

The Effectiveness of MRI Techniques in Evaluating Multiple Sclerosis Patients

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ABSTRACT: Background and objective: Multiple sclerosis (MS) is the most common neurodegenerative disease characterized by multiple focal areas of demyelination called plaques or lesions. The main aim of the study is to evaluate patients with multiple sclerosis disease using MRI technology and to emphasize the effectiveness of this technology in diagnosis of the disease.

Methods: This study was conducted in order to better recognition and understanding of MS disorder using radiologic MRI techniques and the main problem is the increase prevalence among public population. The database registry was limited to hospitalized patients whom diagnosed with multiple sclerosis using MRI techniques and the population of the study was 80 participants their age elder than 16 years old in period from April to November 2020. Normal condition or other neurological disorders were excluded.

Results: The most important results obtained in this study is that it is possible to diagnose Multiple sclerosis patients in an accurate manner using magnetic resonance imaging technology. The outcome of variable detected prevalence of 80 samples 52.5% of them were male, and 47.5% were female and the big distribution group was 53% aged between 30-39 years. The obtained data also showed that the most affected brain region was periventricular matter with 30%, followed by the frontal lobe with 27.5%. clinical etiology big distribution data were achieved for vision Problems with percentage of 22.5 % followed by Dizziness & vertigo sensation with percentage of 18.7% The MRI techniques showed two appearance of MS lesions and plaques, the most distribution achieved for foci appearance with percentage of 75% and patchy appearance with 25% present.

Conclusion: Although for many years there was awareness of the morbidity and mortality associated with Multiple sclerosis however real progress only comes with the ability to early diagnosis using MRI technology.

KEY WORDS: Magnetic resonance imaging, Multiple sclerosis, diagnosis, lesions, plaques

1. INTRODUCTION

Multiple sclerosis disease (MS) is the most common demyelinating and neurodegenerative chronic inflammatory disorder in middle East (MS) is a public health problem as it constitutes the second cause of neurological disability in young adults (1,2). In Saudi Arabia the prevalence have been marked rise regionally increasing at last few years and it is expected from demographics point view to further increase. (3)

This pathology is considered an autoimmune characterized by multiple focal areas of demyelination called plaques or lesions and the diagnostic criteria dependent on the location and appearance of demyelination. (Fig 1, 2).

The (MRI) Magnetic resonance imaging is the most important clinical tool for the diagnosis of MS, hence it has developed into the most important tool for the diagnosis and monitoring for potential safety concerns associated with multiple sclerosis disease. (4) It has been recognized as a major advance and helpful in evaluation and establishing the diagnosis more than other radiological methods where the clinical diagnosis is not definite, moreover MRI has become a powerful as safety assessment method in addition to the improvement of the technology and increased availability, the diagnostic criteria are based on the number and size of brain and spinal cord lesions adding to the location of it. It allows to demonstrate the dissemination in space based on the presence of at least one criteria of the characteristic locations which including cortical region and white matter region additionally to periventricular region and spinal cord. Where dissemination of lesions in these areas can be established from MRI studies with and without contrast enhancement or through the demonstration of new lesions in follow-up MRI studies., The assessment sequences methods of MRI criteria for multiple sclerosis in the white matter of the CNS which are considered typically as signal abnormalities on conventional MRI sequences such as T2-weighted and T2-weighted fluid-attenuated inversion recovery (FLAIR) and post

enhanced contrast T1-weighted scans, these techniques have allowed the definition of criteria that support the early diagnosis of multiple sclerosis in patients with clinical symptoms and they are highly sensitive for distinguishing early relapsing forms of multiple sclerosis from isolated syndromes (4, 5). Adding to optional sequences contribute to the diagnosis such as an enhanced T1weighted image, proton density weighted sequences, inversion recovery and diffusion weighted imaging (DWI), where these sequences are sensitive in detecting white matter characterization of the disease varied by the requirement of demonstrating dissemination in space and time at an initial clinical event and exclusion of other disorders that can mimic multiple sclerosis by their clinical and laboratory profile (6,7).

The correlation between MRI results and the clinical etiology of disability has been questioned and there are remains of needs to standardization of MRI acquisition methods to advance the diagnosis of the disease. (8)

There are four types of MS disease occurring in patients and they named according to the way acts on the body over time. First type is Relapsing-Remitting MS (RRMS), this is the most common form of multiple sclerosis and about 75% to 85% of people with MS are initially diagnosed with it. Second form is Secondary-Progressive MS (SPMS), in this type symptoms worsen more steadily over time with or without the occurrence of relapses and remissions. Third form is Primary-Progressive MS (PPMS), which is not very common, it occurring in about 10% of people with MS. Fourth type is Progressive-Relapsing MS (PRMS) which characterized by slowly worsening symptoms from the beginning with no relapses or remissions, it is a rare form of MS occurring in about 5% of people with MS. (9, 10, 11). The improvements in MRI technology contribute and promise to better diagnosis for typical features were as example it can support and substitute clinical information in the diagnosis in patients presenting with a clinically isolated syndrome by showing disease dissemination in space and time and by helping to exclude disorders that can mimic multiple sclerosis. (12). consequently there are numerous studies supporting the role of MRI in diagnose and management of patients with MS. (12, 13, 14). As MRI has developed into the most important tool for the diagnosis and monitoring of multiple sclerosis disease, thus the main aim of this study is to emphasis the latest insights into the utility of MRI in MS patients in tries to show the characterization of the disease in clinical practice of affected patients by using MRI techniques.

So the recent study were conducted to characterize MS patients using MRI technology in order to search and evaluate the major factors that influence the current status. And to evaluate and determine the correlation between the prevalence of the disease and the distribution results among population of the study.

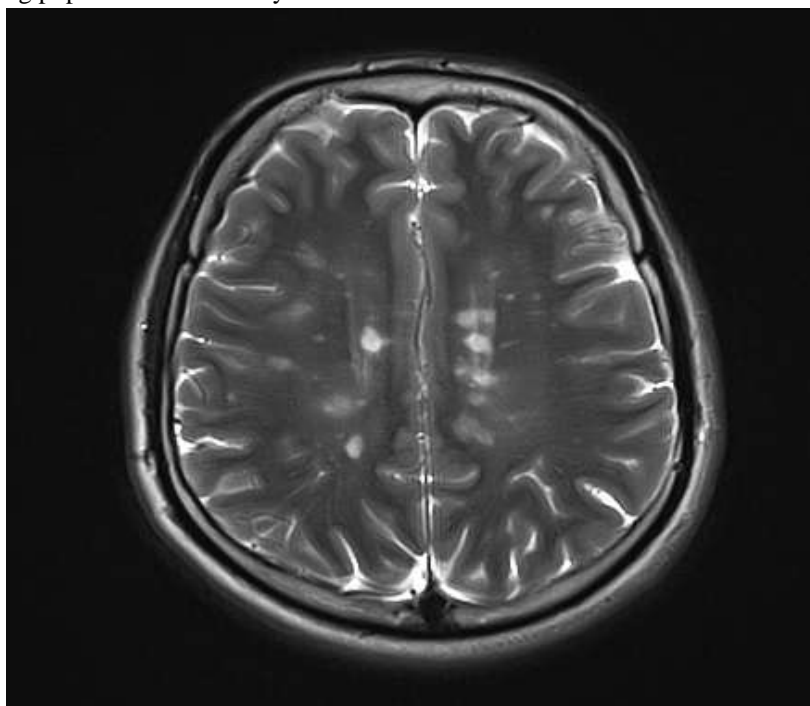


Fig 1. Axial flair MRI shows foci MS lesions

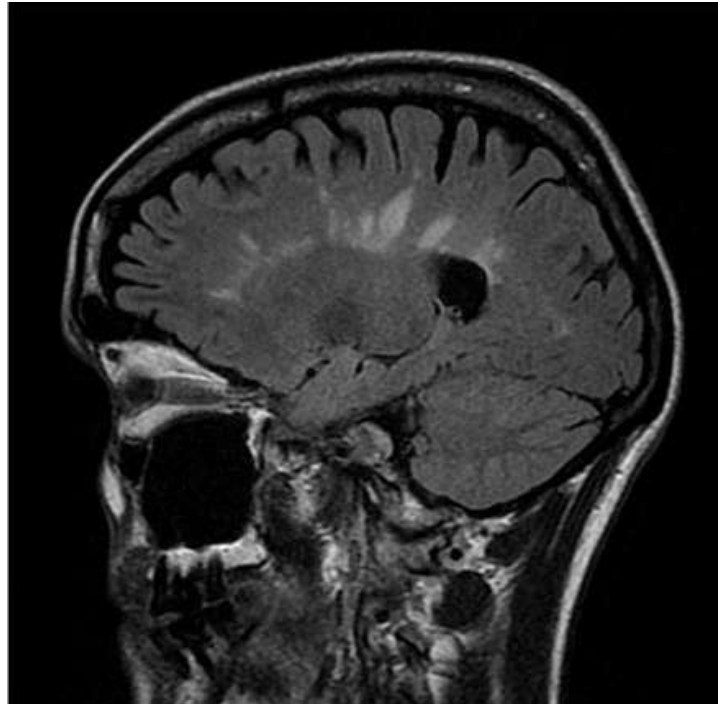


Fig 2. Sagittal flair MRI shows MS plaques

2. MATERIALS AND METHODS

This study was conducted in order to better understanding of MS disorder using radiologic MRI techniques and the main problem is the increase prevalence among public population, 80 patients with suspected MS was being evaluated using MRI tools in Najran province (K.S.A), the patients were evaluated according to the etiology criteria as having definite MS.

The study was conducted during the period from April 2020 to November 2020 in Najran city, Saudi Arabia. The population of the study consisted of all patients male and female whom underwent MRI examination and their age elder than 16 years. The inclusion criteria included all multiple sclerotic patients whom diagnosed with MRI techniques, and the exclusion criteria limited to normal condition or other neurodegenerative pathologies and patient less than 16 years old.

Methods of data collection and Statistical analysis:

The database registry was limited to hospitalized patients whom diagnose with multiple sclerosis using MRI techniques. And the data was being collected using especial data collection sheet (closed questionnaire). Descriptive statistical analysis was performed using Microsoft excel program to determine the distribution frequency for demographic variables in tables and figures.

Ethical considerations:

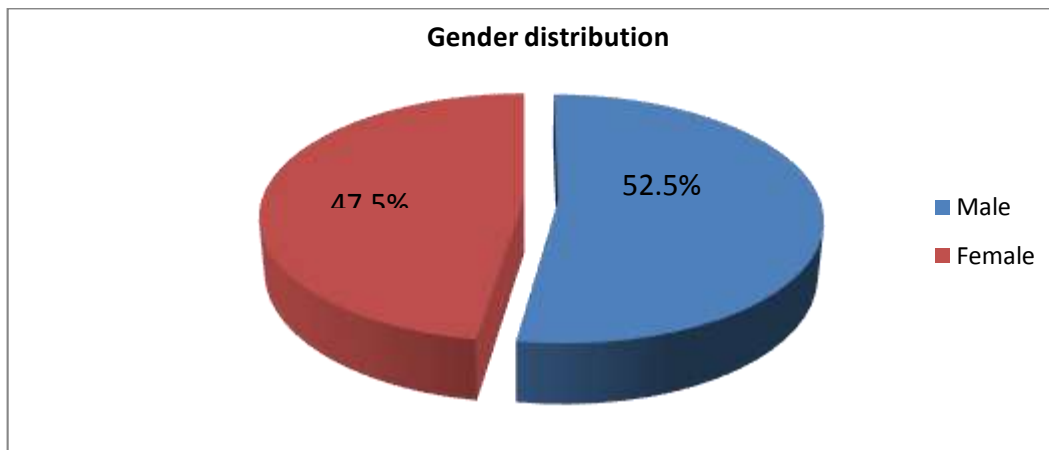
Formal approval and permission from ethics committee of Najran University, Deanship of Scientific research was being carry out prior starting the recent study.

3. RESULTS

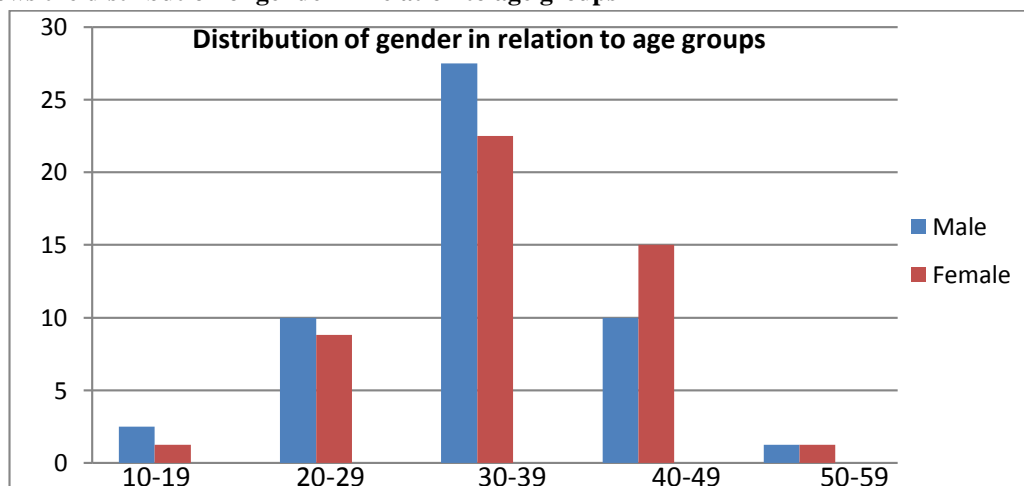
A sample of 80 patients whose ages between (16-60years), diagnosed previously as a multiple sclerosis disease at Najran province hospitals. The MRI findings was reads by radiologists and the following results is obtained from the neurology department, (Gender, Age groups, clinical etiology of MS, Infected parts of the brain and MRI appearance). All demographic variables were arranged and illustrated in tables and figures as shown below

-The main result regarding to gender distribution Graph (3-1) showed that 42 frequency with percentage of 52.5% of patients were male, and 38 frequency with percentage of 47.5% of the sample were female.

Graph (3-1) shows the distribution of Gender



Graph (3-2) shows the distribution of gender in relation to age groups



-The data obtained for age group distribution Table (3-1), found that the big distribution group was 53% of the sample aged between 30-39 years

Table (3-1). shows the distribution of Age Groups

Age group	Frequency	Percent
10-19	3	3.8 %
20-29	15	18.7%
30-39	40	50 %
40-49	20	25 %
50-59	2	2.5 %
Total	80	100 %

-Results regarding detecting of MRI for affecting of brain regions table (3-2), achieved that the most affected region was periventricular matter with 30%, followed by the frontal lobe with 27.5% and then the temporal lobe with 17.5%. The Parietal lobe achieved 10% percent and both Occipital and ventricles achieved 7.5% percent represent the lowest affected region.

Table (3-2). shows the most Affected Brain Regions Groups

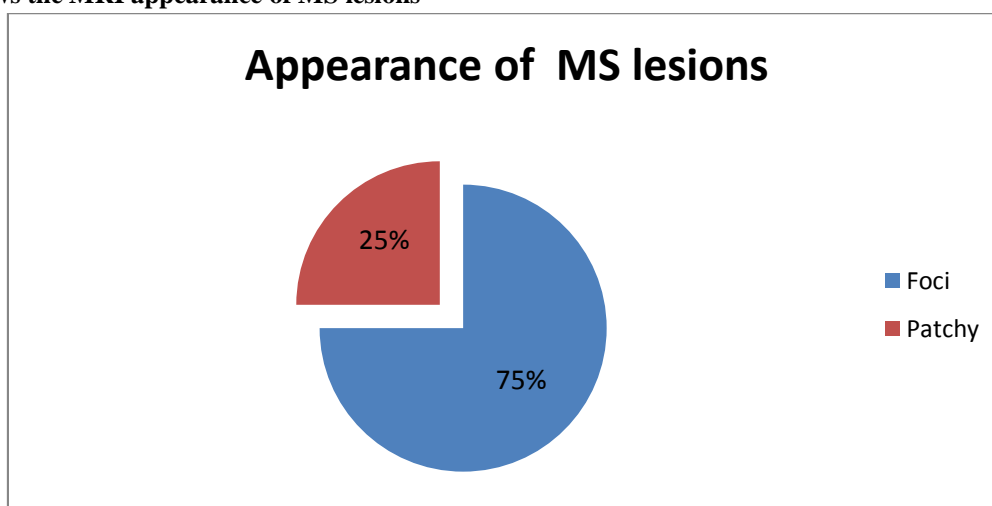
Affected Brain Region	frequency	percent
Frontal lobe	22	27.5%
Parietal lobe	8	10%
Temporal lobe	14	17.5%
Occipital lobe	6	7.5%
Periventricular matter	24	30%
ventricles	6	7.5%
Total	80	100%

Table (3-3). present some clinical etiology

Etiology	Frequency	Percent
Vision problem	18	22.5%
Weakness	12	15%
Dizziness & vertigo	15	18.7%
Loss of hearing	10	12.5%
Numbness	14	17.5%
Tingling sensation	11	13.8%
Total	80	100%

-The obtained results showed some clinical etiology for MS with different Sign and Symptoms , table (3-3) the big distribution were achieved for vision Problems with percentage of 22.5 % followed by Dizziness & vertigo sensation with percentage of 18.7% . Numbness symptom present with percentage of 17.5% and weakness problems present with percentage of 15%. Others symptoms achieved results of 13.8% percent for Tingling sensation and the lower etiology achieved for hearing loss with percentage of 12.5%.

Graph (3-3) shows the MRI appearance of MS lesions



Although many sequences are contributory in MR imaging for MS lesions and plaques , however in recent study many protocols have been used to confirm the diagnosis including Flair imaging which demonstrated periventricular high signal intensity lesions

and axial T2 weighted imaging demonstrated high signal intensity for numerous white matter plaques in colossal and white matter, while axial diffusion weighted image (DWI) showed several hyper intense lesions as feature of active inflammatory conditions. Sagittal T1 weighted image depicts multiple hypo intense lesions in the corpus callosum, this finding indicate of present of multiple sclerosis lesions. The lesions occur in two pattern foci and patchy appearance. The most distribution achieved for foci appearance with percentage of 75% and patchy appearance with 25% present.

4. DISCUSSION

In this issue we discussed the ability of MRI scan in evaluating Multiple sclerosis, were the researchers found out the prevalent results of the diseased patient, gender, age, etiology and appearance adding to identifying the most infected parts of the brain regions. The study consisted from a sample of 80 patients whose ages between (16-60years), diagnosed previously as a multiple sclerosis disease at Najran province Hospitals.

The findings declare that 42 frequency with percentage of 52.5% of patients were male, in comparison with 38 frequency (percentage of 47.5%) of the sample for female. (Graph 3-1). The researchers found this result match with other studies found in literature ([14, 15])

In recent study, researchers found patients with ages between 30-39 years had the big distribution with percentage of 53% of the sample, table (3-1), (graph 3-2) this would be similar to some previous studies (16, 17).

Discussion according to the most brain regions which affecting from MS lesions table (3-2) achieved that, the most affected region was periventricular matter with 30%, followed by the frontal lobe with 27.5%, the temporal lobe with 17.5%. The Parietal lobe achieved 10% percent and both Occipital and ventricles achieved 7.5% percent represent the lowest affected region.

It's believed that Multiple sclerosis exact etiology is poorly known because it have both genetic and acquired contributory components, and has long been suspected due to the geographic distribution; however, in recent study the researchers found different sign and symptoms table (3-3) the big distribution were achieved for vision Problems with percentage of 22.5 % followed by Dizziness & vertigo sensation with percentage of 18.7%. Numbness symptom present with percentage of 17.5% and weakness problems present with percentage of 15%. Others symptoms achieved results of 13.8% percent for Tingling sensation and the lower etiology achieved for hearing loss with percentage of 12.5%.

Results regarding MRI techniques for MS investigations showed that MS lesions occur in two pattern foci and patchy appearance. (Graph 3-3). The most distribution achieved for foci appearance with percentage of 75% and patchy appearance with 25% present.

CONCLUSION

MRI has revolutionized the diagnosis and surveillance of patients with MS were it can confirm the diagnosis and assess the response to the treatment in follow-up scans. Moreover it help in determining the disease pattern. Although for many years there was awareness of the morbidity and mortality associated with Multiple sclerosis where epidemiology has been a major topic of concern during the recent years adding to increasing rate in our area, however real progress only comes with the ability to early diagnosis using MRI technology.

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