Sensitivity: *Medium*

Bibliography: *Consider text*

Citation detection: *Reduce PlagLevel*

Whitelist: --

Abbreviations

Magnetic resonance imaging (MRI), signal-to-noise ratio (SNR), Emergency Care Research Institute (ECRI), specific absorption rate (SAR), peripheral nerves/muscle (PNS), American college of radiology (ACR), magnetic resonance safety officers (MRSO), The Royal Australian and New Zealand College of Radiologists (RANZCR), and gadolinium-based contrast agents (GBCAs).

Introduction

Magnetic resonance imaging (MRI) scanner has the advantage of showing exquisite soft-tissue contrast with an excellent signal-to-noise ratio (SNR) for studying different anatomical areas in comparison to other tomographic imaging modalities. This is achieved by using a powerful static magnetic field combined with radiofrequency pulses and a time-varying magnetic field gradient (Stafford RJ, 2020). However, MRI is not entirely safe; its features are accompanied by safety concerns and increased risks for untrained workers and patients present in the MRI environment (Stafford RJ, 2020; Westbrook C et al., 2018). The MRI ranked eighth among the top ten health device hazards according to the annual report released in 2020 by the Emergency Care Research Institute (ECRI) (Brief E, 2020).

Rapid switching gradient will stimulate the peripheral nerves/muscle (PNS) and induce an electrical current in the implanted device. Moreover, it may cause hearing loss due to a high acoustic noise especially in a rapid sequence that requires rapid switching gradient magnetic fields such as echo planner imaging (EPI) (Stafford RJ, 2020; Westbrook C et al., 2018; Grainger D, 2014;[1] ACR manual on MR safety, 2020).[1] Calculation of specific absorption rate (SAR) is an essential safety concern because the radiofrequency pulses are the main causes of tissue heating and burns in MRI (Stafford RJ, 2020; Westbrook C et al., 2018; Grainger D, 2014). In relation to these safety concerns, committees, and societies in MR safety, such as the American college of radiology

(ACR), regularly provide updated recommendations and guidelines about different aspects in the field of MR safety (such as MRI personnel, screening, gowning, magnetic resonance safety officers (MRSO), who have the proper training for ensuring safety practices in MRI unit, etc.) to keep everyone in the MRI area safe (ACR manual on MR safety, 2020).

[0] Owing to the possible hazards in the MRI environment, The Royal Australian and New Zealand College of Radiologists (RANZCR) specifically recommends that the staff members who work out of hours should not be alone (RANZCR, 2017). The ACR strongly recommends that whenever the patients are in the MRI unit, a minimum of two MR technologists or one MR technologist in the presence of another MR personnel should be available in the MRI Zone II (patient preparation area) through Zone IV (MRI scanner room) at all times due to the high possibility of risk; [1] the communication between the two MRI personnel must be direct and within earshot of each other at all times (ACR manual on MR safety, 2020). [1] Therefore, working alone and away from sight, not being within earshot of the other person and without close or direct supervision in the MRI environment is associated with the increased likelihood of risks. These risks could affect the safety of workers and patients because it makes getting help during emergencies more difficult (Dewland TA et al, 2013; CCOHS, 2020). [0] Some issues related to MR technologists working alone include but are not limited to: MR Technologists tiredness, missing some questions, forgetting patient weight registration leads to wrong calculation of gadolinium-based contrast agents (GBCAs) or (SAR) calculation, difficulty dealing with patient anxiety and aggressive behaviors, a missing object that increases the projectile risk, dealing with quenching, electrical hazard and any other emergency situations (Brief E, 2020; Pyke LM, 2007; Liu CY, 2019).

This study focuses on the current situation of MR technologists working in southern regions of Saudi Arabia to assess the frequency of lone working and any related hazards through analyzing the data collected from the self-report questionnaire.

Materials and Methods

A cross-sectional study uses an online questionnaire distributed to 92 MR technologists from February to March 2021. This study included all MR technologists from both genders with different qualifications levels with at least six months of experience in MRI with their agreement to participate in the study. The study covered 17 public and 6 private hospitals in Southern Saudi Arabia regions (Albaha, Asir, Jazan and Najran regions).

The questionnaire items were derived from previous studies and literature review (Dewland TA et al, 2013; Liu CY, 2019; Alsaleem SA, 2018), it consisted of 20 questions divided into six sections that vary between Yes/No, multiple-choice and 5-points Likert scale questions. It included items about participants demographic information, experience with lone working, department facilities, awareness about lone working regulations according to ACR, training in MRI safety, the efficiency of the MRI unit for lone MR technologists, the effect of this type of work on self-confidence, preference of working with other MR technologists, and experience with safety accidents/mistakes events. Exclusion criteria were the following: MR technologists with less than six months of experience, incomplete questionnaire, and participants that do not agree to participate in the study.

The questionnaire was piloted on a small sample outside the study population to measure validity and reliability before the main distribution takes place. The questionnaire had a Cronbach's alpha of 0.803, thereby indicating an adequate level of inter-item reliability.

The numbers of MR technologists in each hospital were collected through phone calling the head unit in each hospital to quantify the research community in order to measure the response rate later.

The data were analyzed by using SPSS software Version 25.0 through descriptive (e.g. mean, standard deviation, frequencies) and inferential statistics ways (Fisher's exact test, Spearman's correlation, Kruskal Wallis and Mann-Whitney). A *p-value* ≤ 0.05 was considered statistically significant. Microsoft Excel 2010 was used in data visualization (graphs and figures).

Ethical approval was acquired from the regional committee for research ethics on Feb 4, 2021. It is numbered 2-2-2021, with registration number H-06-B-091 from the directorate of health affairs in the Asir region.

Results

A total of 79 MR technologists in the Southern regions out of 92 invited to participate in this study responded to this questionnaire; after applying exclusion criteria, only 73 MR technologists (71% male; [6] 29% female) were involved in the study. Thus, the response rate was 79%.

Table 1 shows the descriptive analysis for participants' demographic data and departments' information. In terms of MRI experience, a majority of participants have an experience of 4 to 10 years (54.8%) in MRI; 84.9% work in the public hospital. Among hospitals, there are less than five (with a minimum of two) MR technologists working in the MRI unit (61.6%). On average, the MR technologists are handling between 10 to 16 patients daily. Most of the participants stated that the MRSO is unavailable in their departments (68.5%), but the policies for reporting safety incidents that occur in the MRI unit are available (83.6%). Regarding the safety training, 89% of MR technologists received training regarding first aids, while only 57.5% received training in MRI safety.

A question that measures the awareness about the ACR recommendations for the lone MRI workers shows that 50.7% do not know about this regulation. In addition, 20.5% are wrongly informed where they agree with the idea that working alone in the MRI unit is optional or depends on the person's desire to work alone. In comparison, only 28.8% are aware of the regulations that prevent the MRI technologist from working alone in the MRI unit.

Table 1. shows the degree of participants' awareness in relation to gender, qualification and experience. The level of awareness is statistically significant with qualification and the years of experience in MRI (*p-value* 0.000;0.024, respectively).

By applying the Mann-Whitney test to find the significant difference between each group, the awareness between diploma and master; and between bachelor and master are significant (*p-value* 0.001; 0.000, respectively). [11] Furthermore, there is a significant difference in the level of awareness between those who have experience in MRI for 4-10 years vs. 10 years (p-value 0.003); and those with 1-3 years vs. 10 years (p-value 0.011). There is no significant difference between genders in level of MRI safety awareness. To sum up, Figure 1, shows how MR technologists with higher education levels and years of experience tend to have a good awareness about the regulation governing the lone working, as it is associated with higher mean rank.

The MR technologists in southern Saudi Arabia have an extensive experience with lone working (83.6%, 61/73). They displayed a positive reaction toward the efficiency of arrangements in their departments for getting an immediate assessment in case of emergencies and reporting any accident (mean 3±0.9; 3.07±0.8; respectively). On the other hand, working as an MR technologist in the presence of another medical staff (such as nurses) is also common between the participants (78%, 57/73).

The study measures the daily rate of working using 4-points Likert questions scaled from Rarely to Always; it shows working as lone MR technologist (n=61), and an MR technologist with the presence of another medical staff (n=57) for "sometimes" is happening daily (57.4%;57.9%, respectively) (Figure 2). [0]

The rate of lone working is statistically significant between workplaces (private and public) (p-value 0.044); the MR technologists in private hospitals tend to experience a higher daily rate of lone working where they have a higher mean rank than those working in the public hospital (mean rank 40.25; 29.19, respectively) (Table 3).

The result shows that the level of self-confidence among MR technologists is high either working alone (87.8%, n=61/73) or working in the presence of another medical staff (such as nurses) (77%,

n=57/73); and 79% out of 73 participants preferred to work with another MR technologist (mean score 4.04±1).

Regardless of the higher self-confidence, lone MR technologists express a greater amount of concerns and accidents/mistakes about different safety aspects (65.57%;64.3%, respectively), (mean score 2.25±0.9; 1.95±0.6, respectively). However, comparing with the situation of working as an MR technologist in the presence of another medical staff; the concerns and accidents/mistakes are lower (59.65%;54.8%, respectively), with mean score (2.1±0.9;1.8± 0.7, respectively) (Figure 3).

More details are shown in Table 4. The rate of working alone is statistically significant added with concerns such as patient safety, presence of a person in MRI unit, any accident affecting the safety, and fear of being subjected to patient's and relative's aggressive behavior (p-value 0.05). At the same time, there is no statistical significance about dealing with patients' fears and fears from feeling isolated (p-value 0.05).[13] Additionally, there is no statistically significant difference between the rate of work as an MR technologist in the presence of another medical staff and concerns (p-value 0.05).

Spearman's statistical result shows that there is a significant positive correlation between the rate of lone working and concern from patient's aggressive behavior (rho=0.323; p-value 0.011).

Even though the lone MR technologists experience higher accidents/mistakes than the situation of working in the presence of another medical staff, the results show a statistical significance in both working situations with forgetting registration of patient weight, forgetting some questions in the safety questionnaire and feeling tired. This may affect safety (p-value 0.05). Whereas, the experience with projectile danger is only statistically significant while working in the presence of another medical staff (such as nurses) (p-value 0.001) (Table 4).

Discussion

Magnetic resonance imaging (MRI) machines vary in design and in their range of magnetic field strengths to achieve higher performance with excellent SNR (Westbrook C et al., 2018). However, MRI is not entirely safe and if untrained workers or lone MR technologists are not provided with close or direct supervision in the MRI environment, it may lead to an increase in risks and affect the safety of workers and patients (Stafford RJ., 2020; Westbrook C et al., 2018; Dewland TA et al., 2013).

To keep the MRI environment safe in light of these risks, the presence of MRSO is a good step that should be promoted in every department where the MRI technologist can be an MRSO and responsible for monitoring safety practices at all times. It is good to appoint an MRSO in duty (ACR manual on MR safety, 2020). The study results showed that most of the participants stated that MRSO was unavailable in their departments and that they received less training in MRI safety compared to first aid. This is possibly due to the Ministry of Health in Saudi Arabia requires health workers to obtain first-aid training and renew it every two years. At the same time, MRI safety training is not mandatory.

It is essential to have policies regarding safety in the MRI environment to document and report any risks in the unit, evaluate them, and prevent later occurrences. The policies for reporting safety incidents in the MRI unit were available in most facilities in our study. The participants stated the efficiency of the arrangements for providing reports about safety accidents and getting an immediate assessment in case of emergencies for lone MRI technologists. Still, the optimum presence of policies in the MRI departments was not always associated with good safety practices. This was obvious in a previous study, where most participants employed optimal policies regarding pre-MRI screening and the appropriate use of zoning systems. However, there were a relative lack of MRI-safe equipment and metal detection systems. So, it is most important to make sure practical implementation accompanies the existence of policies (Stogiannos N et al., 2020).

In confirmation of the above, and despite what participants were shown in terms of availability of policies and efficiency of regulations, this work revealed that more than two-thirds of the participants had insufficient awareness about ACR regulations related to working alone in the MRI unit. At the same time, a lower qualification level and a lesser number of years of experience in the MRI unit were significantly related to lower awareness. That was understandable since we know that a diploma provides a basic theoretical background with little to no hands-on practical experience for radiographers, resulting in inadequate awareness and skills on MRI safety issues. These results were contrary to a study that were opposite to a study that concluded that there is no relationship between MRI safety awareness, performance, and experience (Hossen M et al., 2020). A previous Saudi study that included a convenience sample of nurses from government hospitals and multiple primary health centers proved that adherence to safe practices was strongly associated with their level of awareness (Alghamdi A et al., 2021). Although awareness was limited among our study participants, they felt "high" to "complete" confidence while working alone or with other medical staff. In contrast, our result was different from a previous study that indicated that departments, such as diagnostics and laboratories, have the lowest perception of demographic confidence compared to other departments (Owens KM et al., 2018).

The defect in safety practices was not limited to a lack of awareness about the recommendations for lone workers, but it was also reflected in their work. Approximately more than four-fifth of the MR technologists in Southern Saudi Arabia had experience working alone in the MRI unit, as the results showed, contrary to the ACR and RANZCR recommendations. The daily rate of working as a lone MRI technologist was statistically significant between workplaces, with a higher rate in the private sector than in the public sector, which might be attributed to financial reasons, as indicated by a previous study (Dewland TA et al., 2013).

Many safety aspects are affected by working alone compared to working with other medical staff. As the results indicated, it was clear that the concerns of lone workers were higher than situation

of working in the presence of another staff member. This observation was similar to a previous study that reported a decrease in concerns among MR technologists when working in the presence of other healthcare professionals (Dewland TA et al., 2013). The concerns about patient safety, accidents affecting safety, and fears of being subjected to aggressive behavior from the patients and their relatives were statistically significant while working alone, but not in the presence of another medical staff. Regarding technologists' concerns about aggressive patient behaviors, a previous study in Abha city, which is one of the cities covered in our study, reported a high rate of workplace violence that comes mainly from patients' relatives, with more than half of healthcare workers reporting encounters of violence at the workplace (Tohidnia MR et al., 2019; Alsaleem SA et al., 2018).

On the other hand, lone workers did not just experience more concerns, but their encounters with accidents/mistakes while working alone in an MRI environment were also higher in general than situation of working with another medical staff member, as shown by our results. The safety accidents/mistakes, such as forgetting some questionnaire questions or the registration of the patients' weight and tiredness that may affect the safety, were statistically significant for both lone workers and technologists working in the presence of other medical staff. In contrast, the danger of projectile objects was only significant when technologists worked in the presence of other medical staff (such as nurses) in the MRI unit. Previous studies observed that higher tiredness could adversely impact mental health and increase anxiety (Dewland TA et al., 2013; Sun W, 2012). In addition, forgetting patients' weight registration may affect patients' safety because it is required to keep the SAR levels within the normal range to avoid chances of overheating and burning and to calculate contrast media dosage (Stafford RJ, 2020; Liu CY, 2019). The hazard related to projectile objects could be attributed to the limited awareness of medical staff about safety regulations in an MRI environment (Alghamdi A et al., 2021).

The situation of MR technologists working alone is accompanied by an increase in concerns and accidents/mistakes.[8] Additionally, it seems that MR technologists did not prefer to work alone, and they are usually looking for regulations to avoid lone working due to uncomfortable work experiences and fear of increased risks (CCOHS, 2020).

[8] The main limitation of this study is data collection, which relies on a self-administered questionnaire, not on the collection of events/accidents. This is due to some restrictions of the hospitals or institutions' regulations and policies that need more agreements to collect these kind of data.

Conclusions

MRI is a useful and safe diagnostic modality with no ionizing radiation hazards and it is providing high image quality for different body areas. Screening patient prior study, availability of multiple MR technologists per scanner also regular training of MR technologists and medical staff on MR safety is essential to keep higher performance and avoid any possible risks. MR technologists from Southern Saudi Arabia had high experience with lone working without presence of anybody with them. Most of the MR technologists have insufficient awareness about lone working regulations and encountered an increase in concerns and accidents/mistakes, affecting the safety of other medical staff (such as nurses). There is a need for training in MRI safety and adequate practical experience to raise the awareness of departments and MR technologists about MRI safety regulations related to lone working.

Declaration of Helsinki:

The research was completed in accordance with the Helsinki Declaration

Disclosure of funding: Authors extend their appreciation to the College of Applied Medical Sciences Research Center and Deanship of Scientific Research at King Saud University for funding this project.

Disclosure of any conflict of interest: None

Acknowledgments: We thank the College of Applied Medical Sciences Research Center and Deanship of Scientific Research at King Saud University for support and providing resources. Author Almalki acknowledges the Saudi Ministry of health for the Scholarship.[6] The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Figures

Figure 1. The awareness about the safety regulations for participants according to qualification level and years of experience using the mean rank values from the Kruskal Wallis test represented in the graph. MR technologists with higher education and experience years in MRI (master's degree and experience more than 10 years) tend to have a higher awareness about the safety regulation of lone working as they have higher mean ranks.

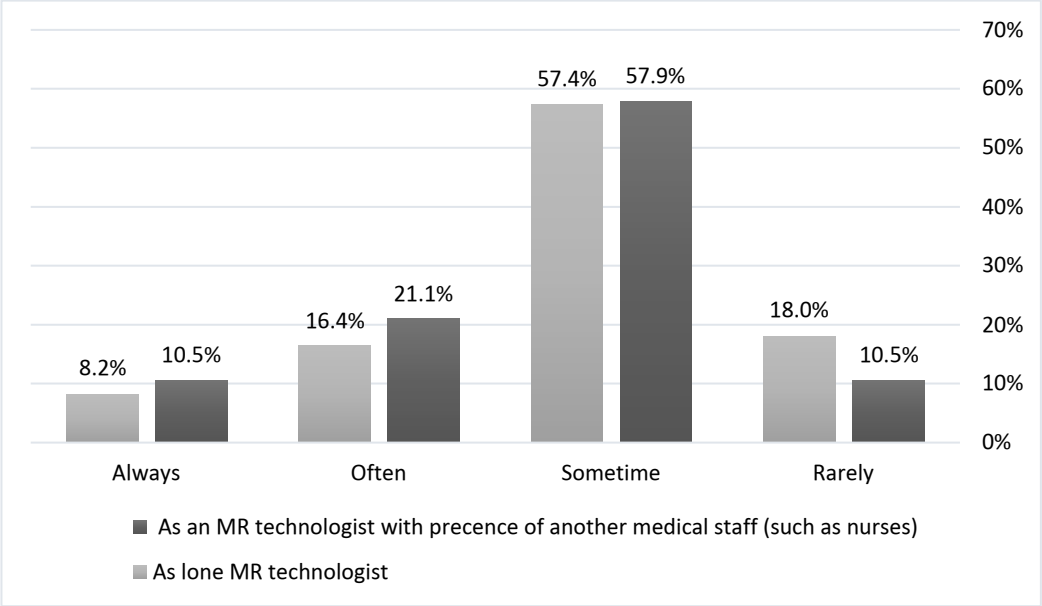

Figure 2. The rates of daily working as alone or with the presence of another medical staff is happening daily for sometimes.

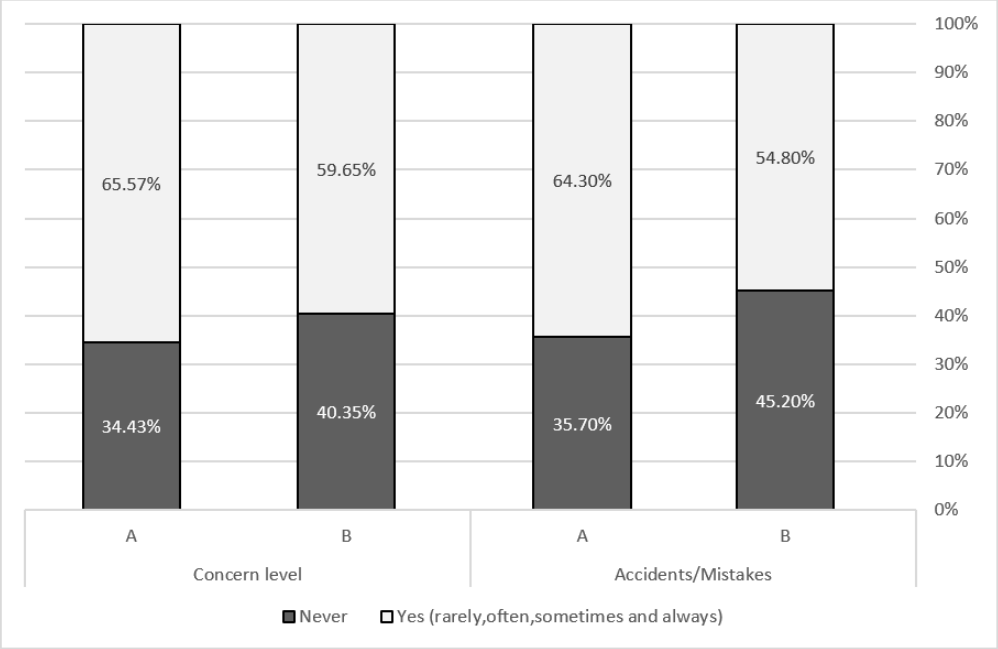

Figure 3. Comparison between the level of concerns and accidents/mistakes experienced by MR technologists while working alone(A) and with another medical staff (B). Lone MR technologists have more concerns and accidents/mistakes than situation of working with other medical staff.

Tables

Table 1. Descriptive analysis for participant demographic data and departments information

Items	**Criteria**	**Number (%)**
Experience	From 6 months to less than a year	7 (9.6)
	1-3 years	23 (31.5)
	4-10 years	40 (54.8)
	More than 10 years (10 y)	3 (4.1)
Participants from each region	Albaha	4 (5.5)
	Asir	29 (39.7)
	Jazan	25 (34.2)
	Najran	15 (20.5)
Gender	Male	52 (71.2)
	Female	21(28.8)
Workplace	Public	62 (84.9)
	Private	11(15.1)
Highest qualification obtained	Diploma degree	7 (9.6)
	Bachelor's degree	60 (82.2)
	Master's degree	6 (8.2)
Presence of MR safety officer (MRSO) in the department:	Available	23 (31.5)
	Not Available	50 (68.5)
Availability of the policies for reporting safety incidents that occur in the MRI unit:	Available	61 (83.6)
	Not Available	12 (16.4)
Number of MR Technologist working in the MRI unit	5	45 (61.6)
	5 or more	28 (38.4)
Training in first aids	Yes	65 (89)
	No	8 (11)
Training in MRI safety	Yes	41 (56.2)
	No	32 (43.8)

Table 2. The degree of participants' awareness in comparison with gender, qualification and experience.

Q. [1] According to the American College of Radiology (ACR): Working alone in the MRI unit is optional, depending on the person's desire and ability to work alone?				
In relation to:	criteria	Number of incorrect answers (%)	Number of correct answers (%)	p-value
Gender	Male	35 (67.3)	17 (32.7)	0.392[a]
	Female	17 (81)	4 (19)	
Qualification	Diploma	7 (13.5)	0 (0)	**0.000[b]** **0.001[c]** **0.000[d]**
	Bachelor	45 (86.5)	15 (71.4)	
	Master	0 (0)	6 (28.6)	
MRI experience	6 months to 1 year	4 (7.7)	3 (14.3)	**0.024[e]** **0.003[f]** **0.011[g]**
	1-3 years	19 (36.5)	4 (19)	
	4-10 years	29 (55.8)	11 (52.4)	
	10 years	0 (0)	3 (14.3)	

-([a]) Fisher exact test.
-(b) Between total qualification and awareness by Kruskal Wallis Test
-(c) Awareness between diploma and master by Mann-Whitney U
-(d) Awareness between bachelor and master by Mann-Whitney U
-(e) Between total experience and awareness by Kruskal Wallis Test
-(f) Awareness between 1-3 years and more than10 years by Mann-Whitney U
-(g) Awareness between 4-10 years and 10 by Mann-Whitney U

There is a statistically significant difference between the degree of qualification and the awareness (p-value 0.000), also between the awareness and years of experience (p-value 0.024). At the same time, there is no significant difference among the genders.

Table 3. Comparison between the workplaces and rate of daily work as alone or with the presence of other medical staff.

Based on 4-point Likert scale questions [a]	**Public (mean rank)**	**Private (mean rank)**	**H**[b]	P-value
Rate of lone working (n= 61)	29.19	40.25	4.056	**0.044**
Rate of working as the only MR technologist with the presence of another medical staff (like nurses) (n=57)	28.84	29.75	0.031	0.860
(a) This 4-points Likert scale question from (rarely to always) (b) Test statistic of Kruskal Wallis Test				

MR technologists in Private hospitals tend to work alone than those working in public hospitals as they have a higher mean rank.

Table 4. The concerns and safety accidents/mistakes events experienced by MR technologists.

Comparison between different concerns and accidents/mistakes experienced by MR technologists while they are working as: A) lone MR technologist (n= 61) B) as an MR technologist with the presence of another medical staff (like nurses) (n= 57)			H[a]	*p-value*
Concerns [b]	i. Regarding to patient safety	A	10.093	**0.018***
		B	3.444	0.328
	ii. Regarding to the safety of the persons presents in the MRI unit	A	9.833	**0.020***
		B	4.567	0.206
	iii. Any accidents that may affect the safety	A	9.422	**0.024***
		B	6.110	0.106
	iv. Fears of being subjected to aggressive behavior by the patient and their relatives	A	8.080	**0.044***
		B	3.362	0.339
	v. Your concerns about how to deal with the patient's anxiety and fears	A	5.371	0.147
		B	7.167	0.067
	vi. Fears from feeling isolated	A	1.891	0.595
		B	1.606	0.658
Accidents/Mistakes [c]	i. Forget patient's weight registration	A	9.175	**0.027***
		B	10.023	**0.018***
	ii. Forget some question in patient safety questionnaire	A	13.585	**0.004****
		B	8.729	**0.033***
	iii. Projectile objects (keys, pens, scissors, Hairpins)	A	1.621	0.655
		B	16.743	**0.001****
	iv. Feeling of tired and exhausted that may affects safety	A	14.273	**0.003****
		B	13.941	**0.003****

The concerns of MRI technologist when they are working alone(A) or with another MRI technologist (B) regarding different safety issues.
(**) and (*) the significant at 0.01 and 0.05, respectively.
(a) Kruskal Wallis Test (H)
(b) Each item based on Likert 5 points scale: from not at all concerned to extremely concerned.
(c) Each item based on Likert 5 points scale: from never to always.

Using Kruskal Wallis test to find if concerns and Accidents/Mistakes are statistically significant with lone working in comparison with working with another medical staff. Lone working is the only type of work that is statistically significant with many concerns, whereas all items of accidents/mistakes are significant in both types of works except (projectile objects) which are significant only with working in the presence of another medical staff.

References

American College of Radiology [Internet]. ACR manual on MR safety; 2020 [cited 2020 Jan 22]. Available from: https://www.acr.org/-/media/ACR/Files/RadiologySafety/MR-Safety/Manual-on-MR-Safety.pdf.

Alghamdi A, Alghamdi M, Alamri S, Alshehri M, Alatawi I, Alzahrani S, et al. Assessment of Saudi Arabian nurses' knowledge and attitudes toward magnetic resonance imaging safety. J Radiol Nurs. 20211-7. doi: 10.1016/j.jradnu.2020.12.005.

Alsaleem SA, Alsabaani A, Alamri RS, Hadi RA, Alkhayri MH, Badawi, K, et al. Violence towards healthcare workers: A study conducted in Abha City, Saudi Arabia. J Fam Community Med. 2018;25(3):188-93. doi: 10.4103%2Fjfcm.JFCM_170_17.

Brief E. Top 10 health technology hazards for 2020 [Internet]. ECRI Inst;9. [cited 2021 Mar 5]. Available from: https://assets.ecri.org/PDF/White-Papers-and-Reports/ECRI-Top-10-Technology-Hazards-2020-v2.pdf

Canadian Center for Occupational Health and Safety [Internet]. Working alone—General: OSH answers; 2020 [cited 2020 March 18]. Available from: https://www.ccohs.ca/oshanswers/hsprograms/workingalone.html.

Dewland TA, Hancock LN, Sargeant S, Min RK, Sarginson RA, Ng CKC. Study of lone working magnetic resonance technologists in Western Australia. Int J Occup Med Environ Health. 2013;26(6),837-45. doi: 10.2478/s13382-013-0159-2.

Grainger D. Safety guidelines for magnetic resonance imaging equipment in clinical use. Medicines and Healthcare Products Regulatory Agency. 2014:1-85.

Hossen M, Rana S, Parvin T, Muraduzzaman SM, Ahmed M. Evaluation of awareness, and attitude of MR technologists towards MRI safety in Dhaka City, Bangladesh. Int J Pure Med Res. 2020;5(5):16-19.

Liu CY, Lai S, Lima JA. MRI gadolinium dosing on basis of blood volume. Magn Reson Med. 2019;81(2):1157-64. doi: 10.1002/mrm.27454.

Owens KM, Keller S. Exploring workforce confidence and patient experiences: A quantitative analysis. Patient Exp J. 2018;5(1):97-105. doi: 10.35680/2372-0247.1210.

Piersson AD, Gorleku PN. A national survey of MRI safety practices in Ghana. Heliyon. 2017;3(12):e00480 doi: 10.1016/j.heliyon.2017.e00480.

Pyke LM. Working alone in MRI? Can J Med Radiat Technol. 2007;38(4):31-6. doi: 10.1016/s0820-5930(09)60257-7.

Royal Australian and New Zealand College of Radiologists [Internet]. MRI safety guidelines; 2017 [cited 2020 March 12]. Available from: https://www.ranzcr.com/documents/512-mri-safety-guidelines/file

Stafford RJ. The physics of magnetic resonance imaging safety. Magn Reson Imaging Clin N Am. 2020;28(4):517-36. doi: 10.1016/j.mric.2020.08.002.

Stogiannos N, Westbrook C. Investigating MRI safety practices in Greece: A national survey. Hell J Radiol. 2020;5(2):24-35. doi: 10.36162/hjr.v5i2.347.

Sun W, Fu J, Chang Y, Wang L. Epidemiological study on risk factors for anxiety disorder among Chinese doctors. J Occup Health. 2012;54:1-8. doi: 10.1539/joh.11-0169-OA.

Tohidnia MR, Rostami R, Ghomshei SM, Moradi S, Azizi SA. Incidence rate of physical and verbal violence inflicted by patients and their companions on the radiology department staff of educational

hospitals of a medical university, Kermanshah, 2017. La radiologia medica. 2019;124(1):14-18. doi: 10.1007/s11547-018-0933-0.

Westbrook C, Talbot J. MRI in practice. City: John Wiley &Sons; 2018.