necessitate active engagement from both healthcare professionals and patients to guarantee safe radiological practices. The successful execution of these requirements is fundamentally reliant on the expertise, dispositions, and conduct of radiographers and radiological technologists, who function as the principal operators of imaging apparatus.

In high income countries (HICs), radiation protection infrastructure is strengthened by comprehensive radiation safety training, quality assurance protocols, and legal requirements. Equally, low- and middle-income nations (LMICs), especially Small Island Developing States (SIDS) such as the Maldives, may face systemic obstacles like a shortage of skilled medical imaging personnel, a lack of national legislation, and insufficient public awareness on radiation protection and safety[7]. A study conducted in Jordan revealed that, despite formal training, medical imaging professionals in resource-limited environments frequently encounter difficulties in executing evidence-based safety standards due to institutional and infrastructural constraints [8–10].

In the Maldivian background, medical imaging services have proliferated in tertiary care hospital, ; nonetheless, significant deficiencies remain in medical imaging professions development, medical imaging facility compliance, and patient education. Circumstantial evidence and first audits by the Ministry of Health indicate insufficient signage, the absence of Radiation Safety Officers (RSOs), unequal dosimeter usage, and a deficiency in organized informed consent procedures [7]. These correspond with regional research demonstrating a pervasive deficiency in radiation risk awareness among patients and healthcare professionals[11–14].

This study aims to address the knowledge gap by evaluating patients' awareness and comprehension of radiation risks associated with diagnostic medical imaging, the medical imaging professionals' practices and safety behaviors, and the structural adherence of medical imaging facilities at Indira Gandhi Memorial Hospital (IGMH) to WHO and IAEA standards on radiation safety and protection. The outcomes of this research will guide national policy formulation, enhance institutional quality, and shape future research in radiation protection for the Maldives.

Methodology

Study Design and Setting

This study was a descriptive cross-sectional study undertaken at Indira Gandhi Memorial Hospital (IGMH) in Malé, the capital of the Republic of Maldives. As the principal tertiary referral hospital in the Maldives, IGMH offers an extensive array of medical imaging services, encompassing general radiography, fluoroscopy, CT scanning, and portable/mobile X-rays. The research was carried out across five months, from March to July 2022.

Study Population

Two different study populations were identified: (1) patients undergoing medical imaging procedure, and (2) licensed medical imaging professionals employed at IGMH. The inclusion criteria for patients were adults aged 18 years and older who had undergone a minimum of one diagnostic imaging procedure utilizing ionizing radiation. Individuals with cognitive disabilities or language obstacles that may hinder comprehension were excluded. Only medical imaging professionals with a minimum of one year of experience who are directly engaged in operating X-ray or CT equipment were included.

Sampling and Recruitment

A convenience sample strategy was utilized for both patients and medical imaging professionalss owing to logistical and ethical limitations. A total of 190 patients and 15 medical imaging professionals were included following the acquisition of both verbal and written informed consent. Participation was wholly voluntary, and anonymity was guaranteed.

Survey Instruments

Two structured questionnaires were created and distributed to gather quantitative data. One was intended for people having diagnostic medical imaging procedure, while the other was aimed at medical imaging professionals. The questionnaire for medical imaging professionals was partially derived from a previously validated instrument by Mung'omba and Botha (2017), which evaluated multiple facets of diagnostic imaging practice, encompassing clinical competency, compliance with radiation safety protocols, and implementation of protective measures[15]. Supplementary items were extracted from recognized instruments endorsed by the WHO and the IAEA to conform to global standards in radiation safety and workplace culture.

The patient questionnaire comprised of four primary sections. The initial section concentrated on demographics, collecting information including age, gender, educational attainment, and previous experience with diagnostic imaging treatments. The second component assessed the patient's comprehension of radiation, namely their awareness of ionizing radiation and its associated hazards. The final portion examined the patient's comprehension of radiation safety protocols, encompassing the utilization of shielding devices, radiation warning signage, and the informed consent procedure. The last portion evaluated communication methods, particularly regarding whether healthcare providers elucidated radiation dangers and safety protocols before the imaging operation.

The medical imaging professional's questionnaire was designed to collect data in multiple essential domains. The process commenced with the collection of demographic and professional background information, encompassing years of experience, level of training, and academic credentials. It subsequently evaluated the utilization of radiation protective equipment, including lead aprons, thyroid shields, and personal dosimeters. A separate component examined radiographers' comprehension of safety practices and their compliance with international standards. The questionnaire also asked for information regarding involvement in continuing professional development (CPD) activities relevant to radiation safety, including workshops and refresher training. Finally, it assessed access to institutional radiation safety support systems, encompassing the availability of standard operating procedures (SOPs), supervisory oversight, and additional workplace safety protocols.

Both questions underwent pre-testing for clarity and face validity with a sample of ten people (n = 10). Minor improvements were implemented to improve comprehension and contextual relevance based on their feedback.

Facility Safety Audit

A structured 10-entry diagnostic health facility audit checklist was adapted from the WHO's "Communicating Radiation Risks in Pediatric Imaging" framework and IAEA's Basic Safety Standards (GSR Part 3)[4,6]. Each entry assessed the presence or absence of essential radiation protection elements in the medical imaging department, including:

Radiation warning signs

Lead shielding in medical imaging rooms

Availability of lead aprons and thyroid shields

Designated Radiation Safety Officer (RSO)

Personal dosimeter usage among medical imaging professionals

Separate control rooms for CT and X-ray units

Gonadal shielding availability

Radiation safety Standard Operating Procedures (SOPs)

Regular training programs on radiation safety

Monitoring and documentation of radiation exposure

Each item was evaluated dichotomously (1 = present, 0 = absent), and the total score was used to calculate a medical imaging Facility Safety Index on a 5-point scale:
<2 = Poor, 2–3 = Low, 3–4 = Moderate, 4–5 = High compliance.

Data Analysis

The data were entered and analyzed using SPSS version 25 and Microsoft Excel. Frequencies and percentages representing categorical variables were summarized using descriptive statistics. Safety index values were analyzed according to established compliance criteria. Inferential statistics were not utilized owing to the exploratory nature and restricted sample size.

Respondents' Consent

Before starting the study, all participants were informed about the purpose of the research and that their participation was voluntary. They were told that there was minimal risk involved and that choosing not to take part would not affect their treatment or job. Participants were also assured that their information would be kept confidential, and no names or personal details would be shared in the results. The data would be used for research purposes only.

Each participant signed a consent form before answering the questionnaire. The study was approved by the Indira Gandhi Memorial Hospital (IGMH) Research Committee and received ethical clearance from the National Health Research Council (NHRC), Ministry of Health, Maldives.

Results

This study involved a total of 202 participants, comprising 190 patients (Table 1) and 12 medical imaging professionals (Table 2) from Indira Gandhi Memorial Hospital in Malé, Maldives. The findings are delineated into three subsections: patient awareness and knowledge, medical imaging professionals' practices and safety behavior, and outcomes from the facility audit.

Table 1: Socio-Demographic Characteristics of Patient Respondents

Variable (n = 190)	N	(%)
Gender		
Male	65	34.2
Female	125	65.8
Age		
18–33	110	57.9
34–49	72	37.9
50+	8	4.2
Education		
None	2	1.1
Primary	13	6.8
Secondary/Diploma	105	55.3
University Degree	70	36.8
Occupation		
Medical Field	35	18.4
Non-Medical Field	119	62.6
Unemployed	36	18.9
Purpose of Visit		
Injury	29	15.3
Illness	131	68.9
Health Check-up	30	15.8

Table 2: Socio-Demographic Characteristics of Radiographer Respondents

Variable (n = 12)	N	(%)
Gender		
Male	11	91.7
Female	1	8.3
Age		
18–33	0	0
34–49	12	100

50+	0	0
Education		
Diploma	10	83.3
University Degree	2	16.7
Years of Experience		
3–5 years	3	25
6–8 years	3	25
9–11 years	5	41.7
12+ years	1	8.3

Patient Awareness and Knowledge

Out of 190 patients surveyed at IGMH, the evaluation of radiation safety awareness among patients revealed significant deficiencies in knowledge and communication. Although a substantial majority (98.9%) acknowledged that X-rays entail ionizing radiation, merely 30% were cognizant of background radiation, and only 30% possessed knowledge regarding protective equipment utilized in radiology rooms. Only 10% of respondents received a brochure or any written information on X-ray treatments, and merely 14.7% indicated that medical professionals had conversed with them about radiation dosages or related hazards before the examination.

Notably, 63.7% of patients recognized radiation warning signals in X-ray zones, presumably owing to explicit visual indicators; yet merely 18.4% indicated that they were solicited for consent or information before participating in radiological procedures. The absence of informed consent presents significant ethical and safety concerns.

Table 3:Awareness of Radiation and Safety Among Patient Respondents

Awareness item (n=190)	**Yes (%)**	**No (%)**
X-rays are a form of ionizing radiation	188 (98.9)	2 (1.1)
Aware about background radiation	57 (30)	133 (70)
A leaflet about x-ray procedures and examination	19 (10)	171 (90)
Medical professionals mentioned to you the amount of dose and radiation risk associated with examination	28 (14.7)	162 (85.3)
Ideas about protective equipment/ wear used in x-ray	57 (30)	133 (70)
Ideas about the radiation warning sign	121 (63.7)	69 (36.3)
Consent form before undergoing any radiology examinations	35 (18.4)	155 (81.6)

Table 4: Association Between Knowledge Level and Demographic Characteristics of Patients

Variable	**Low Level (%)**	**High Level (%)**	**X^2**	**P-value**
Gender			2.805	0.094

Male	39 (39.8)	26 (28.3)		
Female	59 (60.2)	66 (71.7)		
Age			0.694	0.707
18 – 33 years	58 (59.2)	52 (56.5)		
34 – 49 years	37 (37.8)	35 (38)		
50 years and above	3 (3.1)	5 (5.4)		
Educational Background			4.072	0.254
None	1 (1.0)	1 (1.1)		
Primary	6 (6.1)	7 (7.6)		
Secondary / Diploma	61 (62.2)	44 (47.8)		
University degree	30 (30.6)	40 (43.5)		
Professions			5.275	0.072
Medical	12 (12.2)	23 (25)		
Non-Medical	67 (68.4)	52 (56.5)		
Unemployed	19 (19.4)	17 (18.5)		

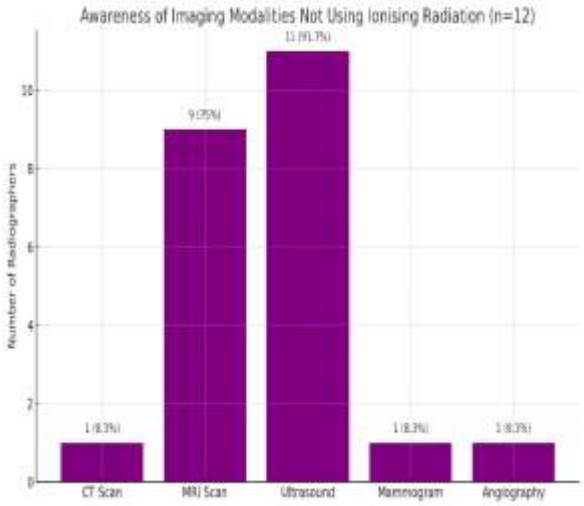
The findings in Table 4 indicate that there was no statistically significant correlation between patients' awareness of radiation hazard and their demographic attributes, such as gender, age, educational level, and occupation. A greater proportion of females (71.7%) exhibited a high degree of knowledge relative to males (28.3%); nonetheless, the association lacked statistical significance ($p = 0.094$). Patients in the younger age group (18–33 years) had the largest proportion of high knowledge (56.5%) among the three age categories; however, this difference was not statistically significant ($p = 0.707$).

Regarding schooling, patients with university degrees had a somewhat elevated knowledge level (43.5%) compared to those with secondary/diploma education (47.8%) and lower educational attainment; however, this disparity was not statistically significant ($p = 0.254$). Regarding occupation, medical professionals exhibited a greater percentage of high knowledge (25%) in comparison to non-medical professionals and unemployed individuals; however, the connection lacked statistical significance ($p = 0.072$). The findings indicate that patients' understanding of radiation dangers is largely unaffected by demographic characteristics, underscoring the necessity for comprehensive public education initiatives irrespective of background.

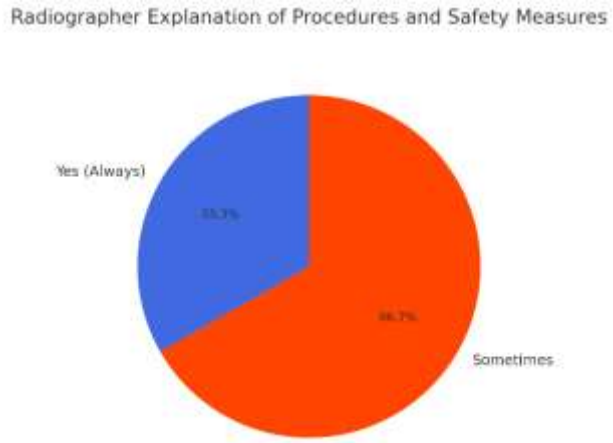
Radiographer Practices and Safety Behavior

Out of the twelve radiographers who were questioned, all of them had received formal training in medical imaging, and eighty percent of them held either a diploma or a bachelor's degree in the subject. Nonetheless, the awareness and execution of safety protocols exhibited significant variability.

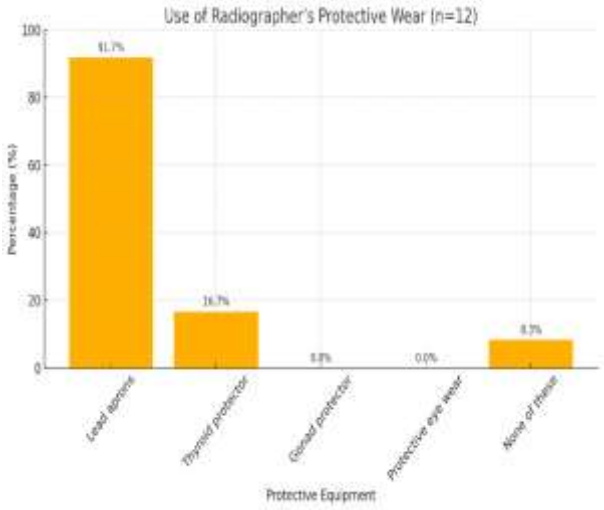
All medical imaging professionals (100%) accurately indicated that X-rays serve both diagnostic and therapeutic functions. A significant majority exhibited precise understanding of non-ionizing modalities, with 91.7% accurately recognizing ultrasound and 75% identifying MRI as not utilizing ionizing radiation. A tiny percentage (8.3%) erroneously assumed that CT, mammography, or angiography do not utilize ionizing radiation, highlighting slight deficiencies in modality-specific understanding.



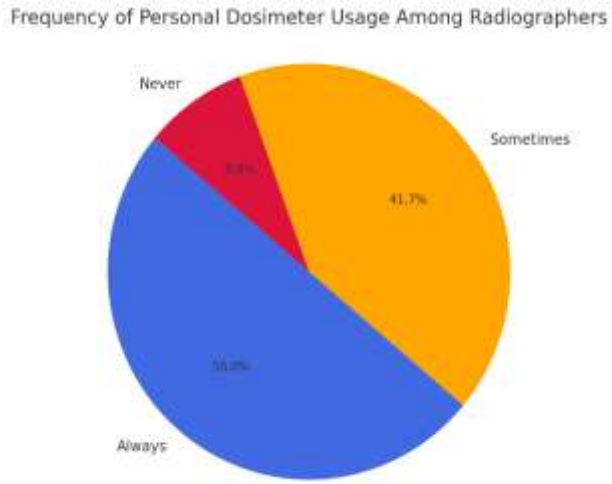
Patient communication concerning radiation protective protocols was uneven. Only four medical imaging professionals (33.3%) consistently reported explaining processes and precautionary measures to patients prior to imaging, whilst the remaining eight (66.7%) indicated that they did so only occasionally. This underscores the necessity for defined methods for patient interaction to guarantee informed patient engagement and adherence to international guidelines.



Concerning the utilization of protective attire, the majority of medical imaging professionals (91.7%) regularly employed lead aprons during imaging sessions. Only 16.7% of subjects utilized thyroid shields, and none indicated the usage of gonadal protection or protective eyewear. Significantly, one radiographer indicated the absence of any protective attire. Medical imaging technologists indicated that access to shielding materials was frequently restricted during mobile X-ray treatments or in emergency situations, thereby jeopardizing the safety of both staff and patients.



The utilization of personal dosimeters was similarly diverse. Fifty percent of medical imaging professionals consistently utilized a dosimeter during X-ray exams, whilst 41.7% employed them intermittently. One staff (8.3%) indicated that they have never utilized a dosimeter. These data indicate irregularities in occupational exposure monitoring, potentially attributable to restricted availability or inadequate institutional enforcement.



Overall, although medical imaging professionals demonstrated a fundamental comprehension of radiation safety, their practices exhibited significant variability, with marked deficiencies in patient communication, utilization of protective equipment, and adherence to dosimeter protocols. These discrepancies underscore the pressing necessity for systematic safety measures, sufficient equipment allocation, and regular training to improve the radiation safety culture inside the organization.

Facility Radiation Safety Audit

The facility audit, utilizing the 10-point WHO/IAEA checklist, indicated moderate adherence to radiation safety standards. The Facility Safety Index was assessed as 3.2 out of 5, indicating considerable potential for enhancement. Principal discoveries comprised in Table 5:

Table 5:Audit Compliance Summary

Audit Item	Compliance
Radiation warning signs in all imaging rooms	✕ (missing in mobile X-ray and fluoroscopy)
Lead shielding (walls, doors, mobile shields)	✓ (available in main X-ray, lacking in mobile)
Availability of lead aprons and thyroid shields	✓ (limited quantity)
Designated Radiation Safety Officer	✕ (no formal designation)
Regular use of personal dosimeters	✕ (partial compliance)
Shielded control rooms for CT and radiography units	✓ (available)
Gonadal shielding availability	✕ (unavailable or not used)
Written SOPs for radiation protection	✕ (incomplete and inaccessible)
Staff participation in training or radiation audits	✕ (limited)
Monitoring and documentation of occupational exposure	✕ (inconsistent)

The absence of key safety infrastructure, such as proper signage, full shielding for portable imaging, and formal oversight by a safety officer, were considered critical deficiencies.

DISCUSSION

This study underscores a significant weakness in patient understanding and institutional compliance with radiation safety standards at the Indira Gandhi Memorial Hospital (IGMH), the tertiary healthcare hospital in the Maldives. The findings indicate fundamental weakness in knowledge awareness, personnel training, and infrastructure adherence challenges frequently encountered in developing health systems, especially in small island developing states (SIDS).

Patient Awareness and Risk Communication

This study discovered critical gaps in patient awareness and risk communication concerning medical radiation exposure in the Maldivian healthcare setting. Remarkably, 90% of patients had never received informational brochures, 70% were unaware of background radiation, and 85.3% were unaware of radiation hazards or doses. Merely 18.4% indicated providing consent before imagining. While nearly all patient participants (98.9%) knew that X-rays involve ionising radiation, deeper understanding of radiation risks and protective practices was limited. This aligns with the findings of a study conducted in tertiary care in United Kingdom, indicates limited patient awareness and understanding of radiation dangers, even in developed settings[16]. A study of ionizing radiation exposure from medical imaging observed that patients often overrate the safety of radiological examinations due to insufficient transparent information [12,17].

At IGMH, most patients did not get pre-procedure information, and informed consent frequently omitted detailed discourse on radiation safety. These observations corroborate the findings of the study conducted by researched in Norway, who underscored the importance of culturally attuned communication tactics employed by radiographers to enhance risk perception[18]. The lack of educational resources and standardized counseling exacerbates the problem, restricting patients' ability to make informed healthcare choices[16,18,19].

A similar study in Zambia revealed analogous problems, with only 22% of patients possessing prior knowledge of radiation dangers, and a minimal number being informed prior to imaging procedures[15]. The absence of standardized consent protocols and teaching resources continues to be a common obstacle throughout LMICs, including the Maldives.

Radiographer Practices

The study's findings reveal a modest level of awareness and inconsistent radiation safety protocols among radiographers at a tertiary care hospital in the Maldives. A majority (91.7%) indicated regular usage of lead aprons, although just 16.7% consistently employed thyroid shields, and 50% reported habitual use of

personal dosimeters. Significantly, merely 33.3% of radiographers indicated that they consistently elucidate the technique and radiation safety protocols to patients before imaging. These data indicate a troubling trend of incomplete adherence to internationally recognized safety standards. These findings indicate worldwide apprehensions. The study conducted in Zanjan, Iran reported inadequate awareness and training among medical imaging professionals in Iran, notwithstanding the presence of established norms[14,20]. Likewise, the study conducted in the Egypt discovered a deficient comprehension of diagnostic reference levels among CT radiographers, hindering appropriate dose management [21].

Globally, compliance with radiation safety practices among medical imaging technologists is inconsistent, frequently affected by regulatory enforcement, institutional policies, availability of protective tools, and ongoing professional education. In affluent nations like Australia, the UK, and the USA, adherence to personal dosimetry usage and shielding protocols is generally elevated owing to stringent occupational safety regulations, comprehensive monitoring systems, and obligatory certification programs[22–24].

The results indicate institutional impediments, including restricted access to personal protective equipment (PPE), absence of supervisory audits, and the lack of a designated Radiation Safety Officer (RSO). The lack of a Radiation Safety Officer contravenes IAEA Basic Safety Standards and undermines the enforcement of safety standards. Di Michele et al. (2020) demonstrate that radiographers tend to excel in settings that emphasize knowledge translation and leadership support[25].

Facility Compliance and Systemic Gaps

The facility achieved a score of 3.2 out of 5 on the WHO/IAEA compliance index, signifying modest compliance[5]. Inadequacies in signs, standard operating procedures, shielding, and monitoring indicate infrastructural deficiencies that jeopardize safety. Comparable deficiencies have been documented in radiation centers in Qazvin, Iran, as well as in hospitals throughout Rwanda and Ghana, where antiquated policies and insufficient investment impede adherence [26–28].

The predicament in the Maldives is worsened by the lack of a national radiation safety framework. The Ministry of Health has prepared regulation documents, but they are not enforced, resulting in a lack of legal accountability for organizations such as IGMH. This vacuum allows hazardous activities to continue unabated [29].

The lack of internal radiation safety audits at IGMH indicates insufficient accountability mechanisms. Some researchers also noted that, in the absence of regulatory pressure, numerous facilities did not uphold technical radiation protection criteria, despite the presence of adequate infrastructure[21,30].

Implications for Policy and Practice

The Maldives presently does not possess an implemented Radiation Protection Act or a national authority responsible for enforcing safety standards. A draft rule exists under the Ministry of Health; however, its implementation has been impeded, resulting in facilities self-regulating. This regulatory void is not exclusive to the Maldives; A researchers identified such issues in Ghana, where nurses and medical imaging professionals functioned under obsolete safety regulations due to postponed policy implementation [9,27].

Conversely, nations with proactive national radiation safety organizations, like South Africa and Jordan, have superior compliance and incident reporting[8]. The establishment of national frameworks guarantees uniform facility audits, obligatory continuing professional development, employment of radiation safety officers, and monitoring of safety incidents—all of which are deficient in the Maldivian environment.

The results of this investigation have considerable consequences. Radiographers require organized continuing professional development programs, sufficient protective equipment, and readily available standard operating procedures at the facility level. Continuing Professional Development (CPD) must be consistent, mandatory, and in accordance with the increasing safety criteria of the IAEA and WHO. A researcher states that ongoing education links knowledge and practice, especially where resources are limited [31–33].

The Ministry of Health, Maldives must promptly implement the radiation safety rule at the policy level. This entails the creation of a national radiation protection body, the licensing of medical imaging facilities at hospitals and healthcare facilities, and the institutionalization of radiation safety audits. Public awareness initiatives must be initiated to inform residents about radiation hazards and their entitlements to safe healthcare.

Assess within a Global Perspective

Assessment of these findings alongside studies from other regions uncovers a consistent trend: whereas technology innovations in medical imaging are extensively implemented, safety protocols and awareness initiatives remain insufficient. On of the revealed that deficiencies in infrastructure, including insufficient shielding and absence of radiation signage, are prevalent even in middle-income nations [14,20,21]. Research from Europe and North America indicates that patients infrequently have adequate information

regarding radiation hazards, highlighting that this issue transcends developing nations and constitutes a global burden[10,16,34,35].

Study Limitations

This study is limited by its cross-sectional design and relatively small sample size, particularly among radiographers. The use of convenience sampling may introduce selection bias, and self-reported data may be subject to social desirability bias. Nonetheless, the mixed-methods approach and triangulation with facility audit data enhance the validity of the findings.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study provides a comprehensive assessment of radiation safety awareness, practices, and infrastructure in the context of a tertiary care hospital in a small island developing state. The findings reveal a considerable gap in patient awareness, moderate adherence to safety practices by radiographers, and only partial compliance with international standards at the institutional level.

More than two-thirds of patients lacked basic awareness of the risks associated with ionising radiation, indicating a critical failure in risk communication and informed consent processes. While radiographers demonstrated moderate professional knowledge, their practical implementation of safety protocols—such as regular dosimeter use, protective shielding, and participation in continued education—remained inconsistent. Most notably, the absence of a designated Radiation Safety Officer (RSO), lack of internal audits, and insufficient signage and shielding within the imaging facility point to systemic deficiencies in institutional governance and oversight.

These findings underscore the urgent need to improve both human and structural components of radiation safety. Without meaningful intervention, patients and healthcare workers in similar low-resource settings remain vulnerable to the long-term risks of cumulative radiation exposure.

Recommendations

A comprehensive set of radiation safety policy, institutional, and educational measures is urgently needed to fill the deficiencies identified in this study. The Maldives should prioritize the implementation and enforcement of a national Radiation Protection Act, adhering to international standards set by the IAEA and WHO. This radiation safety framework require the licensing of all medical imaging facilities, implement mandatory radiation safety audits, and create a centralized system for tracking occupational health exposure among medical imaging professionals.

Secondly, each medical imaging facility, especially higher tertiary hospital like IGMH, must designate a qualified and certified Radiation Safety Officer (RSO). The RSO will monitor radiation safety practices, ensure medical imaging department staff are adherent to protective measures, organize internal radiation safety audits, and spearhead quality improvement projects.

Thirdly, initiatives should be undertaken to improve patient education and awareness on radiation safety and informed consent. Established structured communication processes are necessary to ensure patients are well informed about the risks and benefits of medical imaging procedures. Multilingual educational resources, like as brochures, posters, and multimedia materials, must be created to address the varied literacy and language characteristics of the public.

Fourthly, it is authoritative to enhance continuous professional development (CPD) for medical imaging personnel. This incorporates the provision of regular training and certifications centered on radiation dose optimization, emergency and safety measures, utilization of radiation protective equipment, and updates on advancing worldwide safety standards. Such projects could be further through collaborations with local colleges and worldwide professional organizations.

Simultaneously, healthcare institutions must allocate resources to enhance radiation protective infrastructure. This encompasses guaranteeing the provision of shielding for mobile and stationary imaging units, personal protective equipment including lead aprons, thyroid and gonadal shields, and real-time dosimetry devices. Imaging rooms must include appropriate radiation warning signage, and standard operating procedures (SOPs) should be readily available, consistently updated, and followed by personnel.

Moreover, healthcare facilities must formalize regular radiation safety audits in accordance with WHO and IAEA guidelines. Radiation safety audits must be performed at a minimum of once per year, with findings presented transparently to enhance accountability and enable benchmarking among health facilities. Findings should guide specific improvements and medical imaging professional's re-education as required.

Finally, comprehensive national public awareness efforts should be initiated to enhance the general comprehension of radiation in health science. These efforts should endeavor to educate the public of the diagnostic advantages and possible radiation hazards of ionising radiation, while also enabling patients to pursue information and advocate for safe procedures. Television, radio, social media, and community outreach activities can be utilized to convey consistent and accurate messages. These guidelines collectively offer a framework for enhancing radiation safety in the Maldives and mitigating avoidable health risks linked to diagnostic imaging.

Declaration of Competing Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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Author Contributions

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