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Original Research Article

Study of MRI lesions in severe preeclampsia and eclampsia in General Government Hospital Guntur, India

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ABSTRACT

Background: Study of MRI lesions in patients with PE with severe features and eclampsia and its correlation with clinical findings and laboratory values.

Methods: This prospective observational study was conducted in HDU, Department of Obstetrics and Gynecology, GGH Guntur. 50 patients with preeclampsia and eclampsia divided into two groups based on MRI findings: controls (normal MRI), cases (abnormal MRI). Results analyzed with Chi Square test and student T test.

Results: Out of 50 cases, abnormal MRI findings were observed in 24 (48%) cases and 26 (52%) showed normal MRI findings. PRES lesions majority 20 cases (40%), GLIOSIS in 2 (4%) cases, CSVT in 1 (2%) patients, cerebral hemorrhage seen in 1 (2%) patient. Majority are unbooked cases n= 38 (76%), booked cases n=12 (24%). Symptoms like irritability, headache, unconsciousness, dimness of vision and seizures correlated well with positive MRI findings (P=0.001, P=0.001, P=0.002, P=0.005, P=0.000respectively). Nausea/vomiting and high BP recordings not correlated with positive MRI findings (P=0.21, P=0.312 respectively). Abnormality in blood counts, serum fibrinogen, serum uric acid, PT, APTT and PT INR are not correlated with positive MRI lesions.

Conclusions: Symptoms/signs like unconsciousness, irritability, blurring of vision, headache, seizures, GCS <3 and unbooked status of patients of eclampsia and preeclampsia should be a warning for possible development of MRI brain lesions. Whereas nausea, vomiting and high BP recordings are not significantly associated with positive brain lesions in MRI.

Keywords: Eclampsia, MRI, Severe preeclampsia

INTRODUCTION

Severe preeclampsia is a severe form of preeclampsia that will lead to eclampsia characterized by generalized tonic clonic convulsions and/or loss of consciousness, which cannot be related to another neurological disease, in no time if not treated in time.¹ Incidence of severe preeclampsia is 4 in 1000 deliveries and eclampsia is around 1 in 2000 deliveries in developed countries and approximately 7% and 1% respectively in the Indian population.² Eclampsia is associated with high maternal

mortality can take place 0 to 1.8% in developed countries and a high as 15% in India.

Among the morbidity factors, neurological involvement plays a major role, which are better understood with the help of CT and MRI brain.³ These lesions include intracerebral hemorrhage, cerebral ischemia, and cerebral edema. The objective of present study is to study incidence of MRI lesions in preeclampsia with severe features and eclampsia and also to correlate MRI findings with clinical and laboratory values.⁵

METHODS

An 8 months prospective observational study was conducted in Department of obstetrics, GGH, Guntur. 50 patients admitted in HDU, Labour Room, with eclampsia from august 2022 to march 2023 are taken into study. Diagnosis was made based on clinical findings, detailed history. Blood investigations like CBC, LFT, RFT, serum uric acid, platelet count sent. Imaging for brain changes carried out with MRI for all cases. MRI findings analyzed in all 50 cases, divided into two groups. Those with abnormal MRI findings grouped into cases, those with normal MRI findings grouped into controls. These findings correlated with clinical picture and serology reports.

Statistical analysis

Collected data analyzed for statistical purpose as rates, ratios and proportions. The comparison was done using chi-square test and unpaired student T test. Sensitivity, specificity, positive predictive value and negative predictive value were calculated to find accuracy of neurological presentation in determining MRI diagnosis. A probability value of less than 0.050 was taken as statistically significant.

RESULTS

Out of 50 patients, 6 (12%) women are in the age group of 19 to 20 yrs, 30 (60%) women are in the age group of 21 to 25 years, 11 (22%) women are in the age group of 26 to 30 years and 3 (6%) are in the age group of 31 to 35 years.

3 cases of chronic hypertension complicated by preeclampsia with severe features are in the age group of 31 to 35 yrs (Table 1).

Table 1: Age distribution.

Age group	Cases	Control	Total	Percentage
<20 years	2	4	6	12
21-25	16	14	30	60
26-30	4	7	11	22
31-35	2	1	3	6
Total	24	26	50	

In our study 28 (56%) patients belong to low socioeconomic class, 20 (40%) women are in the low middle class and 2 (4%) women belong to upper middle class (Table 2).

Table 2: Socio-economic' distribution.

Socio-economic status	Cases	Control	Total	%
Low	15	13	28	56
Low middle	8	12	20	40
Upper middle	1	1	2	4
Total	24	26	50	

Majority are unbooked cases 38 (76%), referred from nearby PHCs and private hospitals, presented mostly during the antenatal period and we have booked cases 12 (24%) mostly among intranatal and postnatal cases (Table 3).

Table 3: Booking status.

Booking status	+ ve MRI (Study)	-ve MRI (Control)	Total	Percentage
Booked	4	8	12	24
Unbooked	20	18	38	76
Total	24	26	50	

Out of total 50 cases, 30 patients (60%) were presented during antenatal period, 17 patients (34%) presented during postnatal period and 3 patients (6%) presented during intranatal period (Table 4).

Table 4: Clinical presentation.

Presentation	Study	Control	Total	Percentage
Antenatal	15	15	30	60
Intranatal	1	2	3	6
Postnatal	8	9	17	34
Total	24	26	50	

Regarding parity, 34 (68%) women were primigravidas, 10 (20%) women were second gravidas and 6 (12%) women are 3rd and above (Table 5).

Table 5: Parity.

Parity	Cases	Control	Total	Percentage
Primi	17	17	34	68
Second	3	7	10	20
3 rd and above	4	2	6	12
Total	24	26	50	

Common presentations at admission in addition to high BP recordings are symptoms like unconsciousness, irritability/altered sensorium, dimness of vision, headache, nausea/vomiting and eclampsia. Out of which irritability/altered sensorium, unconsciousness, dimness of vision, headache and seizures correlated well with positive MRI findings (P=0.024, P=0.001, P=0.010, P=0.000, P=0.005, P=0.001 respectively). Nausea, vomiting and

high BP recordings are not correlated with positive MRI findings P=0.02, 0.312 respectively (Table 6).

Table 6: Clinical presentation.

Symptoms	Study	Control	Total	P value
Nausea, vomiting	2	19	21	0.889
Dimness of vision	5	3	8	0.010
Altered sensorium	3	2	5	0.024
GTC	6	0	6	0.001
Unconscious	2	0	2	0.001
Headache	4	5	9	0.005

The sensitivity, specificity, positive predictive value and negative predictive value for neurological findings for abnormal MRI in patients with eclampsia was found to be 91.2%, 74%, 76% and 95.9% respectively. We found MRI lesions in 24 (48%) cases of 50 cases studied and normal MRI in 26 (52%) cases (Table 7).

Our 24 (48%) cases with positive MRI findings, preeclampsia with severe features constituted 6 (12%) cases, HTN superimposed with preeclampsia constituted 2 (4%) cases and eclampsia 16 (32%) cases which are the majority. Patients with abnormal MRI findings grouped as cases and that of normal MRI findings as controls. Most common MRI lesions in my study are PRES lesions in 20 cases (40%), GLIOSIS changes in 2 (4%) cases, CSVT in 1 (2%) patient, cerebral hemorrhage in 1 (2%) patient. Remaining 26 (52%) showed normal MRI findings (Table 8).

Table 7: Diagnosis and MRI lesions.

Diagnosis	Abnormal MRI	Normal MRI	Total	Percentage
PE with severe features	6	15	21	42
Eclampsia	16	10	26	52
Chronic HTN super imposed with PE	2	1	3	6
Total	24	26	50	

Table 8: Magnetic resonance findings.

MRI Findings	Number of MRI positives	Percentage
PRES	20	40
GLIOSIS	2	4
CSVT	1	2
Cerebral hemorrhage	1	2
Total MRI lesions	24	

Table 9: LAB parameters.

Lab values	Cases	Controls	total	P value
Hb% <9 gm%	7	8	15	0.901
Platelet count < 1 lakh	4	5	9	0.0894
S. uric acid > 5 mg %	4	4	8	0.792
S. fibrinogen < 400 mg%	3	2	5	0.924
PT	2	2	4	0.661
AP TT	2	2	4	0.661
PT INR	1	2	3	0.942

Table 10: Maternal outcome.

Complications	Cases	Controls	total	Percentage
Status eclampticus	1	0	1	2
PPH	1	1	2	4
Abruption	1	1	2	4
Pulmonary oedema	1	0	1	2
ARF	0	1	1	2
DIC	1	0	1	2
Aspiration pneumonia	1	1	2	4
HELLP	2	1	3	6

Abnormality in blood counts, serum fibrinogen, serum uric acid, PT, APTT and PT INR are not correlated with positive MRI lesions, other investigations like LFT and RFT were normal in all cases despite positive MRI findings. Patients with decreased serum fibrinogen are later complicated by DIC (Table 9).

Complications

Complications like HELLP (n=3) 6% significantly higher, abruption, aspiration pneumonia, PPH, were 4% each (n=2) in my study when compared to DIC, pulmonary edema, ARF and status epilepticus 2% (n=1) each. No cases of neurological deficit and maternal mortality found in my study (Table 10).

DISCUSSION

Brain lesions in eclampsia might be related to disturbance of the cerebral auto-regulation and impairment of endothelial function that is the hallmark of preeclampsia. Effective functioning of neurological mechanisms depends on sympathetic innervation. The cerebral auto-regulation mechanism consisting of myogenic and neurogenic components, maintains stable blood perfusion in normal individuals. Direct toxic effects on endothelium or vessel distention, which depends on elevated blood pressure, decreases the effect of myogenic mechanisms.¹ In these cases neurogenic mechanisms takeover the regulation of cerebral perfusion, this way posterior circulation areas which are relatively sparsely innervated by sympathetic nerves become more sensitive to blood pressure elevations. In cases with hypertension serum extravasation occurs when the elevation in blood pressure passes beyond auto-regulation capacity of brain blood vessels. Brain lesions are more commonly demonstrated in posterior areas in these cases.² In cases without hypertension, direct endothelial cell dysfunction, which increases blood brain barrier cell permeability, is thought to be responsible for the pathogenicity.⁵

In this study various clinical, laboratory findings were compared with positive and negative MRI lesions.

In my study, out of 50 cases admitted with preeclampsia and eclampsia, 30 cases were antenatal (60%), 3 cases were intranatal (6%), 17 cases were in the postnatal period (34%) at the time of presentation. Whereas in another study by Dahia et al in 2023 antenatal cases were 17%, intranatal cases were 0 and postnatal cases were 33%, which is not comparable to the present study.³ Regarding parity, 68% are primigravidas and 32% are multigravidas which is close to the results in a study by Mubarak F in 2012.⁴

Symptoms like altered sensorium, unconsciousness and convulsions are well correlated with MRI lesions in brain with P value 0.024 and 0.001 and 0.001 respectively, whereas nausea vomiting and high BP recordings are not significantly associated with positive MRI lesions in brain,

with P value 0.889, 0.111 respectively. In another study by Dahia et al also showed similar results.⁵ A study in Bangladesh also showed comparable radiological findings.⁶

In my study, abnormal findings in lab investigations like Hb% (n=15), platelet count (n=9), serum uric acid (n=8), PT (n=4), APTT (n=4), PT INR (n=3) and serum fibrinogen (n=5) doesn't statistically correlate with MRI brain changes as indicated by P value 0.901, 0.894, 0.792, 0.661, 0.661 0.942 and 0.924 respectively. This is comparable to a study by Rishadha et al.⁵

Complications like status epilepticus, pulmonary edema, ARF and DIC found in 2% (n=1) each, aspiration pneumonia, abruption and PPH in 4% (n=2) cases. No maternal deaths among 50 cases studied. This is comparable to a study by Jindal MA reported that status epilepticus.⁷ HELLP found in 3 cases (6%).

Brain changes diagnosed with MRI found in 48% cases, of which 8 cases are PE with severe features, 16 cases are eclampsia cases and PRES accounted for majority of changes- 40%, gliosis was seen in 4% cases, cerebral hemorrhage in 2% and CSVT in 2% cases. Predominant lesions in severe preeclampsia are gliosis and PRES. One patient with eclampsia had cerebral hemorrhage and another patient had CSVT. Eclampsia is one of the many causes of PRES, characterized by areas of altered signal intensity in MRI, predominantly involving the occipital and parietal regions. There is more involvement of white matter than gray matter which is consistent with vasogenic edema lesions are mostly hemispheric, bilaterally symmetric. The occipital lobe is a frequently affected area in preeclampsia and eclampsia followed by parietal, frontal temporal lobe and basal ganglia involvement.¹⁰ Cerebellum and brainstem involved in more severe cases. Occipital lobe is more commonly affected in our study followed by parietal, frontal lobes then basal ganglion. In comparison with the study by Jnewar, similar findings were observed.⁷ All were treated with magnesium sulfate Prichard regime. Out of 50 cases treated, 14 cases (28%) developed reversible complications like PPH, HELLP, DIC ARF, aspiration pneumonia and status epilepticus and treated accordingly. No maternal deaths in our study, this was comparable to study by Dahia et al.⁸

CONCLUSION

Intact cerebral auto-regulation is important for preventing convulsions. Loss of auto-regulation leads to onset of seizures by means of increased permeability of the blood brain barrier due to endothelial injury leading to distribution of cerebral lesions in the posterior watershed region, which is sparsely innervated by sympathetic nerves leading to various MRI lesions in the brain. Further in this study it is evident that, symptoms/signs like unconsciousness, irritability, blurring of vision, headache, seizures, GCS <3, high BP recordings and unbooked status of patients of eclampsia and preeclampsia should be a

warning for possible development of MRI brain lesions. Whereas nausea, vomiting and high BP recordings are not significantly associated with positive brain lesions in MRI. Further abnormal brain lesions need not be preceded with abnormal blood counts and abnormal renal and liver function tests.

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