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Spectrum of MRI Findings of Brain Among Patients Attended in a Tertiary Level Hospital of Bangladesh.

Dr. Marufa Yasmin[1*], Dr. A.K.M. Mizanur Rahman[2], Dr. Atiquzzaman[3], Dr. Mohammad Afjal Hossain[4]

[1]Associate Professor, Department of Radiology & Imaging, US Bangla Medical College, Rupganj, Narayanganj, Bangladesh
[2]Assistant Professor, Department of Pediatrics Surgery, Sher-e-Bangla Medical College, Barishal, Bangladesh
[3]Assistant Professor, Department of Medicine, US Bangla Medical College, Rupganj, Narayanganj, Bangladesh
[4]Assistant Professor, Department of Endocrinology, US Bangla Medical College, Narayanganj, Bangladesh

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***Corresponding author:** Dr. Marufa Yasmin E-mail: marufa75yasmin@gmail.com

Abstract **Original Research Article**

Background: MRI can distinguish a variety of pathological conditions of brain like infarcts, tumors, haemorrhage, developmental and structural abnormalities, infections, inflammations, and vascular abnormalities. It can also detect functional status of V-P shunt, whether working or not. ***Aim of the study*** to assess the spectrum of MRI findings of the brain among the patients presenting with various clinical conditions. ***Methods & Materials:*** It was a prospective observational study conducted in the Dept. of Radiology & Imaging, Dr. Sirajul Islam Medical College and Hospital, Dhaka, Bangladesh during the period from January 2018 to December 2018. A total of 136 patients with several health problems were attended in the hospital and underwent diagnostic brain MRI. The ethical committee of the mentioned hospital has approved this study. Properly written consent was taken from each participant before starting data collection. A pre-designed questionnaire was used in patent data collection. All data were processed, analyzed, and disseminated by MS Office and SPSS version as per need. ***Result:*** Majority (58.82%) of the patients were of male sex. Elderly (>60 years) population comprised 38.2% of the participants. A significant number of patients had more than one pathological MRI findings. 49.6% participants had deep white matter ischemic changes. Mild to moderate degree of generalized cortical atrophy was found in 41.2% patients. Unilateral (8.4%) or bilateral maxillary sinusitis was evident in 17.6%. Acute infarcts were found in left/right (7.6%)/both cerebral hemisphere (6.9%); old infarcts were identified in right/left (5.3%)/both cerebral hemisphere (3.8%). Right-sided vestibular schwannoma were found in 2.3% participants. Besides these, some other minor MRI findings were observed among 45% of participants. MRI findings were unremarkable in 20.6% patients. ***Conclusion:*** Deep white matter ischemic changes (DWMI), mild to moderate degree of generalized cortical atrophy and maxillary sinusitis may be considered as the probable frequent finding among the participants.

Keywords: Spectrum of MRI, Brain, Diagnosis, Diffusion weight, DWI images.

I. INTRODUCTION

MRI can discriminate a variety of conditions of the brain like developmental and structural abnormalities, infections, inflammations, or problems with the blood vessels, cysts, tumors, bleeding, and swelling. It can detect if a shunt is working and find out the damage to the brain caused by an injury or a stroke. When repeated biopsies can be burdensome, MRI offers the potential of noninvasive longitudinal monitoring of disease progression, for example in the case of brain tumors. MRI has frequently been speculated for optimizing patient selection in clinical trials of novel drugs and to provide potential biomarkers for monitoring the effects of therapies at both pre-clinical and clinical stages [1]. Due to the ease of translation of results between pre-clinical and clinical settings, further, some investigators have advocated the use of imaging as a surrogate endpoint for long-term outcomes in clinical trials [2]. Besides these, individual MRI parametric maps typically present single snapshots in time of disease processes which are highly dynamic. To better assess tissue in acute stroke patients, viability and potential recovery after therapeutic intervention in regions of reduced cerebral blood flow (CBF), extra data on changes in cerebral blood volume (CBV) (e.g. whether it is reduced or elevated) [3] may be critical. Diagnostic methods like MRI or any other procedure are to be selected according to one's hypothesis, by statistical tests such as analysis of variance to determine if there exists a difference in volumes between groups and/or multivariate regression to forecast an outcome variable. In compare signal intensity in different patient

cohorts, e.g. treated or non-treated, region of interest (ROI) analysis can also be performed. These volumetric regional approaches have been used to investigate several brain disorders ranging from acute stroke, brain tumors, migraine, multiple sclerosis, dementia, CADASIL, Alzheimer's disease, and epilepsy [4, 5]. Automatic Image Registration, Laboratory of Neuro Imaging, UCLA [6], and MRI manufacturers have developed automatic MRI slice positioning protocols (e. g., Auto-Align) that enable the precise and consistent alignment of scans among different individuals and repeated imaging of the same individidual [7].

II. OBJECTIVES

General Objective

- To assess the spectrum of MRI findings of brain among the patients with several complaints.

Specific Objective

- To collect information regarding demographic status of the participants.
- To collect information regarding clinical status of the participants.

III. METHODS & MATERIALS

This was a prospective observational study which was conducted in the Department of Radiology & Imaging, Dr. Sirajul Islam Medical College Hospital, Dhaka, Bangladesh during the period from January 2018 to December 2019. In total 136 patients with several health problems attended the mentioned hospital and performed and submitted brain MRI reports in their treatment procedures were enrolled as the study population. The ethical committee of the mentioned hospital approved the study. Before starting data collection, written consent was taken from each participant. A pre-designed questionnaire was used in patent data collection. The MRI examinations were completed in dedicated 1.5 T or 3 T MRI scanners. All of the participants underwent imaging during the acute phase of the illness (between day 3 and day 6). The MRI scans included T1weighted fast spin-echo, T2-weighted, and fluid-attenuated inversion recovery (FLAIR) sequences. Diffusion-weighted (DWI) images were acquired using single-shot fast spin-echo planar sequences with sensitizing gradients applied in all three orthogonal planes with b factors of 500 s/mm2 and 1000 s/mm2. Using the software supplied by the vendor, we also generated apparent diffusion coefficient maps. We also acquired gradient recalled echo (GRE) fast low-angle shot sequences (in six patients) and susceptibility-weighted imaging (SWI) sequences (in three patients), to identify hemorrhagic foci. In all cases, contrast-enhanced T1- weighted scans were also obtained. All data were processed, analyzed, and disseminated by MS Office and SPSS version 22.0.

IV. RESULT

In this study, in analyzing the ages of the participants we observed the highest number of participants were from >60 years' age group which was 38.2%. Besides this, 18.4%, 22.8%, and 20.6% were from ≤30, 31-50, and 51-60 years' age groups respectively. Among all the participants 58.82% (n=80) were male and the rest 41.18% (n=56) were female. So, the male was dominating in number and the male-female ratio was 1.43:1. As clinical features among the participant's headache were found among 21.9% of participants which was the highest frequency as a unique clinical finding. Besides this vertigo, right-side weakness, left side weakness, vomiting, slurring of speech, convulsion, DM, HTN, chest pain, unable to talk, nasal bleeding, and some other clinical features were found in 12.3%, 11.4%, 11.4%, 9.6%, 8.8%, 5.3%, 5.3%, 4.4%, 2.6%, 2.6%, 1.8%, and 29.8% participants respectively. In analyzing the MRI findings of the participants, we observed a large number of participant's deep white matter ischemic change: DWMI (49.6%) and/or mild to moderate degree of generalized cortical atrophy (41.2%) were found. Then unremarkable, bilateral maxillary sinusitis, left maxillary sinusitis, acute infarcts in left cerebral hemisphere / infarcts in left cerebral hemisphere, old infarcts in right cerebral hemisphere, acute infarcts in right cerebral hemisphere / infarcts in right cerebral hemisphere, right maxillary sinusitis, acute infarcts in both cerebral hemisphere / infarcts in both cerebral hemisphere, old infarcts in both cerebral hemisphere, right-sided vestibular schwannoma were found among 20.6%, 17.6%, 8.4%, 7.6%, another 7.6%, 6.9%, 5.3%, 3.8%, another 3.8% and 2.3% participants respectively. Besides these, some other minor MRI findings were observed among 45% of participants.

Table I: Demographic Profile of the participants (N=136)

Clinical information	n	%
Gender		
Male	80	58.82
Female	56	41.18
Age(In Years)		
≥ 30 yrs.	25	18.4
31-50 yrs.	31	22.8
51-60 yrs.	28	20.6
>60 yrs.	52	38.2

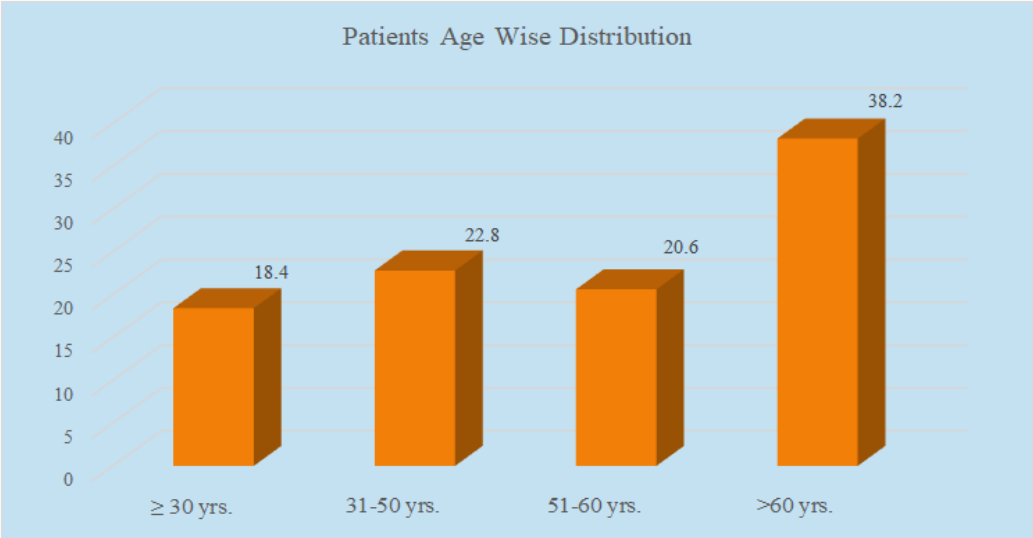

Figure I: Age Groups of the participants (N=136)

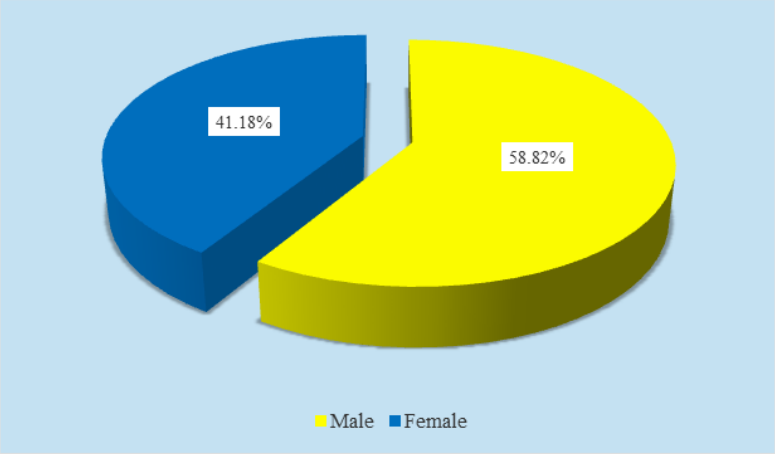

Figure II: Gender distribution of the participants (n=136)

Table II: Distribution of clinical findings among participants (N=136)

Clinical information	n	%
Headache	25	21.9
Vertigo	14	12.3
Right side weakness	13	11.4
Left side weakness	13	11.4
Vomiting	11	9.6
Slurring of speech	10	8.8
Convulsion	6	5.3
Diabetes Mellitus	6	5.3
Hypertension	5	4.4
Chest pain	3	2.6
Unable to talk	3	2.6
Nasal bleeding	2	1.8
Others	34	29.8

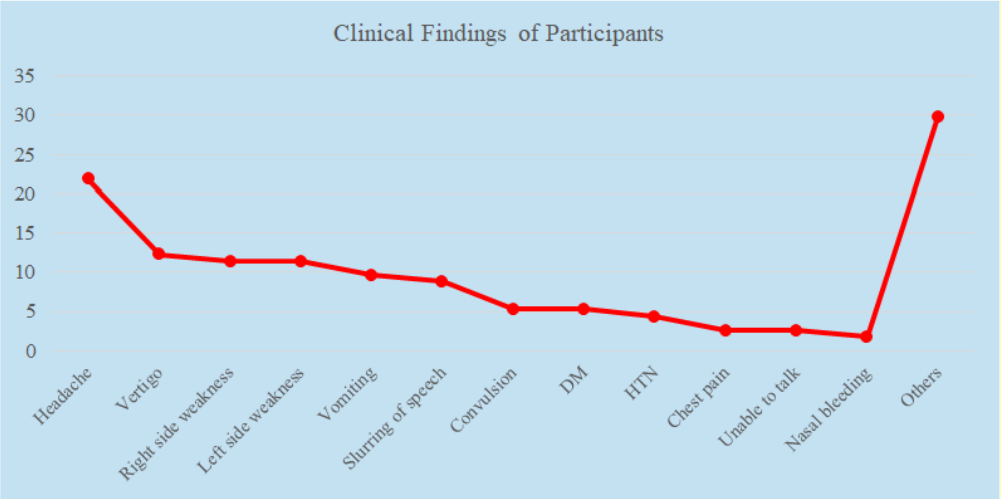

Figure III: Clinical Findings of Participants (N=136)

Table III: Distribution of MRI findings among participants (N=136)

MRI Findings	n	%
Deep white matter ischemic change	65	49.6
Mild/moderate degree of generalized cortical atrophy	54	41.2
Unremarkable	27	20.6
Bilateral maxillary sinusitis	23	17.6
Left maxillary sinusitis	11	8.4
Acute infarcts in left cerebral hemisphere/ infects in left cerebral hemisphere	10	7.6
Old infarcts in right cerebral hemisphere	10	7.6
Acute infarcts in right cerebral hemisphere/infects in right cerebral hemisphere	9	6.9
Right maxillary sinusitis	7	5.3
Acute infarcts in both cerebral hemisphere / infarcts both cerebral hemisphere	5	3.8
Old infarcts in both cerebral hemisphere	5	3.8
Right sided vestibular schwannoma	3	2.3
Others	59	45

V. DISCUSSION

Include the basal ganglia, thalamus, temporal lobes, hippocampus, cerebellum, and cerebral white matter, there have been isolated case reports suggesting that the commonly affected regions of the brain [8]. In all patients, we encountered foci of blooming on GRE/SWI sequences, which was indicative of hemorrhage within the lesions. The DWI characteristics of the lesions have been reported in only a few previous studies. In those studies, the lesions showed hyperintense signals on DWI, the diffusion being restricted in some cases and facilitated in others [9]. In our series, all of the focal lesions showed restricted diffusion. Hemorrhagic foci within the lesions have also rarely been reported in dengue encephalitis [10]. In our study in analyzing the MRI findings of the participants, we observed in a large number of participant's deep white matter ischemic change: DWMI (49.6%) and/or mild to moderate degree of generalized cortical atrophy (41.2%) were found. Then unremarkable, bilateral maxillary sinusitis, left maxillary sinusitis, acute infarcts in left cerebral hemisphere / infarcts in left cerebral hemisphere, old infarcts in right cerebral hemisphere, acute infarcts in right cerebral hemisphere / infarcts in right cerebral hemisphere, right maxillary sinusitis, acute infarcts in both cerebral hemisphere / infarcts in both cerebral hemisphere, old infarcts in both cerebral hemisphere, right-sided vestibular schwannoma were found among 20.6%, 17.6%, 8.4%, 7.6%, another 7.6%, 6.9%, 5.3%, 3.8%, another 3.8% and 2.3% participants respectively. Besides these, some other minor MRI findings were observed among 45% of participants. On the basis of MRI findings alone. Analysis of the cerebrospinal fluid and clinical profile might provide clues to the specific clinical entity. In our study, in analyzing the ages of the participants we observed the highest number of participants were from >60 year's age group which was 38.2%. Among all the participants 58.82% (n=80) were male and the rest 41.18% (n=56) were female. So, the male was dominating in number and the male-female ratio was 1.43:1. As clinical features among the participant's headache were found among 21.9% of participants which was the highest frequency as a unique clinical finding. Besides this vertigo, right-side weakness, left side weakness, vomiting, slurring of speech, convulsion, DM, HTN, chest pain, unable to talk, nasal bleeding, and some other clinical features were found in 12.3%, 11.4%, 11.4%, 9.6%, 8.8%, 5.3%, 5.3%, 4.4%, 2.6%, 2.6%, 1.8%, and 29.8% participants respectively.

All these findings may be helpful in similar further studies.

VI. LIMITATIONS OF THE STUDY

This was a small sample size-based single-centered study. So, the findings of this study might not be mirror the exact scenario of the whole country.

VII. CONCLUSION AND RECOMMENDATIONS

Deep white matter ischemic change (DWMI), mild/moderate degree of generalized cortical atrophy, unremarkable and bilateral maxillary sinusitis may be considered as the provable frequent finding among the patients with the necessity of MRI. Headache, vertigo, right and left side weakness may be considered as the most frequent clinical features of selected patients for MRI. For getting more reliable information we would like to recommend conducting more studies in several places with larger sample size.

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