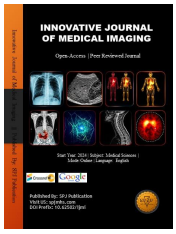
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REVIEW ARTICLE

Investigating MRI Interpretation Discrepancies: A Qualitative Study with the Public

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ABSTRACT

Background: Magnetic Resonance Imaging (MRI) is a non-invasive imaging modality widely used for diagnosing a variety of diseases. Adequate knowledge of MRI principles and safety among healthcare professionals is essential for ensuring patient safety and effective clinical practice.

Objective: This study aimed to assess the knowledge, awareness, and perceptions of paramedical students regarding MRI technology, safety, and clinical applications.

Materials and Methods: A prospective cross-sectional questionnaire-based study was conducted among paramedical students at Narayana Paramedical College, India. A validated questionnaire containing 18 structured questions was administered to 230 students, of whom 148 completed the survey. The questionnaire evaluated demographic characteristics, MRI knowledge, safety awareness, and perceptions. Data were analyzed using descriptive statistics in Microsoft Excel.

Results: Among the participants, 57.4% demonstrated excellent knowledge, while 10.1% had good knowledge of MRI. Most students (92.1%) correctly identified MRI as a radiation-free imaging modality, and 72% recognized its superior soft-tissue contrast. However, misconceptions regarding MRI safety, implant compatibility, pregnancy, and claustrophobia were identified. Approximately 66% reported anxiety related to MRI examinations, highlighting the need for improved education.

Conclusion: Although the overall knowledge of MRI among paramedical students was satisfactory, important gaps remain in MRI safety awareness and patient counselling. Enhanced educational programs and practical MRI safety training are recommended to improve professional competency and patient care.

Keywords: Magnetic Resonance Imaging, Knowledge, Paramedical Students, MRI Safety, Questionnaire Study.

INTRODUCTION

Magnetic Resonance Imaging (MRI) is one of the most advanced non-invasive diagnostic imaging modalities used in modern medicine. By utilizing strong magnetic fields, radiofrequency pulses, and the principles of nuclear magnetic resonance, MRI produces high-resolution images of soft tissues, organs, and musculoskeletal structures without exposing patients to ionizing radiation. Owing to its excellent tissue contrast and multiplanar imaging capability, MRI has become indispensable in the diagnosis, treatment planning, and follow-up of neurological, musculoskeletal, cardiovascular, abdominal, and oncological diseases. [1,2] Despite its widespread clinical application and proven diagnostic value, MRI remains poorly understood by many patients and members of the general public. Misconceptions regarding the MRI procedure, magnetic fields, radiation exposure, contrast agents, claustrophobia, noise, and patient safety frequently contribute to anxiety and reluctance to undergo imaging examinations. Such misunderstandings may negatively affect patient cooperation, increase procedure cancellations, reduce image quality due to patient movement, and ultimately

Such misunderstandings may negatively affect patient cooperation, increase procedure cancellations, reduce image quality due to patient movement, and ultimately compromise diagnostic outcomes. Effective patient education and communication are therefore essential for improving patient confidence and ensuring successful MRI examinations. [3,4] Another important challenge associated with MRI is the interpretation of imaging findings. Accurate MRI interpretation requires extensive knowledge of anatomy, pathology, imaging physics, and clinical correlation. Variations in image quality, motion artifacts, technical parameters, and observer experience may contribute to discrepancies in image interpretation. Diagnostic disagreements between radiologists or healthcare professionals can influence clinical decision-making, potentially resulting in delayed diagnosis, unnecessary investigations, inappropriate treatment, or increased healthcare costs [5,6] Beyond technical considerations, patients' understanding of MRI reports has become increasingly important in patient-centered healthcare. Many patients access their imaging reports through electronic health records before consulting their physicians, making health literacy a critical factor in interpreting medical information. Limited understanding of radiological terminology may lead to confusion, anxiety, and misconceptions regarding disease severity. Clear communication between radiologists, referring clinicians, and patients is therefore essential to improve comprehension, strengthen patient trust, and facilitate shared decision-making. [7,8]

This qualitative study aims to explore public perceptions and understanding of MRI examinations and MRI interpretation. Specifically, it investigates common misconceptions regarding MRI technology, examines how interpretation discrepancies influence patient trust and healthcare decisions, and evaluates the role of health literacy in understanding MRI findings and communication with healthcare professionals. The findings are expected to provide insights that can support patient education initiatives, improve clinician–patient communication, and enhance the overall quality and safety of MRI services.

MATERIALS AND METHODS

Study Design: A prospective cross-sectional questionnaire-based study was conducted to assess the knowledge, awareness, and perceptions of paramedical students regarding Magnetic Resonance Imaging (MRI).

Study Population: The study was carried out among paramedical students at Narayana Paramedical College, India. A total of 230 students were invited to participate, of whom 148 students completed the questionnaire and were included in the final analysis. Students from non-paramedical programs and departments were excluded from the study.

Data Collection: Data were collected using a validated, self-administered questionnaire comprising 18 structured questions. The questionnaire was divided into three sections: (i) demographic information, (ii) multiple-choice questions assessing knowledge of MRI principles, safety, and applications, and (iii) questions evaluating participants' perceptions and attitudes toward MRI examinations. Before data collection, participants were informed about the objectives of the study, and informed consent was obtained. Participation was voluntary, and anonymity and confidentiality were maintained throughout the survey.

Data Analysis: The collected data were entered and analyzed using Microsoft Excel. Descriptive statistical methods, including frequencies, percentages, and graphical representations, were used to summarize demographic characteristics and questionnaire responses. Charts and graphs were generated using Microsoft Excel to facilitate clear presentation and interpretation of the study findings.

Ethical Considerations: Participation was voluntary, and informed consent was obtained from all participants before the survey. Participant confidentiality and anonymity were maintained throughout the study, and all data were used exclusively for research purposes.

RESULTS

A total of 230 paramedical students were invited to participate in this prospective cross-sectional survey, of whom 148 students completed the questionnaire, resulting in a response rate of 64.3%. The study population comprised 99 (66.9%) male and 49 (33.1%) female participants (Figure 1). The mean age of the participants was 30 years, with the majority (94%) belonging to the 28–34 years age group, indicating that most respondents were young adults pursuing paramedical education.

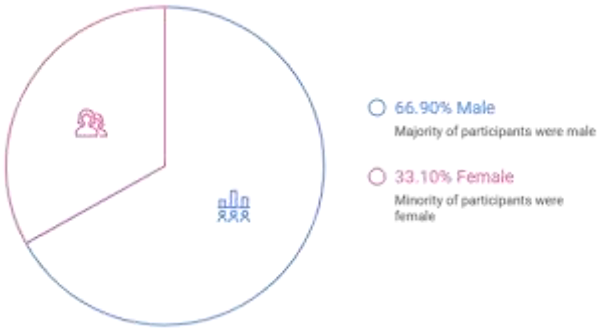


Figure: 1. Gender Distribution of Survey Participants

Assessment of MRI knowledge revealed varying levels of understanding among the participants. Figure 2 illustrate, overall MRI Knowledge Assessment and Awareness, 85 students (57.4%) demonstrated excellent knowledge, while 15 students (10.1%) exhibited good knowledge regarding MRI principles, applications, and safety. Conversely, 30 participants (20.3%) had insufficient knowledge, and 18 participants (12.2%) demonstrated poor knowledge, indicating that nearly one-third of the respondents possessed inadequate understanding of MRI concepts. Participants showed a high level of awareness regarding the fundamental purpose of MRI, with 92.1% correctly

identifying MRI as a diagnostic modality used to produce detailed images of internal body structures without the use of ionizing radiation. When questioned about the advantages of MRI over other imaging modalities, 72% correctly recognized its superior soft-tissue contrast resolution as its principal advantage, while a smaller proportion identified its multiplanar imaging capability and excellent diagnostic accuracy for neurological and musculoskeletal disorders.

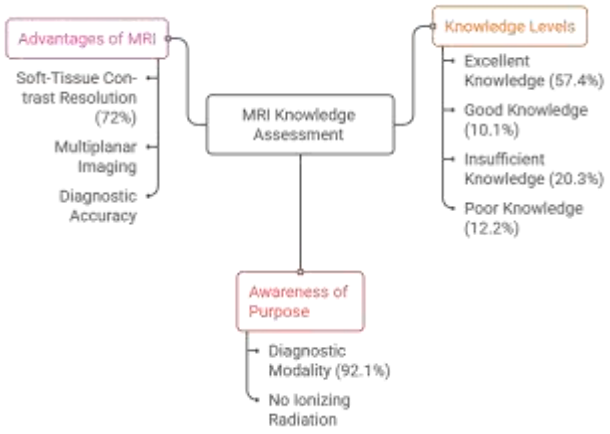


Figure: 2. MRI Knowledge Assessment and Awareness

Despite demonstrating satisfactory overall knowledge, several misconceptions regarding MRI safety were identified. Approximately 66% of participants reported anxiety or fear associated with MRI examinations, primarily due to uncertainty regarding the procedure, enclosed scanner environment, loud acoustic noise, and prolonged examination time. Furthermore, only 23.4% correctly recognized that titanium implants are generally MRI-compatible under appropriate conditions, suggesting inadequate awareness regarding MRI-safe metallic implants and implant screening procedures. Knowledge regarding patient safety during MRI examinations varied considerably. About 72.3% of participants correctly identified claustrophobia as one of the most common challenges experienced by patients undergoing MRI. However, responses concerning MRI safety during pregnancy, the use of ionizing radiation, contraindications related to implanted medical devices, and the invasive nature of MRI demonstrated notable inconsistencies, indicating persistent misconceptions among a substantial proportion of respondents.

Participants also expressed differing opinions regarding strategies for improving patient comfort during MRI examinations. Nearly 48.2% believed that allowing patients, particularly children, to sleep during the procedure could reduce anxiety and motion artifacts, whereas 25.6% suggested that listening to music would improve patient relaxation and cooperation. Other respondents recommended patient counselling, effective communication before scanning, family support, and psychological reassurance as useful measures to minimize anxiety and improve the overall MRI experience. The findings indicate that while the majority of paramedical students possess satisfactory knowledge regarding the clinical applications and advantages of MRI, important knowledge gaps remain concerning MRI safety, contraindications, implant compatibility, and patient management. These findings highlight the need for enhanced educational interventions and structured MRI safety training within paramedical curricula to improve future healthcare professionals' competency in MRI practice.

DISCUSSION

This study evaluated the knowledge, awareness, and perceptions of paramedical students regarding Magnetic Resonance Imaging (MRI) and identified both strengths and gaps in their understanding. The findings indicate that although the majority of participants demonstrated good to excellent knowledge of MRI principles and clinical applications, misconceptions regarding MRI safety, contraindications, implant compatibility, and patient management remain prevalent. These findings emphasize the importance of strengthening MRI education within paramedical curricula.

Most participants correctly recognized MRI as a non-invasive imaging modality that provides excellent soft-tissue contrast without the use of ionizing radiation. They also identified its superiority over other imaging techniques in evaluating neurological, musculoskeletal, and soft-tissue disorders. However, misconceptions regarding MRI-compatible implants, MRI safety during pregnancy, and the management of patients with claustrophobia suggest that theoretical knowledge is not always complemented by adequate practical understanding. Similar findings have been reported in previous studies, which indicate that insufficient awareness of MRI safety protocols may compromise patient counselling and increase anxiety before imaging procedures. [9]

The study further revealed that fear of the unknown and the enclosed environment of the MRI scanner were the most common concerns among participants. Claustrophobia was recognized by most respondents as a major challenge during MRI examinations, while strategies such as patient counselling, music therapy, and relaxation techniques were considered effective in improving patient cooperation. These findings highlight the essential role of radiographers and other healthcare professionals in educating patients before MRI examinations to reduce anxiety, improve compliance, and minimize motion-related image artifacts. Although the overall level of knowledge was satisfactory, the presence of participants with insufficient or poor knowledge indicates the need for regular educational interventions, practical demonstrations, and structured MRI safety training. Incorporating simulation-based learning, case-based discussions, and updated MRI safety guidelines into paramedical education may improve students' confidence, clinical competence, and ability to communicate effectively with patients undergoing MRI examinations. [10-12]

CONCLUSION

The present study demonstrates that paramedical students possess a generally satisfactory understanding of Magnetic Resonance Imaging and its clinical applications; however, significant knowledge gaps remain regarding MRI safety, contraindications, implant compatibility, and patient counselling. Addressing these deficiencies through comprehensive educational programs, hands-on training, and continuous professional development is essential to enhance patient safety and diagnostic quality. Improving MRI-related knowledge among future healthcare professionals will facilitate effective patient communication, reduce misconceptions and anxiety associated with MRI examinations, and ultimately contribute to improved patient care and clinical outcomes.

DECLARATIONS

Ethical Approval: The study was conducted in accordance with institutional ethical guidelines. Ethical approval was obtained from the Institutional Ethics Committee before commencement of the study.

Informed Consent: Written informed consent was obtained from all participants prior to their inclusion in the study. Participation was voluntary, and participants had the right to withdraw from the study at any stage without any consequences.

Consent for Publication: Not applicable.

Availability of Data and Materials: The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of Interest: The authors declare that they have no conflict of interest related to this study.

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Authors' Contributions: All authors contributed substantially to the conception and design of the study, data collection, data analysis, manuscript preparation, critical revision, and approval of the final manuscript.

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