



Received: 2015.08.07  
Accepted: 2015.08.16  
Published: 2016.01.25

Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
- D** Data Interpretation
- E** Manuscript Preparation
- F** Literature Search
- G** Funds Collection

## Magnetic Resonance Imaging Perception of the Society in Kars: A Local Study

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**Background:**

The start point of this study was the sentence that a patient used: 'my pains had gone with MRI'. It is known that MRI has not a usage area in treatment, yet. Perhaps, the feeling of loss of pain was only a perception. But we want to search the demographic factors that make the perception of loss of pain. The purpose of this study was to determine the consciousness level of the society about MRI.

**Material/Methods:**

This prospective survey study included 302 (107 men, 195 women; mean age  $43.11 \pm 15.18$  years) patients who were referred to the radiology clinic to undergo MRI.

**Results:**

Almost half of the patients were illiterate and graduated from a primary school. Low level of education was more frequent in women than in men. Most of the patients declared that MRI would diagnose their disease. Among all the patients surveyed, 209 of 302 patients indicated no changes in the degree of pain before and after MRI, 30 indicated increased pain, 62 indicated decreased pain, and one patient did not answer the question. Most of the patients who declared decreasing pain had lumbar or cervical MRI.

**Conclusions:**

The function of MRI was known by the patients independently from their educational status. The degree of decrease in pain was higher in the 'treatment' answer. Perhaps the relatively higher percentage was a result of the expectations about treatment and was related with psychological motivation.

**MeSH Keywords:**

Ethnology • Magnetic Resonance Imaging • Perception

**PDF file:**

<http://www.polradiol.com/abstract/index/idArt/895578>

### Background

Magnetic Resonance Imaging (MRI) was first demonstrated by Bloch et al. and Purcell et al. in 1946 [1–3]. It took more than two decades to implement Nuclear Magnetic Resonance-based imaging. Even after the pioneering work by Lauterbur and the development of basic imaging techniques by Kumar et al. and Mansfield, several more years were required to design and develop imaging hardware at a level necessary to produce high-quality diagnostic images of the human body. Despite its relatively slow beginning, MRI has become an indispensable diagnostic tool since the early 1980s [4–6]. Nowadays, MRI is used in routine daily radiological procedures. The operational principle of MRI is

simply a huge magnetic field and radio waves [7]. Spherical and narrow-entrance magnetic field is used and the patient lies in the narrow tube. MR imaging time varies depending on the body part examined. It takes approximately 10–30 minutes.

There are numerous systemic or focal disorders requiring MRI in the diagnostics. MRI has advantage in diagnosing soft tissues and parenchymal disorders. Lack of non-ionizing radiation makes MRI safer than computed tomography (CT), thus it can be used in pregnant women and in children. Nowadays, MRI has a very wide usage spectrum from head to toe, such as cranial, cervical, spinal, extremity, abdomen MRI, with new developing sequences [1].

**Table 1.** The questionnaire form.

<b>Part 1: Demographic data</b>			
<b>Number:</b>		<b>Date:</b>	
<b>MRI PERCEPTION OF SOCIETY – QUESTIONNAIRE FORM</b>			
<b>Name and Surname of the Patient:</b>			
<b>Age:</b>	<b>Gender:</b>	Man	Woman
<b>Profession:</b>			
<b>Educational Status:</b>			
Illiterate		Graduated from primary school	
Graduated from secondary school		Graduated from high school	
Graduated from university		Master	
<b>Part 2: MRI knowledge</b>			
<b>1. In MRI, which part of your body will be imaged:</b>			
<b>2. Have you performed an MRI previously:</b>		Yes	No
<b>3. Will MRI diagnose or treat your disease?</b>		Diagnose	Treat Dignose + treatment
<b>4. Do you have pain now:</b>		Yes	No
<b>5. What is the degree of your pain now (before MRI)</b>			
0 1 2 3 4 5 6 7 8 9 10			
<b>6. What is the degree of your pain now (after MRI)</b>			
0 1 2 3 4 5 6 7 8 9 10			

In everyday practice, numerous patients are referred to radiology departments for an MRI. Patients’ demographic characteristics (age, gender, educational status, profession) show variability, due to a broad indication spectrum of MRI. The starting point of this study was a sentence of a patient: ‘my pains had gone with MRI’. MRI has no application in treatment yet. The feeling of subsiding pain was just a perception but we aim to search for demographic factors that influence that perception of subsiding pain. The purpose of this study was to determine the general level of knowledge on MRI.

**Material and Methods**

This prospective study was carried out between October 2011 and March 2012 and included 302 patients referred to the radiology clinic to undergo an MRI. One out of 10 patients was selected. A questionnaire form was filled by an MRI technician in the presence of the patient (Table 1). The questionnaires of patients who did not consciously answer the questions were excluded from the study. Under-aged, non-cooperative, senile or debile patients were also excluded. If a patient was excluded, the next 10<sup>th</sup> patient was considered as the following patient.

The questionnaire had two parts. Questions of part 1 aimed to gather the demographic data such as age, gender, profession and educational status. Questions in part 2 included the status of knowledge on MRI. The questionnaire form was filled during a face-to-face interview with the patients and the answers were recorded carefully.

**Statistical analysis**

Statistical analysis of the study was made using IBM SPSS Statistics version 21 (IBM Corp. © Copyright IBM Corporation and other(s) 1989, 2012). Nominal variables were expressed as arithmetical mean ± standard deviation, while ordinal variables were expressed as percentages (%).

**Results**

The answers of part 1 (demographic data): A total of 107 out of 302 of patients (35.4%) were men and 195/302 (64.6%) of patients were women. The mean age of the patients was 43.11±15.18 years (range from 16 to 85 years). Almost half of the patients (136/302, 45%) were illiterate and graduated from primary school (Figure 1). The level of education was higher in women than in men. Unfortunately, 53.33% of women were illiterate and graduated from primary school, as compared to 42.06% of men.

In this study, various professions were declared. The distribution of professions of the patients was as follows: housewife 147 patients (48.7%), farmer 21 (7%), student 29 (9.6%), government worker 20 (6.6%), self-employed 20 (6.6%), teacher 16 (5.3%), retired 15 (5%), worker 9 (3.0%), nurse 6 (2.0%), soldier 6 (2.0%), policeman 3 (1.0%), baker 3 (1.0%), unemployed 3 (1.0%), contractor 2 (0.7%), research assistant 1 (0.3%), guardian 1 (0.3%).

The answers to part 2 (MRI knowledge) were as follows:

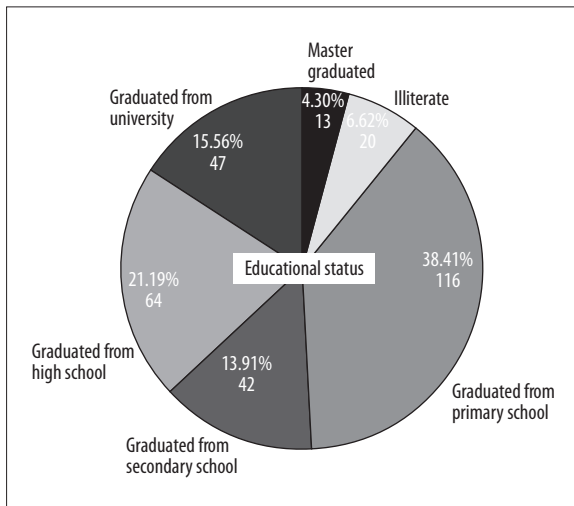


Figure 1. Pie chart graphic of the educational status.

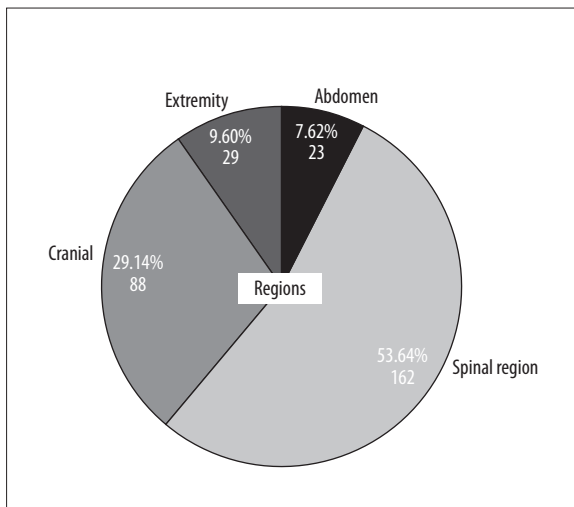


Figure 2. Pie chart graphic of body regions

The first question concerned the body region covered with MRI. We recorded the answers to this question from the radiological willing form of different departments, including several regions of the body: lumbar disc, cervical disc, thoracic disc, sacroiliac joint, knee, shoulder, foot-ankle, hand-wrist, cranium, temporal bone, abdomen, magnetic resonance cholangiopancreatography (MRCP) and magnetic resonance angiography. We rearranged them into four groups, based on their similarity. Lumbar, cervical, thoracic discs and sacroiliac joint were gathered in the same group named 'spinal region', while knee, shoulder, foot-ankle and hand-wrist were gathered in the 'extremity' group. Cranial cavity and temporal bone made one group named 'cranial', and abdomen, MRCP and angiography made one group named 'abdomen'. More than 50% of MRI examinations were in the spinal region (Figure 2).

The second question checked if the patient had performed MRI previously. There were two answers possible: 'yes' and 'no'. A total of 178 (58.9%) patients answered 'yes' whereas 124 (41.1%) answered 'no'. When considering gender, the distribution of the answers was as follows: 'yes' was given by 66 (37.1%) men and 112 (62.9%) women;

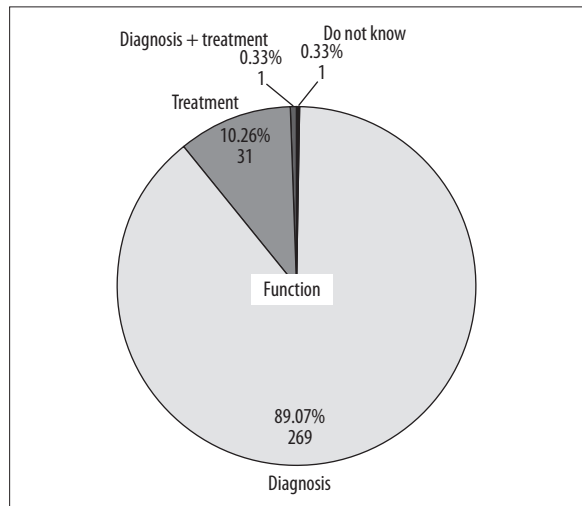


Figure 3. Pie chart graphic of patients' opinions about MRI function.

Table 2. Gender distribution according to the function of MRI.

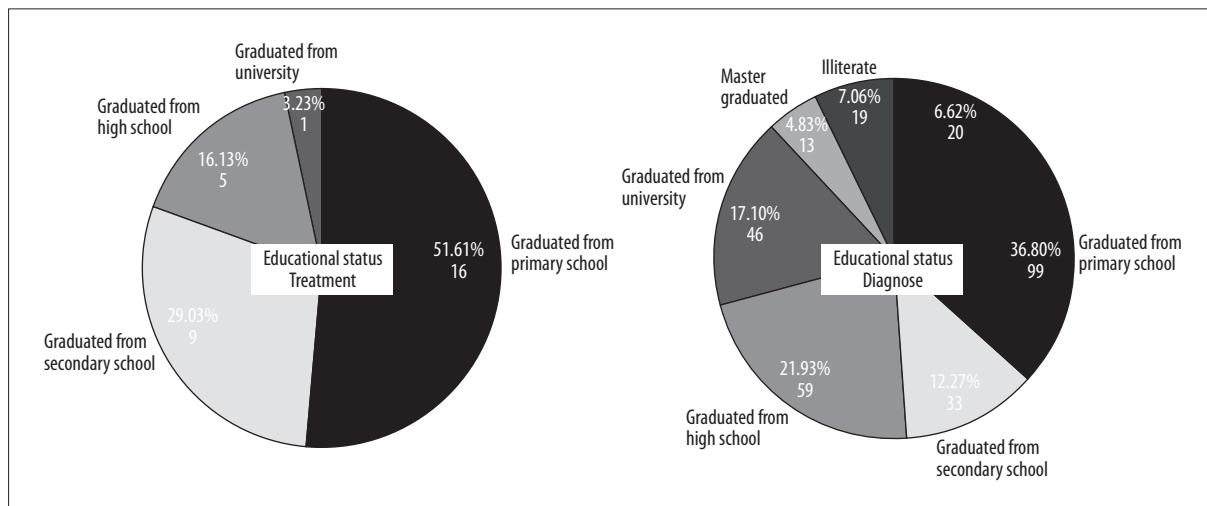
Function	Men	Women
Diagnosis	95 (35.3%)	174 (64.7%)
Treatment	12 (38.7%)	19 (61.3%)
Diagnosis + treatment		1 (100.0%)
Do not know	1 (100.0%)	

leaving 41 (33.1%) 'no' answers among men and 83 (66.9%) among women.

The third question was one of the pivotal questions in the survey: 'will MRI diagnose or treat your disease?'. The answer choices were: 'diagnose', 'treat', 'diagnose + treat' and 'do not know'. Most of the patients (269/302) declared that MRI would diagnose their disease (Figure 3). Only 31 of the patients marked 'treat', with 19 (61.3%) being women and 12 (38.7%) being men (Table 2). The educational status of the patients did not show any significant difference as concerns the answer 'treat' or 'diagnose'. Evaluation of the educational status of 31 patients showed that half of them graduated from primary school. (Figure 4).

The fourth question of part 2 asked if the patient had pain or not at the moment of the survey. The answers were formulated as 'yes' or 'no'. A total of 254 out of 302 (84.1%) patients answered that question as 'yes' whereas 48 of 302 (15.9%) said 'no'.

Question five and six were formulated in a similar manner. In question five the patient was asked about the degree of pain before MRI and in question six – after MRI. Visual Analog Scale (VAS) was used to detect the pain degree [8,9]. The degree of pain was measured in a 0–10 interval. Level '0' indicated no pain whereas level '10' indicated the highest degree of pain. The degrees of pain were explained to the patient simply as '0=no pain' and '10=the strongest'. Among all the patients surveyed, i.e. 302, 209 (69.2%) indicated no changes in the degree of pain before and after MRI, 30 of 302 (9.9%) patients indicated increased pain, 62



**Figure 4.** Pie charts of the educational status with regard to the answers 'diagnose' or 'treat'.

**Table 3.** The body region according to the function of MRI.

Function	Spinal region	Extremity	Cranium	Abdomen
Diagnosis	148 (55.0%)	28 (10.4%)	76 (28.3%)	17 (6.3%)
Treatment	14 (45.2%)	1 (3.2%)	12 (38.7%)	4 (12.9%)
Diagnosis + treatment				1 (100.0%)
Do not know				1 (100.0%)

of 302 (20.5%) indicated decreased pain, and one patient (0.3%) did not answer the question. Most of the patients who declared decreased pain had a lumbar or cervical MRI (35/62, 57%) (Table 3). The change in pain was shown in Table 4 according to question 3 in part 2 ('Will MRI diagnose your disease or treat it?').

The mean age of the patients was  $44.84 \pm 17.58$  years for 'treatment' answer, and  $42.85 \pm 14.91$  years for 'diagnose'.

**Discussion**

To the best of our knowledge, this was the first study in the literature on the knowledge of the society on MRI. This study showed patients' misperception of MRI. A fairly large proportion of the patients declared that MRI was a tool for diagnosis, while a few declared it to be a tool for treatment. An interesting outcome was the percentage of patients who declared a decrease in pain. Nearly half of the patients who chose the "treat" option, declared pain decrease. This may be psychological as well as physiological. Since nearly 3/5 of the patients performing lumbar and cervical MRI declared pain decrease, flat-lying for about 20 minutes might decrease pain. Alternatively, magnetic field could have an effect on pain status of the patients. Should it be proven scientifically in the near future, MRI could be used not only for diagnosis but also for treatment. This could be another interesting research subject.

The educational status of the patients did not show any difference regarding the choice of 'treat' or 'diagnose' option. The knowledge of the patients on the MRI function was not

**Table 4.** The relationship between MRI effect and change in the status of pain.

Function	Pain change status	Frequency (percentage)
Diagnosis	No change	191 (71.0%)
	Increase	28 (10.4%)
	<b>Decrease</b>	<b>49 (18.2%)</b>
	No answer	1 (0.4%)
	Total	269
Treatment	No change	16 (51.6%)
	Increase	2 (6.5%)
	<b>Decrease</b>	<b>13 (41.9%)</b>
	Total	31
Diagnosis + treatment	No change	1 (100.0%)
Do not know	No change	1 (100.0%)

influenced by their educational status, though most of our study patients were low-graduated.

The secondary outcome of this study concerned the educational status of the women. Most of the patients (about 2/3 of the patients) were women and half of the women were illiterate or graduated from primary schools. The = percentage of illiterate women was nine times higher than in men. That dramatic status made us realize that we should be concerned about the education of the girls. Approximately half of the female patients were

housewives. We sampled more women due to their predominance in MRI procedures. Overrepresentation of females among patients of regional hospitals would be an interesting research problem.

The mean age of the patients who declared 'diagnose', was similar to the general population. Generally, MRI is well known by the population, but a part of the patients surveyed had insufficient information on MRI.

A large proportion of all MRI examinations performed was for cranial, cervical and lumbar regions. Among all of the patients, 3/5 had already had an MRI previously. Therefore, MRI has been a routine procedure for various body parts and for all demographic representatives in Kars in Turkey.

One of the main limitations of our study was the form of a local survey. If this had been a multi-center study, the results might have been more objective. The second limitation was the questionnaire form. It was slightly

complicated and we had a lot of data to measure. The third limitation was that there was no objective grading scale to measure the pain degree.

## Conclusions

According to our local study, the function of MRI was known to the patients independently of their educational status. The percentage of decrease in pain was higher in the group who chose the 'treat' answer. Perhaps that relatively higher percentage was connected with the expectations of treatment, related with psychological motivation. Maybe the magnetic field of MRI affected the pain status. If magnetic field has any healing effect on pain, MRI may in the near future be used not only for diagnosis but also for treatment.

## Competing interests

None declared.

## References:

1. Benassi A, Bertoldo A, Cerutti S et al: Advanced image processing in MRI. Landini L, Positano V, Santarelli MF (eds.), Taylor & Francis Group, LLC: New York; 2005
2. Bloch F: Nuclear induction. *Phys Rev*, 1946; 70: 460
3. Purcell EM, Torrey HC, Pound RV: Resonance absorption by nuclear magnetic moments in a solid. *Phys Rev*, 1946; 69: 37
4. Kuperman V: Magnetic resonance imaging physical principles and applications. Mayergoyz I (eds.), Press: United States of America, 2000
5. Kumar A, Welti D, Ernst RR: NMR Fourier zeugmatography. 1975. *J Magn Reson*, 2011; 213: 495-509
6. Mansfield P: Multi-planar image formation using NMR spin echoes. *J Phys C*, 1977; 10
7. Hendee WR, Ritenour ER: Medical imaging physics. A John Wiley & Sons, Inc., New York, 2002
8. Downie WW, Leatham PA, Rhind VM et al: Studies with pain rating scales. *Ann Rheum Dis*, 1978; 37: 378-81
9. Wewers ME, Lowe NK: A critical review of visual analogue scales in the measurement of clinical phenomena. *Res Nurs Health*, 1990; 13: 227-36