

Patients' perceptions and awareness of the safety of magnetic resonance imaging

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Abstract

Background: Magnetic resonance imaging (MRI) is a widely used diagnostic tool that relies on strong magnetic fields, radiofrequency waves, and advanced computer technology to produce detailed images of the body's internal structures. Despite being considered safe, many patients still lack adequate knowledge about MRI safety, which may contribute to increased anxiety and delays in undergoing the procedure. Understanding patient perceptions and knowledge of MRI safety is critical to improving patient experience and adherence to safety guidelines.

Methods: This study was conducted in the radiology department of a hospital. A questionnaire was distributed to 50 patients undergoing MRI scans to assess their knowledge and perceptions of MRI safety. The questionnaire collected demographic data, awareness of MRI preparation, safety measures, and emotional responses before and during the procedure.

Results: The study found that 58% of patients were aware of how to prepare for an MRI scan, while only 8% knew about MRI magnetic zones. Awareness regarding the prohibition of jewelry during MRI scans was low, with only 28% of patients understanding the reason behind it. Regarding safety concerns, 42% of participants considered MRI safe for pregnant women, while 34% believed it was unsafe. Most patients (76%) understood that MRI is primarily used for diagnosis, but 92% reported discomfort from the MRI noise. Emotional responses before the scan included fear (30%) and anxiety (14%), while during the scan, 42% felt uncomfortable.

Conclusion: The study reveals significant gaps in patient knowledge about MRI procedures, particularly regarding safety measures, preparation, and restrictions. Healthcare professionals need to improve communication and education efforts to enhance patient awareness, reduce anxiety, and ensure a safer and more comfortable MRI experience for all patients.

Introduction

Magnetic resonance imaging (MRI) is a widely used, non-invasive diagnostic tool that relies on strong magnetic fields, radiofrequency waves, and computer technology to create detailed images of the body's internal structures, particularly soft tissues (1). The American College of Radiology (ACR) guidelines, outlined in their 2013 document on MR safety practices, recommend categorizing areas around the MRI scanner into four distinct zones.

Zone I refers to all areas accessible to the general public where the magnetic field does not pose any risk, such as the MRI department entrance. Zone II includes areas where patients are generally supervised by MRI personnel, such as reception areas, changing rooms, and MRI screening rooms. Zone III is restricted by physical barriers, including coded access doors, and

is designated for approved MRI staff and patients who have been screened for MRI compatibility. The MRI control room is typically located in Zone III.

Zone IV is the MRI room itself, where the magnet is located, and entry to this zone is only possible through Zone III. The walls of Zone IV are designed to contain the 0.5 mT (or 5 Gauss) fringe field line of the magnet (2, 3).

While MRI is generally considered safe, potential risks associated with the use of strong magnetic fields and radiofrequency waves exist. Despite efforts to educate patients about MRI safety, many still lack adequate understanding and awareness of the risks and safety protocols involved in the procedure. This lack of knowledge can contribute to patient anxiety, stress, and delays in undergoing MRI scans (4).

The perception of MRI safety among patients is a growing concern in healthcare, prompting several studies that have assessed patients' understanding of MRI safety. These studies emphasize the need for better communication strategies to enhance patient awareness and understanding of MRI safety. As MRI technology continues to advance, it is crucial to keep patients informed about the latest safety measures and developments in MRI procedures (5).

Understanding MRI safety and the associated risks is essential for patients, as it can impact their decision to undergo the procedure and their adherence to safety guidelines. Therefore, it is vital for healthcare professionals to ensure that patients are well-informed about the risks and benefits of MRI and provide the necessary support to help them make informed choices regarding their healthcare (6).

Methods

This research utilized a questionnaire approach to assess the knowledge and perception of MRI safety among patients. The study was carried out in the radiology department, focusing on patients who came for MRI scans.

Data was gathered from patients undergoing MRI scans. A questionnaire was provided to patients within the radiology department, where the purpose of the research was clearly explained to each participant.

The study collected demographic information, including age, sex, and marital status, along with data on the participants' knowledge and perceptions regarding MRI safety.

Inclusion Criteria

All patients who voluntarily agreed to participate and were referred for an MRI scan were included in the study.

Exclusion Criteria

Patients who were not interested in participating or were unavailable, including pediatric patients, were excluded from the study.

Statistical Analysis

The collected data was organized, summarized in tables and graphs, and analyzed using statistical tests in Excel.

Results

In this study, participants were categorized into eight different age groups (Table 1). The first group, comprising individuals aged over 20 years, included 2 patients (4%). The second group, 21-30 years, had 9 patients (18%). The third group, 31-40 years, consisted of 15 patients (30%). The fourth group, 41-50 years, included 8 patients (16%). The fifth group, 51-60 years, had 6 patients (12%). The sixth group, 61-70 years, also included 8 patients (16%). The seventh and eighth groups, 71-80 years and 81-90 years, each consisted of 1 patient (2% in each group).

The gender distribution was as follows: 23 female patients (46%) and 27 male patients (54%) across the various age groups. Table 2 shows the gender distribution, patient numbers, and the percentage of responses for each question.

When asked about how to prepare for an MRI procedure, 29 patients (58%) answered affirmatively, while 21 patients (42%) did not know how to prepare. Only 4 patients (8%) were aware of MRI magnetic zones, while the majority, 92%, were not familiar with these zones.

Regarding the restriction on wearing jewelry during MRI, 14 patients (28%) understood the reasoning behind it, while 36 patients (72%) were unaware of the restriction.

When asked whether MRI is safe for pregnant patients, 21 patients believed it was safe, 17 patients (34%) disagreed, and 12 patients were unsure.

Concerning MRI safety with a cardiac pacemaker, 22% of patients believed it was safe, 30% thought it was not, and 48% were unsure.

When asked whether MRI diagnoses or treats diseases, 38 patients (76%) believed MRI was used for diagnosis only. No patients selected "treat," and 10 patients (20%) thought MRI both diagnoses and treats. Only 2 patients (4%) were uncertain and chose the "don't know" option.

Regarding discomfort from MRI noise, 46 patients (92%) reported feeling uncomfortable due to the noise, while 4 patients (8%) did not find it troubling.

Before undergoing an MRI scan, 8 patients (16%) reported feeling panic, 5 patients (10%) felt both fear and panic, 3 patients (6%) experienced fear and anxiety, and 15 patients (30%) solely felt fear. Seven patients (14%) felt only anxiety, while 2 patients (4%) experienced regret. Ten patients (20%) did not report any emotional discomfort before the scan.

During the MRI scan, 1 patient (2%) felt a combination of panic, discomfort, and anxiety. Four patients (8%) selected two emotions, specifically "uncomfortable" and "anxiety." The majority, 21 patients (42%), chose "uncomfortable." Five patients (10%) selected "anxiety," while only 1 patient reported both panic and anxiety. Additionally, 5 patients (10%) felt panic due to the prolonged duration of the MRI scan. Lastly, 13 patients (26%) reported feeling comfortable during the procedure.

Table 1: Age Group Allocation of Patients

Age Group (in Years)	N	Percentage (%)
>20	2	4.00
21-30	9	18.00
31-40	15	30.00
41-50	8	16.00
51-60	6	12.00
61-70	8	16.00
71-80	1	2.00
81-90	1	2.00
Total	50	100.00

Table 2: Gender Ratio of Patients

Gender	N	Percentage (%)
Male	27	54.00
Female	23	46.00
Total	50	100.00

Discussion

This study aimed to assess the knowledge and perceptions of 50 patients regarding MRI procedures. Among the participants, the majority were male (27, 54%), while females made up a smaller portion of the sample. Regarding MRI preparation, 58% of patients reported being aware of how to prepare for the procedure, while 42% were uninformed. These findings align with a study by Magbool et al., where 19% of patients were knowledgeable about MRI preparation, with a large portion (81%) lacking awareness due to low literacy rates (5).

The awareness of the MRI magnetic zone was notably low in our study, with only 8% of patients being familiar with it. In contrast, Magbool et al. found that 70.4% of their participants knew about MRI zones, as healthcare staff, such as doctors and technicians, explained it to them (5). Similarly, when patients were asked about the safety of MRI for pregnant women, 42% believed it was safe, while 34% thought it was unsafe, and the remaining patients were uncertain. These results are consistent with those of Magbool et al., where only 19.7% considered MRI safe for pregnant women, with a majority disagreeing (5). Further studies, such as those by Shrestha et al. and Asante et al., also found that a majority of patients were uncertain or thought MRI was unsafe for pregnant individuals (4,7).

Conclusion

Approximately 58% of patients reported knowing how to prepare for an MRI, likely due to prior exposure to the procedure. Those unaware may not have had sufficient knowledge or experience with MRI scans. The low awareness regarding MRI zones (only 8% of patients) may be attributed to a lack of communication from healthcare staff, such as doctors or radiology technicians. Most patients (92%) were not informed about the magnetic zone, as radiology is not typically part of routine patient education.

Only 28% of patients understood why jewelry is prohibited in the MRI room, while 72% were unaware. This may be because they did not grasp the underlying principles of MRI or how it functions. Regarding the safety of MRI during pregnancy, 42% of patients considered it safe, possibly due to personal experiences or previous exposures, while 34% thought it unsafe. The remaining 24% were either unsure or did not answer the question, perhaps due to uncertainty or fear of providing incorrect information.

When it comes to MRI compatibility with cardiac pacemakers, 22% of patients knew it was possible, likely due to having received information from healthcare professionals. However, 30% believed it was not possible, possibly due to concerns about older pacemaker models, and 48% did not know or did not respond.

A large portion of the patients (76%) understood that MRI is used primarily for diagnosing diseases, as explained by their healthcare providers. However, 20% mistakenly believed it could both diagnose and treat conditions, likely due to a lack of explanation during the procedure. Only 4% were completely unaware of its purpose.

The noise produced by the MRI machine was uncomfortable for 92% of patients, with only 8% reporting no discomfort. This high level of discomfort could be attributed to the loud, hammer-like noise generated by the MRI.

Regarding patients' emotional reactions before the procedure, 30% reported feeling fear, likely due to the unfamiliarity of the MRI procedure and the anxiety associated with its preparation. About 14% experienced anxiety, possibly because of concerns about the time-consuming nature of the procedure and the need to remain still. A smaller group (4%) felt regret, worrying about their ability to endure the scan. The remaining 20% experienced no significant anxiety or fear.

During the procedure, 42% of patients felt uncomfortable, likely due to the extended duration and the claustrophobic environment of the MRI machine. Approximately 26% reported feeling comfortable, possibly due to familiarity with the procedure or previous MRI experiences. The

remaining 32% exhibited varying degrees of discomfort, anxiety, and panic, which may have been exacerbated by claustrophobia or other physical or mental health issues that made it difficult to stay still for extended periods.

In conclusion, the study reveals that many patients are unfamiliar with key aspects of MRI procedures, including preparation, safety concerns, and the reasons behind restrictions like the prohibition of jewelry. It is essential for healthcare professionals to better educate patients about the MRI process, its potential risks, and the necessary precautions to ensure a more informed and comfortable experience for all.

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