ORIGINAL ARTICLE

Pilot Study and Reliability Testing of Questionnaires on Knowledge, Perception and Awareness Toward Mri and Nuclear Imaging Safety Risk Among Medical Imaging Students

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ABSTRACT

Introduction: Medical imaging students typically learn about MRI and nuclear imaging safety risks through their curriculum, but the emphasis often remains on theoretical knowledge. Assessing students' practical knowledge, perception, and awareness of these safety issues is essential for their clinical preparedness. This study aimed to develop and validate questionnaires to evaluate knowledge and perceptions of MRI safety risks and knowledge and awareness of nuclear imaging safety risks among medical imaging students in Malaysia and Indonesia. **Methods:** A total of 26 questions were developed for the MRI safety questionnaire and 20 for the nuclear imaging safety questionnaire. Using purposive sampling, 109 students who had completed MRI and nuclear imaging courses participated in the study. Reliability testing was conducted on a randomly selected subset of 20 responses for each questionnaire using the Kuder-Richardson Formula 20 (KR-20). A descriptive analysis of the entire sample was done to evaluate the knowledge, perception, and awareness of MRI and nuclear imaging safety. **Result:** The MRI questionnaire produced a reliability coefficient of 0.76, and the nuclear imaging questionnaire produced 0.71, both indicating acceptable reliability. The descriptive analysis revealed that most students demonstrated moderate levels of knowledge, perception, and awareness of MRI and nuclear imaging safety. These findings suggest a need for targeted educational strategies to strengthen students' understanding, to better prepare them for clinical practice. **Conclusion:** The study shows that the developed questionnaires are reliable tools for assessing safety knowledge, perception, and awareness among medical imaging students, emphasizing the importance of continuous improvements in educational approaches.
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Keywords: Reliability test, Kuder-Richardson (KR-20), MRI, nuclear imaging, safety risk

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INTRODUCTION

In the rapidly evolving field of medical imaging, safety concerns associated with Magnetic Resonance Imaging (MRI) and nuclear imaging have become increasingly critical. These imaging modalities are indispensable for diagnosing and treating various illnesses, each offering unique advantages. MRI, for instance, provides detailed anatomical images with superior soft tissue contrast, while nuclear imaging allows for the assessment of metabolic and physiological functions, making them both essential in comprehensive diagnosis and treatment planning.

Despite their benefits, both MRI and nuclear imaging present unique risks. MRI, though generally considered safer due to its non-ionizing nature, has been associated with incidents involving ferromagnetic objects, which can cause serious harm if brought into the MRI room (1-2). For instance, there has been a report of a nurse suffering injuries after becoming trapped between a bed and an MRI machine due to the strong magnetic field (3). Nuclear imaging, on the other hand, involves radiopharmaceuticals—radioactive substances used in diagnosis and treatment—that carry inherent risks of radiation exposure and contamination if safety protocols are not strictly followed (4). In regions like West Scotland, incidents in nuclear medicine have included patient overexposures and contamination events, highlighting

the need for strict adherence to safety standards (5)

Studies show that while medical imaging students receive theoretical training in MRI and nuclear imaging, many lack a practical understanding of the associated safety risks. For instance, Alyami et al. found that although applied medical science students were aware of MRI's potential risks, many mistakenly believed it involved ionizing radiation, underscoring the need for better-targeted education (6). Furthermore, a Swedish survey revealed a negative correlation between MRI safety knowledge and incident rates, suggesting that more extensive education could reduce accidents (3). Despite the critical need for thorough knowledge in these areas, research on MRI and nuclear imaging safety awareness is often limited to hospital staff, leaving a gap in our understanding of student preparedness, particularly among those studying medical imaging (7).

Additionally, study on MRI and nuclear imaging safety awareness are still lacking in Southeast Asia, where the mobility of healthcare professionals is increasing (8-9). Countries such as Malaysia, Indonesia, and Singapore frequently exchange healthcare workers, making it essential to ensure that students across these regions expose to the similar training on MRI and nuclear imaging safety. Difference in exposure to clinical practicve training, educational curriculum and healthcare system may lead to variation in the readiness, understanding and perception of student for practice in the real world. Identifying potential curriculum gaps and variations in safety education can provide insights on whether students are well prepared through existing training for actual clinical practice in real world.

To address this gap, this study aims to develop and validate a specialized questionnaire for assessing knowledge, perception, and awareness of MRI and nuclear imaging safety among medical imaging students across two countries; Malaysia and Indonesia. We designed two separate questionnaires to specifically target MRI safety perception and nuclear imaging safety awareness, administered to students from Malaysia and Indonesia. To ensure the questionnaires' reliability and internal consistency, we conducted pilot testing, utilizing Kuder-Richardson 20 (KR-20) for its suitability with dichotomous data, as opposed to Cronbach's alpha, which is more appropriate for Likert-scale items (10).

Pilot testing serves a dual purpose in this study: it validates the reliability of the questionnaire and provides initial insights into the knowledge, perception and awareness levels of MRI and nuclear imaging safety among students. Reliability testing is essential for ensuring that responses are consistent over time, thus supporting meaningful comparisons across different groups. By rigorously assessing the internal consistency of the questionnaire through KR-20, we aim to refine it for robust application in future studies. Through this approach, we ensure that our tool can accurately capture gaps in student knowledge and awareness, guiding curriculum enhancements to better prepare students for clinical settings.

In summary, this study develops a validated, reliable instrument to assess critical safety knowledge among medical imaging students and explores their baseline understanding of MRI and nuclear imaging safety risks across two countries. This effort aims to inform educational strategies and improve safety training for future healthcare professionals. By comparing students' knowledge and perceptions across two different educational settings, findings of this study contribute to improving safety education, standardizing best practices, and enhancing radiation protection awareness in medical imaging programs in Malaysia and Indonesia.

METHODOLOGY

This pilot study is a cross-sectional survey among medical imaging students from Malaysia and Indonesia. This pilot study was conducted from January 2024 to April 2024. This study consists of three phases, the first phase involves the development of a questionnaire, the second phase is the reliability testing of the survey questions and the last phase is the pilot testing of the knowledge, perception and awareness of safety risks in MRI and nuclear imaging among medical imaging students.

Ethical considerations

Ethical approval was obtained from the UniSZA Human Research Ethics Committee (UHREC) (UniSZA/UHREC/2023/558)

Questionnaire development

1. Questionnaire for Knowledge and Perception of MRI Safety Risks

The questionnaires for assessing knowledge and perception of MRI safety risk questionnaire were adapted from a validated study which assessed MRI safety knowledge and perception among healthcare workers (7). Ensuring cultural and linguistic compatibility for students in Malaysia and Indonesia, the questionnaire was translated into Indonesian through online consultations with experts from both countries. This collaborative process ensured accuracy and maintained the content's integrity.

The MRI questionnaire comprises three sections; 1) Demographic Information including age, gender, institution, and year of study 2) Knowledge of MRI Safety Risks contains 15 yes/no questions assessing knowledge of MRI safety and 3) Perception of MRI Safety Risks contains 11 yes/no questions focusing on students' perceptions of MRI safety practices.

2. Questionnaire for Knowledge and Awareness of

Nuclear Imaging Safety Risks

The nuclear imaging questionnaire was adapted from two studies: Dhoodhat (2016), which focuses on knowledge of nuclear medicine principles, and Dehghani (2015), which assesses radiation safety awareness among staff and patients (11-12). As with the MRI questionnaire, the nuclear imaging questionnaire was translated into Indonesian with expert input to ensure cultural and linguistic relevance.

The nuclear imaging questionnaire is divided into; 1) Demographic Information similar to the MRI questionnaire, this section includes age, gender, institution, and year of study, 2) Knowledge on nuclear imaging safety risks contains 10 yes/no questions to assess knowledge of nuclear imaging safety protocols and 3) Awareness of Nuclear Imaging Safety Risks includes 10 yes/no questions assessing awareness of safety measures specific to nuclear imaging.

Pilot Study

In this pilot study, we administered the MRI and nuclear imaging safety questionnaires to a total of 109 participants from Malaysia and Indonesia to evaluate their knowledge, perception, and awareness levels. The questionnaires were prepared in Google Forms and distributed to participants via WhatsApp. Informed consent was obtained beforehand to uphold ethical standards, and the digital format facilitated efficient data collection across geographical locations.

1. Reliability Testing

To assess the internal consistency of each questionnaire, we randomly selected 20 participants for each questionnaire from the total pool of 109 respondents. This subset consisted of 10 participants from Malaysia and 10 from Indonesia, ensuring balanced representation across both countries. The reliability of the questionnaires was evaluated using the Kuder-Richardson Formula 20 (KR-20), a measure well-suited for binary (yes/no) response items, such as those used in this study. KR-20 calculates the internal consistency of dichotomous items, helping to determine whether the questions effectively measure the intended construct (13). The KR-20 formula is as follows:

$$\mathbf{KR - 20} = \frac{K}{(K - 1)} \left(1 - \frac{\Sigma pq}{\sigma^2}\right)$$

Where, K = Total number of questions, p = Proportion of correct answer, q = Proportion of wrong answer, Σpq = Sum of pq and σ = Variance for the total score

The KR-20 coefficient ranges from 0 to 1, with higher values indicating better reliability (see Table I). A higher KR-20 score suggests a strong internal consistency, meaning the items in the questionnaire reliably measure the same construct. If a low KR-20 score is encountered, we would consider revising ambiguous items, removing items with low item-total correlations, or increasing the number of questions to improve reliability.

Table I: KR-20 coefficient ranges and the reliability level

KR-20 coefficient ranges	Reliability levels
0.90 or higher	Excellent reliability
0.80–0.89	Good reliability
0.70–0.79	Acceptable reliability
0.60–0.69	Marginal reliability
Below 0.60	Poor reliability

Table I presents the KR-20 coefficient ranges and their associated reliability levels, which are used to assess the internal consistency of questionnaire items. A KR-20 value of 0.70 or higher indicates acceptable reliability, ensuring the consistency of responses across items within a questionnaire. This table serves as a reference for interpreting the reliability of the MRI and nuclear imaging safety risk questionnaires analyzed in this study.

2. Descriptive Analysis of Knowledge, Perception, and Awareness Levels

After completing the reliability test, the full dataset of 109 participants was analyzed descriptively to determine the overall levels of knowledge and perception of MRI safety risk and knowledge and awareness of nuclear imaging safety risks. This larger sample allowed us to draw more comprehensive conclusions regarding the baseline safety knowledge among medical imaging students in both Malaysia and Indonesia.

Descriptive statistics, including means, frequencies, and percentages, were computed to summarize the knowledge, perception, and awareness levels of participants across the two countries. This descriptive analysis provides a broader understanding of medical imaging students' baseline knowledge and perceptions about MRI and nuclear imaging safety. These insights can help identify gaps in understanding and guide potential curriculum improvements in safety education.

RESULTS

Demographic information

Demographic characteristics of the overall sample of 109 participants are shown in Table II, providing context for understanding the results. The majority of participants were female (66.1%, n = 72), with males comprising 33.9% (n = 37). Most respondents were aged 18–21 years (79.8%, n = 87), followed by 22–25 years (19.3%, n = 21), and only one participant was aged 26–29 years (0.9%, n = 1). Regarding the year of study, 70.6% (n = 77) were in Year 3, 26.6% (n = 29) in Year 4, and 2.8% (n = 3) in Year 2. The participants represented from two countries: Indonesia 73.4%, n = 80, and Malaysia 26.6%, n = 29

Table II: Demographic information of respondents (N = 109)

Demographic characteristics		Frequency (n)	Percentage (%)
Gender	Male	37	33.9
	Female	72	66.1
Age	18 - 21 years old	87	79.8
	22 - 25 years old	21	19.3
	26 – 29 years old	1	0.9
Year of Study	Year 3	15	75
	Year 4	5	25
Country	Malaysia	29	26.6
	Indonesia	80	73.4

Table II provides the demographic characteristics of the study participants (N = 109). Gender, age groups, and year of study were recorded to ensure a representative sample of the study population. Age categories were grouped based on typical educational progression, and 'Year 3' and 'Year 4' refer to participants in the third and fourth years of their respective programs. Participants were recruited using convenience sampling from two countries, Malaysia and Indonesia. The demographic profile was analyzed to contextualize the findings and ensure their applicability to the target population. No missing data were reported for these variables.

Reliability Analysis

The KR-20 coefficient for the MRI safety risk questionnaire, based on responses from 20 randomly selected participants (10 from Malaysia and 10 from Indonesia), was 0.76, indicating acceptable reliability (see Table III). This suggests that the items in the MRI questionnaire consistently measure the intended constructs of knowledge and perception.

Table III: Summary of reliability analysis for MRI and nuclear imaging safety risk questionnaire on KR-20

Items	Reliability test result	
	MRI Safety Risk Questionnaire	Nuclear Imaging safety risk questionnaire
K	26	20
Σpq	2.50	1.68
σ	9.35	5.09
KR-20	0.76	0.71
Interpretation	Acceptable reliability	Acceptable reliability

Table III summarizes the reliability analysis for the MRI and nuclear imaging safety risk questionnaires, calculated using the KR-20 coefficient. K represents the number of items in the questionnaire, Σpq is the sum of the product of the proportion of correct and incorrect responses for all items, and σ^2 is the variance of the total test scores. KR-20 values of 0.76 and 0.71 indicate acceptable reliability for the MRI Safety Risk Questionnaire and the Nuclear Imaging Safety Risk Questionnaire, respectively, based on the threshold of 0.7 for acceptable internal consistency. These results demonstrate the reliability of the questionnaires for assessing safety risks among the target population.

The nuclear imaging safety risk questionnaire also underwent KR-20 reliability testing with 20 randomly selected participants (10 from each country). The KR-20 coefficient for this questionnaire was 0.71, which is within the acceptable range for reliability (Table II). This indicates that the questionnaire items reliably measure knowledge and awareness related to nuclear imaging safety.

Descriptive Analysis of Knowledge and Perception towards MRI safety risk

In addition to the reliability testing, descriptive analysis was conducted on the full sample of 109 participants to determine overall levels of knowledge, perception, and awareness regarding MRI and nuclear imaging safety risks. The descriptive analysis revealed that 16.5% of participants demonstrated low knowledge of MRI safety, while the majority (67%) exhibited a moderate level of knowledge, and 22% had good knowledge (see Fig. 1). In terms of perception, 7.3% of participants showed low perception, 72.5% were at a moderate level, and 20.2% demonstrated good perception regarding MRI safety (see Fig. 2).

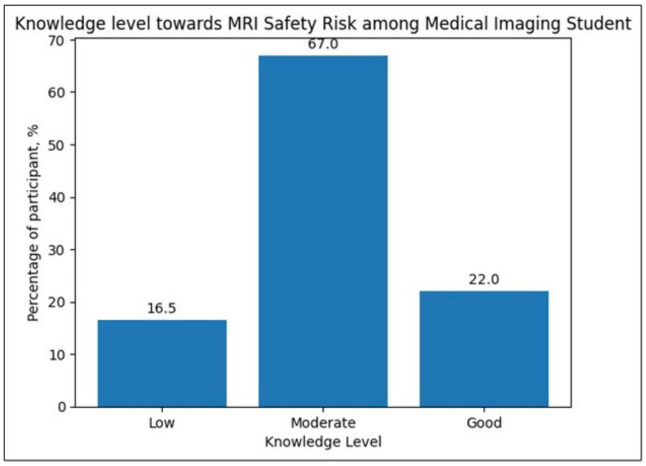

Fig. 1 : Knowledge level towards MRI safety risk among medical imaging student in Malaysia and Indonesia

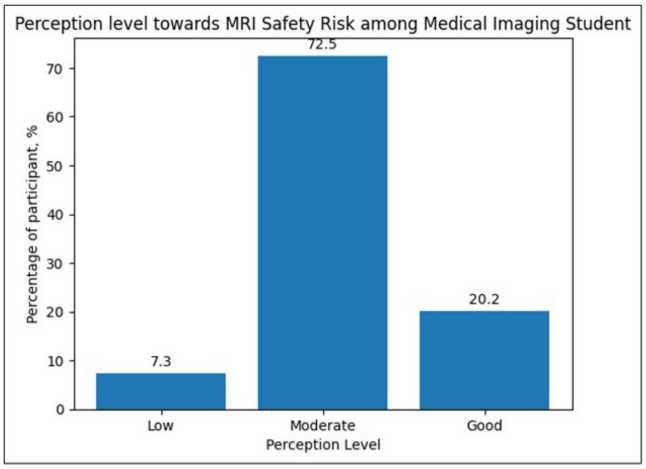

Fig. 2 : Perception level towards MRI safety risk among medical imaging student in Malaysia and Indonesia

Descriptive Analysis of Knowledge and Awareness towards Nuclear Imaging Safety Risk

For nuclear imaging safety, only 0.9% of participants exhibited low knowledge, whereas 92.7% had a moderate level of knowledge, and 6.4% demonstrated good knowledge (see Fig. 3). Awareness levels showed that 2.8% of participants had low awareness, 86.2% were at a moderate level, and 11% displayed good awareness of nuclear imaging safety risks (see Fig. 4)

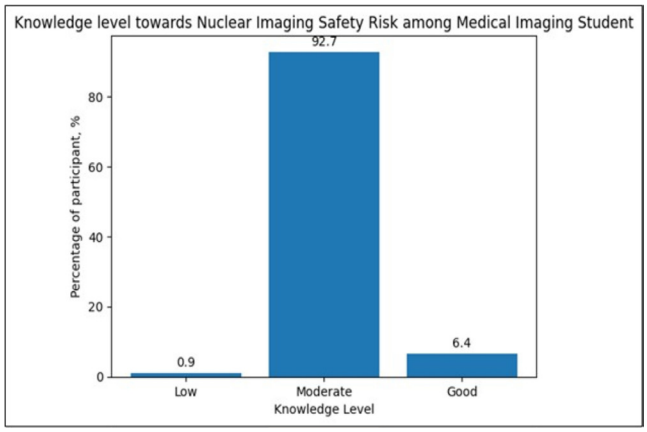

Fig. 3 : Knowledge level towards nuclear imaging safety risk among medical imaging student in Malaysia and Indonesia

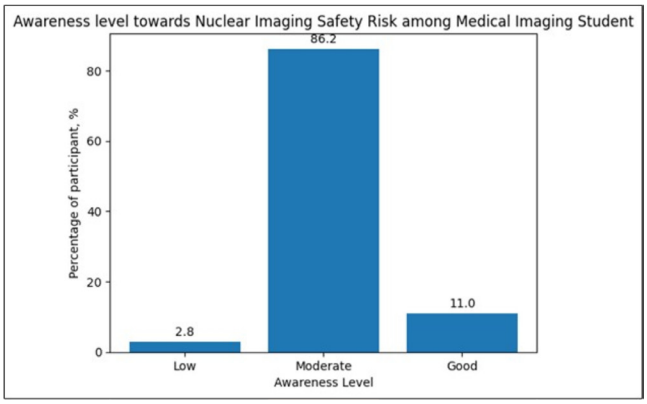

Fig. 4 : Awareness level towards nuclear imaging safety risk among medical imaging student in Malaysia and Indonesia

DISCUSSION

This pilot study assessed the internal consistency of a newly adapted and modified questionnaire designed to measure knowledge, perception, and awareness of safety risks in MRI and nuclear imaging among medical imaging students from Malaysia and Indonesia. Ensuring the reliability of this instrument is essential for its effective application in both educational and clinical contexts, as it provides a tool to gauge students' preparedness in handling these imaging modalities' inherent safety risks.

In this study, the KR-20 scores for the MRI and nuclear imaging questionnaires were 0.76 and 0.71, respectively, both within the acceptable range. Although these scores fall short of the ideal threshold of 0.80 or higher, they indicate respectable internal consistency, suggesting that the questionnaires reliably measure the intended constructs. As previous studies have demonstrated, a KR-20 coefficient of around 0.70 can still indicate satisfactory reliability in pilot studies, supporting the questionnaire's preliminary quality and its potential for broader application (14). Higher KR-20 values signify greater internal consistency, a critical quality for tools intended for educational research (15). Reliability scores above 0.80 are generally preferred for high-stakes assessments, while scores below 0.70 may necessitate further refinement before such applications.

The reliability demonstrated by this pilot study supports the questionnaire's utility in ongoing research and practice. The KR-20 values obtained suggest that the items are well-correlated, collectively providing a dependable measure of knowledge and perception of MRI and nuclear imaging safety among medical imaging students. This validation process contributes to the study's credibility and supports the use of KR-20 as an effective measure of internal consistency for binary data, especially in contexts where Cronbach's alpha is less applicable (16).

In addition to reliability testing, a descriptive analysis was conducted on the full sample of 109 participants, providing a preliminary result on a broader understanding of students' baseline knowledge, perception, and awareness levels regarding MRI and nuclear imaging safety. For MRI safety, while only a small proportion of students (16.5%) demonstrated low knowledge, the majority (67%) showed a moderate level of understanding, and 22% were categorized as having good knowledge. This distribution indicates that although students possess a basic understanding of MRI safety, there are gaps in advanced knowledge that could be improved through targeted educational interventions. Interestingly, this outcome differs from previous study, such as Alelyani et al. (2021), which reported that healthcare workers had low knowledge about MRI safety risks (17). This difference may be attributed to the participants in our study being medical imaging students who have already completed MRI coursework. Nonetheless, the moderate knowledge level observed still warrants attention to ensure comprehensive understanding. The perception scores were predominantly in the moderate range, with 72.5% of participants falling into this category. Only 20.2% demonstrated good perception scores, highlighting potential areas for improvement in safety training focused on MRI risks. This outcome aligns with findings

from a previous study by Abd Aziz et al. (2022), where healthcare workers also reported moderate perceptions of MRI safety risks (7). Although the respondents in our study were medical imaging students, not healthcare professionals, the moderate perception levels may be attributed to their exposure to the MRI environment during their training.

For nuclear imaging safety, the majority of students (92.7%) demonstrated moderate knowledge, with only 6.4% achieving a good knowledge level. This indicates that students may have limited understanding of specific safety practices, such as handling radiopharmaceuticals and adhering to radiation protection protocols. This result is consistent with findings from Dhoodhat (2016), where the highest proportion of respondents, including medical students and faculty members, also showed moderate knowledge levels (11). Awareness of nuclear imaging safety risks was similarly moderate, with 86.2% of students falling into this category and only 11% displaying high awareness. This highlights a need for curricular improvements, as nuclear imaging involves unique safety risks that may not be fully understood by students. However, this finding contrasts with Dehghani (2014), where the majority of hospital staff demonstrated high awareness (12). This difference may be attributed to the fact that our study focused on students, whereas Dehghani's study involved experienced hospital staff.

These descriptive findings underscore the importance of integrating practical safety education into medical imaging curricula. The lower levels of knowledge and awareness, particularly in nuclear imaging, suggest that students may benefit from enhanced experiential learning opportunities, such as hands-on training in safety protocols. Such training could improve their readiness to handle real-world safety challenges in clinical environments. Additionally, the moderate levels of knowledge and awareness observed across both MRI and nuclear imaging highlight the need for continued evaluation of educational effectiveness, ensuring that students are adequately prepared to manage safety risks associated with advanced imaging technologies.

Overall, this study suggests that while students possess a foundational understanding of imaging safety, there is room for improvement, particularly in nuclear imaging. By identifying specific areas where knowledge and awareness are lacking, educators can better tailor their teaching strategies to address these gaps, ultimately enhancing student preparedness for clinical practice.

CONCLUSION

This study developed and validated questionnaires to assess knowledge, perception, and awareness of MRI and nuclear imaging safety among medical imaging students in Malaysia and Indonesia. The reliability analysis using Kuder-Richardson Formula 20 (KR-20) yielded acceptable reliability coefficients for both questionnaires, confirming their suitability for further research and educational application. Descriptive analysis revealed that while most students demonstrated moderate knowledge and awareness of MRI and nuclear imaging safety, there were notable gaps in advanced knowledge and high-level awareness, particularly for nuclear imaging. These findings align with some prior research, highlighting that even students with theoretical exposure may require more targeted training to fully grasp safety practices.

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REFERENCES

1. Inaguma K, Kotani T, Kishida S, Sakuma T, Ueno K, Iijima Y,et al. Medical Accidents Related to Ferromagnetic Objects Brought into the MRI Room: Analysis of the National Multicenter Database by Orthopedic Surgeons. Spine Surg Relat Res. 2022;7(1):96-102. doi: 10.22603/ssrr.2022-0110. PMID: 36819626;
2. Kihlberg J, Hansson B, Hall A, Tisell A, Lundberg P. Magnetic resonance imaging incidents are severely underreported: a finding in a multicentre interview survey. Eur Radiol. 2022;32(1):477-488. doi: 10.1007/s00330-021-08160-w.
3. Jarosz B. Bay Area nurse crushed in MRI accident highlighting safety concerns. KTVU 2023
4. Heston TF, Tafti D. Nuclear Medicine Safety. StatPearls. Treasure Island (FL): StatPearls Publishing; 2024
5. Martin CJ. A survey of incidents in radiology and nuclear medicine in the West of Scotland. Br J Radiol. 2005 Oct;78(934):913-21. doi: 10.1259/bjr/20111483. PMID: 16177014.
6. Ali A, Mohammed MH, Musaad MA, Muhammad AA, Turkey R, Nouf A, Wael A, et al. Evaluation of awareness and knowledge regarding MRI safety among students in the faculty of applied medical science at Jazan University. Journal of Radiation Research and Applied Sciences. 2023;16(4)
7. Abd Aziz NNS, Che Zakaria WFW, Mohamad Yamin,LS. Assessment of knowledge and perception toward magnetic resonance imaging (MRI) safety among healthcare workers. Healthscope: The Official Research Book of Faculty of Health Sciences, UiTM, 2022; 5(1), 42-47.
8. Swee KK. Southeast Asia's Big Export to the World: Health Professionals. Thinks Global Health, Trade; 2019

9. Toyin-Thomas P, Ikhurionan P, Omoyibo EE, et al. Drivers of health workers' migration, intention to migrate and non-migration from low/ middle-income countries, 1970–2022: a systematic review. BMJ Global Health. 2023;8:e012338.
10. Anselmi P, Colledani D, Robusto E. A Comparison of Classical and Modern Measures of Internal Consistency. Front Psychol. 2019;10:2714.
11. Dhoodhat, S. Assessment of doctors in training - at two academic hospitals - knowledge of the basic principles and clinical applications of nuclear medicine. 2016. https://wiredspace.wits.ac.za/items/c00ad667-d4b2-4604-9547-551b35f87154
12. Dehghani, Ali. (2015). Radiation safety awareness amongst staff and patients in the hospitals. International journal of occupational and environmental health. 6. 114-119.
13. Naah, A., B. Mayeem, A. Adjei, and T. Aquinas Ossei Anto. "Assessing Senior High School Science Students' Planning Skills in Selected Topics from The Integrated Science Syllabus." Int. J. Sci. Res. Manag. 6, no. II (2018): 721-778. https://doi.org/10.18535/ijsrm/v6i11.el01
14. Sabri SB,Idris S. (). Item Analysis of Student Comprehensive Test for Research in Teaching Beginner String Ensemble Using Model Based Teaching Among Music Students in Public Universities 2013.
15. Wombacher, K. Reliability, Kuder Richardson Formula. In M. Allen, (Ed.), The SAGE Encyclopedia of Communication Research Methods. Sage Publications. 2018
16. Setyaedhi HS. Comparative Test of Cronbach's Alpha Reliability Coefficient, KR-20, KR-21 and Split-Half Method. Journal of Education Research and Evaluation, 2024 :8(1): 47–57. https://doi.org/10.23887/jere.v8i1.68164
17. Magbool A, Mohammed A, Sultan A, Ali A, Ahmad JA, Abdullah AA, et al, Saudi Arabian Health Workers' Perception and Attitudes Toward Magnetic Resonance Imaging Safety. Journal of Radiology Nursing. 2021: 40(3):279-285. https://doi.org/10.1016/j.jradnu.2021.03.004.