ORIGINAL ARTICLE

MRI CHANGES AMONG PATIENTS OF ECLAMPSIA AND PREECLAMPSIA WITH ASSOCIATED NEUROLOGICAL SYMPTOM ANALYSIS

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Background: Pregnancy poses some stress on normal homeostasis of the human body and brings changes in the body which predisposes the individual towards various pathological conditions as well. **Objective:** Objective of the study was to determine the magnetic resonance imaging (MRI) changes and clinical symptoms associated with these changes among patients of eclampsia and preeclampsia managed at tertiary care unit. It was a cross-sectional study, conducted at Gynaecology and obstetrics department Pak Emirates Military Hospital (PEMH) Rawalpindi. January to June 2019. **Methods:** A total of 80 pregnant women who were diagnosed by consultant obstetrician for eclampsia or pre-eclampsia were included in the study. All the patients underwent Plain MRI brain including TIWI, T2WI, FLAIR, DWI, ADC, GRE and SWI sequences at radiology department of PEMH RWP. Positive MRI findings were defined as presence of cerebral oedema, infarction, cerebral venous sinus thrombosis and cerebral haemorrhage. Headache, seizures, altered mental status and visual problems were correlated with MRI changes among the target population. **Results:** Out of 80 pregnant women with eclampsia or pre-eclampsia, 49 (61.2%) had no changes on MRI while 31 (38.8%) had significant changes on MRI. Cerebral oedema 12 (15%) was the most common MRI finding followed by cerebral haemorrhage 8 (10%). Mean age of participants was 36.33±2.238 years. With Pearson chi-square analysis, it was found that presence of seizures and altered mental state had statistically significant relationship with presence of MRI findings among the target population. **Conclusion:** MRI changes were a common finding among the patients of eclampsia or pre-eclampsia. Cerebral oedema was the commonest finding in our study. Patients with serious clinical symptoms like seizures and altered mental state had more chances of having MRI changes as compared to patients without the serious clinical symptoms.

Keywords: Magnetic resonance imaging; Pre-eclampsia; Clinical

Citation: Umar T, Gilani A, Tasnim A, Yousaf MA, Umar S, Mehboob A, *et al*. MRI changes among patients of eclampsia and preeclampsia with associated neurological symptom analysis. J Ayub Med Coll Abbottabad 2022;34(2):269–72.

INTRODUCTION

Pregnancy poses some stress on normal homeostasis of the human body and bring changes in the body which predispose the individual towards various pathological conditions as well.[1] Multiple endocrine and metabolic changes may occur among the females during pregnancy.[2] Blood pressure abnormalities during the pregnancy also have serious consequences both for mother and the baby and may lead to potentially fatal conditions like eclampsia and pre-eclampsia.[3]

Eclampsia and pre-eclampsia have been fairly common complications related to pregnancy across the globe with high mortality and morbidity.[4,5] Diagnosis is usually based upon clinical findings, vital signs and relevant laboratory investigations.[6] Patients usually managed in obstetric units or high dependency or intensive care units depending upon the nature of symptoms and severity of the condition.

Neuroimaging has not been part of routine diagnostic or prognostic modalities for eclampsia or preeclampsia, but a lot of work has been done because of involvement of brain parenchyma in this clinical condition. Demirtas *et al*.[7] conducted a study in 2005 concluded that out of 39 patients of eclampsia and pre-eclampsia they studied MR imaging was normal in 21 patients while positive findings were present in 18 of the patients. Occipital lobe was the commonest brain area involved in almost all of the patients. Watershed distribution was found in thirteen patients. When the patients with and without MR imaging findings were compared, there was a statistically significant difference regarding visual disturbances, depression of consciousness, and seizures (p=0.042, p=0.006, p=0.000, respectively).[7] Di *et al*.[8] in 2018 performed a similar study and came up with the findings that around 88% patients of eclampsia had abnormal neuroimaging findings and cerebral oedema was the commonest followed by infarction. Uric acid abnormalities had a significant link with presence of neuroimaging abnormalities in such patients. Findings in patients with preeclampsia were not very different from the findings in patients with eclampsia.[8] Dong *et al*.[9] in their

retrospective study published in 2019 concluded that cerebral oedema was the commonest neuroimaging abnormality among patients of eclampsia and significantly related to presence of headache among these patients.[9] An investigation has to be evaluated from multiple perspectives in order to make it part of some procedure. Developing countries have to consider cost factor as well for any treatment or diagnostic modality as government and people both have limited health care resources. A study done by Saxena *et al*.[10] in India concluded that significant number of patients with eclampsia have MRI findings but it is not a cost-effective investigation therefore cannot be used in routine in such patients. This study was designed to determine the MRI changes and clinical symptoms associated with these changes among patients of eclampsia and pre-eclampsia managed at our obstetric unit.

MATERIAL AND METHODS

This study was a correlational study conducted in Gynaecology and obstetrics department Pak Emirates Military Hospital Rawalpindi from January to June 2019. WHO Sample Size Calculator was used for sample size calculation with population prevalence proportion of 3%.[11] Non probabilities consecutive sampling technique used to gather the samples. All the pregnant women between 18 and 45 years of age diagnosed with eclampsia or pre-eclampsia on the basis of clinical and laboratory parameters by consultant obstetrician were included in the study. It was defined as hypertension developing after 20 weeks' gestation with one or more of the following: proteinuria, maternal organ dysfunction (including renal, hepatic, haematological, or neurological complications), or foetal growth restriction.[12,13] Patients with history of pre-eclampsia or eclampsia in previous pregnancies were excluded from the study. Patients with past or current history of epilepsy, stroke, encephalitis or meningitis were also excluded from the study. Patients with any autoimmune disorders or any haematological or solid malignancies were also not included in the study. Patients who refused neuroimaging or had some relative or absolute contraindication for MRI were also excluded at the start of the study. Ethical approval was obtained from Internal Review Board of Pak Emirates Military Hospital (IREB Letter no: A/28/EC/132/20). Study was explained and informed consent was taken from patients or their next of kin. Pregnant women with eclampsia or pre-eclampsia meeting the inclusion/exclusion criteria were included in the study. MRI was done in radiology department/Armed forces institute of radiology. Plain MRI brain was done on 3.0 Tesla MRI machine for all the study participants and consultant radiologist reported them all and highlighted the relevant findings related to eclampsia/pre-eclampsia. T2-weighted and fluid-attenuated inversion recovery images of brain MRI were considered specifically to make the diagnosis.[14]Relevant clinical signs and symptoms like headache, seizures, altered consciousness and visual disturbances were asked from patients/elicited by treating obstetrician and entered in a proforma especially designed for this study. All statistical analysis was performed by using the SPSS-24.0. Mean and standard deviation for the age of study participants was calculated. Frequency and percentages for patients with pre-eclampsia and eclampsia having positive findings on MRI were calculated. Chi-square was applied to look for any association between the headache, seizures, altered consciousness and visual disturbances with presence of positive MRI findings. *p*-values of less than or equal to 0.05 were considered as significant.

RESULTS

After applying the inclusion and exclusion criteria on the patients of eclampsia and pre-eclampsia managed in department in the given time 80 patients were recruited in the study and underwent MRI brain in the radiology department. Out of these 80 pregnant women with eclampsia or pre-eclampsia, 49 (61.2%) had no changes on MRI while 31 (38.8%) had significant changes on MRI. Table-1 shows that Cerebral oedema 12 (15%) was the most common MRI finding followed by cerebral haemorrhage 8 (10%). Mean age of participants was 36.33±2.238 years. With Pearson chi-square analysis (Table-2), it was found that presence of seizures and altered mental state had statistically significant relationship with presence of MRI findings among the target population (p-value<0.05) while headache and visual disturbances were not significantly related to presence of MRI findings (p-value>0.05).

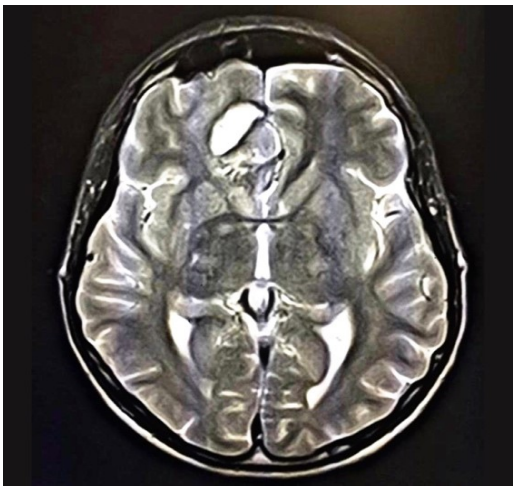

Figure-1: MRI Brain axial T2W sequence shows hyperintense lesion in right frontal lobe due to haemorrhage resulting from cerebral venous sinus thrombosis

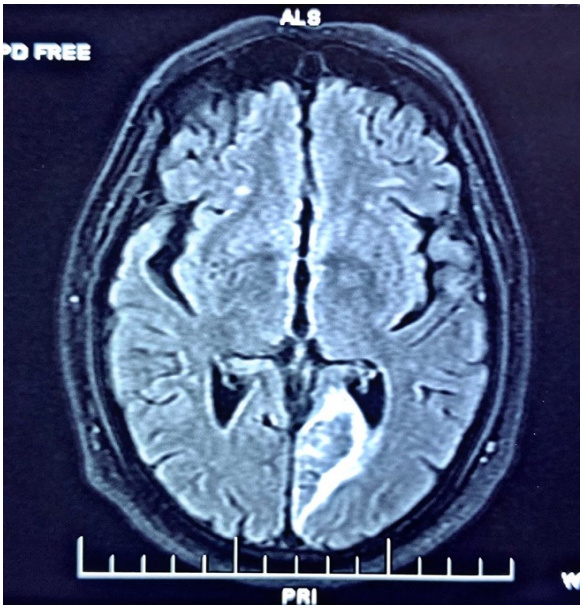

Figure-2: MRI Brain axial FLAIR sequence shows hyperintense lesion in left occipital lobe due to infarction.

Table-1: Characteristics of study participants n=80

Age (years)	
Mean±SD	36.33±2.238
Range (min-max)	18–45 years
MRI changes	
No	49 (61.2%)
Yes	31 (38.8%)
Types of MRI changes	
Cerebral oedema	12 (15%)
Cerebral infarction	08 (10%)
Cerebral haemorrhage	05 (6.25%)
Cerebral venous sinus thrombosis	04 (5%)
Other	2 (2.5%)

Table-2: Relationship of various clinical symptoms with MRI changes: Chi-square test

Clinical symptoms	No MRI changes	MRI changes	*p*-value
Headache			
No	21 (42.8%)	11 (35.5%)	0.511
Yes	28 (57.2%)	20 (64.5%)	
Seizures			
No	45 (91.8%)	21 (67.7%)	0.006
Yes	04 (8.2%)	10 (32.3%)	
Altered mental state	41 (83.7%)	14 (45.2%)	<0.001
No	08 (16.3%)	17 (54.8%)	
Yes			
Visual problems			
No	36 (73.5%)	20 (64.5%)	0.397
Yes	13 (26.5%)	11 (35.5%)	

DISCUSSION

Pre-eclampsia and eclampsia are common clinical conditions associated with pregnancy in all parts of the world. Situation has not been different in our part of the world and a lot of pregnant women suffer from these conditions and have serious consequences.[15,16] We therefore planned this study including only the eclampsia patients with objective to determine the MRI changes and clinical symptoms associated with these changes among these patients managed at our tertiary care obstetric unit.

Osmanağaoğlu *et al.*[11] in a study published in 2005 studied 38 pregnant women with eclampsia and pre-eclampsia for presence of any MRI changes. They concluded that ischemia was the commonest finding in patients followed by haemorrhages. Long term follow-up also revealed that two women developed cerebral infarction later on.[11]We did not follow up patients for long period of time and interpreted MRI findings during the presentation and cerebral oedema was the commonest finding followed by cerebral infarction in our set of patients.

Postma *et al.*[14] in 2014 did a literature review in this regard and summarized that cerebral oedema in parietal and occipital lobe and nonspecific white matter changes were commonly seen on the neuroimaging modalities among the patients presenting with eclampsia and pre-eclampsia.[14] Our findings supported their results as cerebral oedema was present in most of the patients with positive MRI findings and ischemia and infarction were also present in considerable number of patients as white matter lesions.

Hellmeyer *et al.*[17] in 2009 in Germany did a similar study with the objective to look for the correlation of neurological symptoms with MRI findings among patients with eclampsia. They concluded that patients with seizure and the visual disturbances had the white matter hyperintensities on T (2)-weighted MR and FLAIR sequence images in the occipital region and in the basal ganglia.[17] Visual disturbances in our analysis had no correlation with positive MRI findings but presence of seizures in the patients had a very strong correlation with positive MRI findings in our study participants.

Studies done in recent past revealed that visual problems and seizures were significantly associated with presence of MRI findings especially cerebral oedema in the occipital lobe.[18–20] Seizures were associated in a similar pattern with MRI changes in our analysis as well but visual disturbances did not show any such association.

Altered consciousness and seizures were significantly related to presence of abnormal findings on MRI among patients of eclampsia or severe pre-eclampsia in a study done in our neighbouring country by Saxena *et al.* in 2018.[10]Similar findings were seen in our study population and altered consciousness and seizures were found significantly

more in patients with positive MRI findings as compared to those without the positive MRI findings.

There may be some limitations in the study. It was a single center study with small sample size therefore results cannot be generalized to general population. Patients were not followed up and once neuroimaging performed were not evaluated again for reimaging even if the condition became worse as neuroimaging is not a routine in our setting among such patients. Cost is another parameter which was not evaluated as all of our patients were entitled for free investigations inside the hospital.

CONCLUSION

MRI changes were a common finding among the patients of eclampsia or pre-eclampsia. Cerebral edema was the commonest finding in our study. Patients with serious clinical symptoms like seizures and altered mental state had more chances of having MRI changes as compared to patients without the serious clinical symptoms.

Conflict of interest

None to declare

Acknowledgement

None

AUTHORS' CONTRIBUTION:

TU: Conceived the study, done data collection & analysis, wrote manuscript, did proof reading. AG: Data collection, wrote manuscript, did statistical analysis and proof reading. AT: Data collection & analysis. MAY: Conceived the study, supervised whole study & proof reading. SU: Data collection & analysis, proof reading. AM: Data collection & statistical analysis. AG: Wrote the manuscript, did proof reading. FG: Data collection & statistical analysis

REFERENCES

1. Kepley JM, Mohiuddin SS. Physiology, Maternal Changes. [Updated 2019 Apr 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. [cited 2020 Aug]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK539766/
2. Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. Cardiovasc J Afr 2016;27(2):89–94.
3. Rana S, Lemoine E, Granger JP, Karumanchi SA. Preeclampsia: Pathophysiology, Challenges, and Perspectives [published correction appears in Circ Res. 2020 Jan 3;126(1):e8]. Circ Res 2019;124(7):1094–112.
4. Magley M, Hinson MR. Eclampsia. [Updated 2020 Feb 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan. [cited 2020 Aug]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554392/
5. Mayrink J, Souza RT, Feitosa FE, Rocha Filho EA, Leite DF, Vettorazzi J, *et al*. Incidence and risk factors for Preeclampsia in a cohort of healthy nulliparous pregnant women: a nested case-control study. Sci Rep 2019;9(1):9517.
6. Duhig K, Vandermolen B, Shennan A. Recent advances in the diagnosis and management of pre-eclampsia. F1000Res 2018;7:242.
7. Demirtaş O, Gelal F, Vidinli BD, Demirtaş LO, Uluç E, Baloğlu A. Cranial MR imaging with clinical correlation in preeclampsia and eclampsia. Diagn Interv Radiol 2005;11(4):189–94.
8. Di X, Mai H, Zheng Z, Guo K, Morse AN, Liu H. Neuroimaging findings in women who develop neurologic symptoms in severe preeclampsia with or without eclampsia. Hypertens Res 2018;41(8):598–604.
9. Dong X, Nao J. Neurological manifestations and neuroimaging presentations in patients with severe preeclampsia: predisposing factors and clinical implications. Neurol Sci 2019;40(6):1245–53.
10. Saxena R, Joshi K, Saxena G, Sharma G, Yadav K. A cross-sectional study to evaluate the cranial magnetic resonance imaging findings in eclampsia and severe pre-eclampsia patients and its clinical correlation. Adv Hum Biol 2018;8(1):41–5.
11. Osmanağaoğlu MA, Dinç G, Osmanağaoğlu S, Dinç H, Bozkaya H. Comparison of cerebral magnetic resonance and electroencephalogram findings in pre-eclamptic and eclamptic women. Aust N Z J Obstet Gynaecol 2005;45(5):384–90.
12. Portelli M, Baron B. Clinical Presentation of Preeclampsia and the Diagnostic Value of Proteins and Their Methylation Products as Biomarkers in Pregnant Women with Preeclampsia and Their Newborns. J Pregnancy 2018;2018:2632637.
13. Postma IR, Slager S, Kremer HP, de Groot JC, Zeeman GG. Long-term consequences of the posterior reversible encephalopathy syndrome in eclampsia and preeclampsia: a review of the obstetric and nonobstetric literature. Obstet Gynecol Surv 2014;69(5):287–300.
14. Soomro S, Kumar R, Lakhan H, Shaukat F. Risk Factors for Pre-eclampsia and Eclampsia Disorders in Tertiary Care Center in Sukkur, Pakistan. Cureus 2019;11(11):e6115.
15. Ahmad I, Zubair UB, Mumtaz H, Yousaf MA, Muhammad WW. Posterior reversible encephalopathy syndrome in our setup. Pak Armed Forces Med J 2013;63(3):365–68.
16. Hellmeyer L, Iwinska-Zelder J, Gerken L, Kühnert M, Schmidt S. MR-tomografische Veränderungen bei Präeklampsie und Eklampsie [Changes in MR images in pre-eclampsia and eclampsia]. Z Geburtshilfe Neonatol 2009;213(1):27–31.
17. Dong XY, Bai CB, Nao JF. Clinical and radiological features of posterior reversible encephalopathy syndrome in patients with pre-eclampsia and eclampsia. Clin Radiol 2017;72(10):887–95.
18. Rijal JP, Giri S, Dawadi S, Dahal KV. Posterior reversible encephalopathy syndrome (PRES) in a patient with late postpartum eclampsia. BMJ Case Rep 2014;2014(1):bcr2013203162.
19. Dong X, Nao J. Influential factors and clinical significance of an atypical presentation of posterior reversible encephalopathy syndrome in patients with eclampsia. Neurol Sci 2019;40(2):377–84.

Submitted: August 22, 2020	*Revised: October 18, 2020*	*Accepted: May 14, 2021*

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