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Original Research Article

A STUDY ON CORRELATION BETWEEN NEUROIMAGING AND NEUROLOGICAL CLINICAL MANIFESTATIONS OF ECLAMPSIA COMPLICATING PREGNANCY AND MATERNAL OUTCOME

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Abstract

Background: The main aim of the present study is to correlate neuroimaging and neurological clinical manifestations in eclampsia and maternal outcomes. **Materials and Methods:** This prospective study was conducted in the department of obstetrics and gynecology, government general hospital, Guntur from the period of 2 years. A total of 75 women presented with antepartum or post-partum eclampsia were included. **Result:** In the present study, Mean age of study population 24.29, were primiparous women. Antepartum eclampsia 40%, intrapartum eclampsia2.7%, Postpartum eclampsia 57.3%. All women had generalised tonic clonic convulsions. Mean systolic BP 150.5 mmHg, Diastolic BP 95.5 mmHg. Proteinuria 2+ found in most of the women. 73.3% had normal fundoscopy findings. Most of them had headache, presented in unconscious state. Most of them delivered vaginally within 12 hours of admission. In postpartum eclampsia delivery to seizure interval is 3.88 days. PRES was seen as a major radiological finding. Out of 46 patients with radiological abnormality 38 had neurological signs and symptoms. 45.4% of women recovered without any complications, DIC seen in 13.3% Maternal death was 5%, Common cause was cortical vein thrombosis. **Conclusion:** Finally we concluded that more awareness should be created for the women while attending the antenatal clinics. Women from low socio economic status should be educated about nutrition, pregnancy, information about premonitory symptoms and the need for regular antenatal and postnatal checkups.

INTRODUCTION

Eclampsia Definition: occurence of one or more convulsions in pregnant woman with hypertension and proteinuria that cannot be attributed to any other cause.

Despite availability of intensive care units and improved antenatal care such as RCH, NRHM programs, etc., some women still die from eclampsia. Cerebral complications are the major cause of deaths in eclampsia patients,[1] but the neuropath physiology of eclamptic seizure still remain undiscovered.

Eclampsia itself along with hyper coagulopathy of pregnancy is a high-risk factor for development of CVT and intracranial haemorrhage. Although eclampsia affects variety of organs, cerebrovascular involvement is the major cause of death in eclampsia patients. There has been considerable debate as to whether the neurological symptoms of eclampsia arise from the over autoregulation that causes vasospasm and ischaemia OR from hyperperfusion that causes cerebral oedema formation.[2]

Most common finding on CT scan in eclampsia patients is generalised cerebral oedema and features suggestive of hypertensive encephalopathy.

Neuroimaging can be very helpful in eclampsia patients who do not respond to conventional treatment with MgSO4 and antihypertensives.[3,4]

CT scan findings in eclampsia patients have found mainly transient cortical and subcortical white matter hypodensities which could be due to hypoxia or oedema.[5,6] These lesions correspond to mainly watershed areas of circulation where anterior, middle and posterior cerebral arteries meet. It is in this area where the earliest breakthrough in autoregulation occurs

Need For Study

Eclampsia is a highly hazardous pregnancy condition that causes significant rates of maternal and neonatal mortality. Eclampsia is a severe, sometimes fatal pregnancy condition that manifests as tonic-clonic

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seizures (convulsions), generally in a woman who has pre-eclampsia. 1.56 percent of Indian women develop eclampsia.

Although not all cases of eclampsia are preventable, the majority of cases can be avoided by detecting preeclampsia early and treating it effectively, which calls for competent ANC services.The outlook for mother and baby becomes bleak once eclampsia begins.

Maternal mortality in eclampsia is brought on by a number of aggravating factors.

Brain MRI and computed tomography (CT) have completely changed how lesions in eclampsia and other organic disorders can be identified.

Aims and Objectives

To correlate neuroimaging and neurologicalclinical manifestations in eclampsia and maternal outcomes

Objectives

1. To assess the utility of radiological (CT/MRI) imaging by
   a. Correlating with clinical presentation and neuroimaging
   b. To identify abnormalities will help in proper arrival of diagnosis and treatment
2. To evaluate maternal morbidity and mortality associated with eclampsia.

MATERIALS AND METHODS

Study Design: A hospital based prospective observational study.

Analysis of Data: Data collected would be analysed using Microsoft excel and spss v 21 trial. Data will be analysed using appropriate statistical tests and a p value of less than 0.05 will be considered as statistically significant.

Study Tools: Data will be collected and compiled in data sheets using information from case sheets, baseline investigations and special investigations required for analysis

Duration of Study:two years from approval of protocol

Target Population: patients admitted in the inpatient labour room. complex and ICU of department of obstetrics, Guntur Medical College.

Sample Size:75

Inclusion Criteria

Patientswith eclampsia (in a women with preeclampsia, a convulsion which cannot be attributed to any other cause) antepartum, intrapartum, postpartum.

Exclusion Criteria

Womenwho are known case of chronic hypertension and epilepsy. Seizures due to metabolic disturbances, space occupying lesions or intracerebral infections

Methodology

1. All patients of eclampsia admitted at Government General hospital Guntur. Who fulfilled the inclusion criteria would be first stabilized with anticonvulsants and antihypertensives according to blood pressure levels and other supportive care.
2. Patients satisfying the inclusion criteria only will be subjected to the study.
3. Initial workup of the patients will be done with detailed clinical history (from patient / attendant/ companion), thorough physical examination and required laboratory investigations.
4. Informed written consent will be taken from the patients/ attendants/ companion before subjected for Neuroimaging (CT/MRI) in postpartum period. The reports given by the Dept. of Radiology will also be recorded.

RESULTS

Study sample consists of 75 women with eclampsia whose average age was 24.29 years while mean age of patients from age group above 21 years and below 21 years was found to be 23.03 years and 18.52 years respectively. 41% ofpatients fall under 20-24 years age group. Out of the sample, 10.7 % found to beless than 19 years while 8 % found to be above 30 years age group. [Table 1]

30 cases were Antepartum eclampsia while 43 cases were Postpartum eclampsia. Out of 30 antepartum eclampsia cases, 40% had age group between 22 to 24 years and 21.43 % fall under age group of 25 to 29 years. Similarly, under 58 postpartum eclampsia cases, 65.52% had age group between 20 to 24 years and 18.97% fall under age group of 25 to 29 years. [Table 2]

Onset of antepatrum eclampsia was observed at an average gestational ageof 36.07 weeks. .66.7% had gestational age greater than 36 weeks. Percent of cases with average gestational age of 28-32 weeks and 32 to 36 weeks are found to be 23.33% and 23.33% respectively. [Table 3]

Clinical Presentation

Commonest clinical presentation was found tobe Unconsciousness accounting to 69.33% percent of which 24 were reported under Antepartumeclampsia while 28 was reported under postpartum eclampsia. Altered Sensorium falls next to unconsciousness with 17.33% contribution in clinical presentation.

Within Antepartum eclampsia cases, Unconsciousness, Altered Sensorium and Frothing were reported as 24,3,2respectively. Single case of Incontinence was reported under Antepartum eclampsia. Similarly, within Postpartum eclampsia cases, Unconsciousness and Incontinence, frothing was reported as 28,2 ,4respectively. P value >0.5 not significant.

Symptoms

The commonest symptoms found in antepartum eclampsia was headache and it was observed in 33.31% (15.) whereas in postpartum eclampsia no imminent symptoms were found in 37.28% of women. The blurring of vision and vomiting were the other symptoms of eclampsia in which 26.7%and 6.7% of women in antepartum eclampsia had symptoms of blurring of vision and vomiting

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In postpartum eclampsia 42.2% of women had headache followed by blurring of vision (9.3 %) and vomiting (11.6%). Decreased urine output 2 women fall under the category of antepartum eclampsia, under post-partum eclampsia Each.

While considering the overall symptoms of eclampsia, 32% of women had no imminent symptoms. 40% of women had the symptoms of head ache followed by blurring vision (17.3%) and Vomiting (9%).

Posterior Reversible Encephalopathy Syndrome (PRES) is a specific radiological finding which is found in 33.3per cent of women. Out of which, antepartum eclampsia women had higher number of findings rather than post partum eclampsia. 10 patients with PRES had headache, followed by blurring of vision 5, vomiting 1 and reduced urine output 2. While considering clinical presentation, 12 women presented with unconscious state followed by altered sensorium 3 frothing 3 and incontinence 1 respectively. CVT with Infarct 11, out of which 1 case of antepartum eclamspia and 10 cases of postpartum eclampsia were found to have CVT with infarct. While concern to imminent symptoms, headache present in 7 followed by blurring of vision and vomiting 5,1 respectively.

In clinical presentation, 7 were presented in unconscious state followed by 4 had altered sensorium.

Infarct was found in 10 of women out of which, 3 patients belongs to antepartum eclamspia (33.33%) and remaining 7 patients belongs to postpartum eclampsia (66.66%). The most common neurological imminent symptom was headache 7. In clinical presentation, 8 presented in unconsiuous state. [Table 10]

Table 1: Age distribution

Age (Years)	Frequency	Percentage
<=19	8	10.7
20-24	41	54.7
25-30	18	24.0
>30	8	10.7
Total	75	100.0
Mean Age	24.29±5.15	

Table 2: Onset of eclampsia

	Frequency	Percentage
Antepartum	30	40.0%
Intrapartum	2	2.7%
Postpartum	43	57.3%
Total	75	100.0

Table 3: Gestational age at onset of Antepartum eclampsia

	Frequency	Percentage
28-32	3	10.00%
32-36	7	23.33%
>36	20	66.67%
Total	30	100.0

Table 4: Distribution based on Obstetric score

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
Primi para	20	66.7%	2	100%	32	74.44%	54	72%
Multi Para	10	33.3%	0	0%	11	25.58%	21	28%
Total	30	100.0%	2	100%	43	100.0%	75	100%

Table 5: Distribution based on proteinuria

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
1+	8	26.7%	0	0.0%	8	18.6%	16	21.3%
2+	10	33.3%	0	0.0%	14	32.6%	24	32.0%
3+	1	3.3%	1	50.0%	8	18.6%	10	13.3%
4+	2	6.7%	1	50.0%	4	9.3%	7	9.3%
NIL	9	30.0%	0	0.0%	9	20.9%	18	24.0%
Total	30	100.0%	2	100.0%	43	100.0%	75	100.0%

Table 6: Distribution based on Ophthalmological findings.

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
Grade I	6	20.0%	0	0.0%	9	20.9%	15	20.0%
Grade II	0	0.0%	0	0.0%	2	4.7%	2	2.7%
Grade III	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Grade IV	1	3.3%	0	0.0%	0	0.0%	1	1.3%

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Corticalblindness	2	6.7%	0	0.0%	0	0.0%	2	2.7%
Normal	21	70.0%	2	100.0%	32	74.4%	55	73.3%
Total	30	100%	2	1005	43	100%	75	100%

Table 7: Distribution based on Clinical presentation

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
Altered Sensorium	3	10%	1	50.0%	9	20.9%	13	17.33%
Frothing	2	6%	1	50.0%	4	9%	7	9%
Incontinence	1	3%	0	0.0%	2	4%	3	4%
Unconscious	24	80%	0	0.0%	28	65%	52	69.33%
Total	30	100.0%	2	100%	43	100.0%	75	100.0%
Chi square test=1.72 p =0.8 Inference : Is Not Statistically Significant								

Table 8: Distribution based on Imminent symptoms

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
Blurring Of Vision	8	26.7%	1	50.0%	4	9.3%	13	17.3%
Headace	10	33.3%	1	50.0%	19	44.2%	30	40.0%
No ImminentSymptoms	8	26.7%	0	0.0%	16	37.2%	24	32.0%
Reduced UrineOutput	2	6.7%	0	0.0%	0	0.0%	2	2.7%
Vomiting	2	6.7%	0	0.0%	5	11.6%	7	9.3%
Total	30	100%	2	100%	43	100%	75	100%
p >0.05 Inference : Is Not Statistically Significant								

Table 9: Distribution based on Radiological findings

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
Cerebral Atrophy	0	0.0%	0	0.0%	1	2.3%	1	1.3%
CVT with Infarct	1	3.3%	0	0.0%	10	23.3%	11	14.7%
HypertensiveLeuko Encephalopathy	3	10.0%	0	0.0%	0	0.0%	3	4.0%
Infarct	3	10.0%	0	0.0%	7	16.3%	10	13.3%
PRES	10	33.3%	1	50.0%	9	20.9%	20	26.7%
Subarchnoidhaenorrhage	0	0.0%	0	0.0%	1	2.3%	1	1.3%
No Abnormality	13	43.3%	1	50.0%	15	34.9%	29	38.7%
Total	30	100%	2	100%	43	100%	75	100%
Chi square test=13.47 p =0.01* Inference : Is Statistically Significant								

Table 10: Distribution based on Radiological findings v/s Imminent symptoms

Radiological findings vs Imminent symptoms	Cerebral Atrophy	CVT withInfarct	Hypertensive Leuko Encephalopathy	Infarct	PRES	Subarchnoid haenorrh age	No Abnormality	Total
Blurring of Vision	0	1	0	0	5	0	4	10
Headace	0	9	2	7	10	1	0	29
NoImminent Symptoms	1	0	0	3	1	0	22	27
Reduced UrineOutput	0	0	0	0	2	0	0	2
Vomiting	0	1	2	0	1	1	3	7
Total	1	11	3	10	20	1	29	75

Table 11: Distribution based on Radiological findings and Clinical presentation

Radiologi cal findings vs Clinical presentation	Cerebral Atrophy	CVT withInfarct	Hypertensive Leuko Encephalopathy	Infarct	PRES	Subarchnoid haenorrh age	No Abnormality	Total
AlteredSensorium	1	4	1	1	3	0	3	13
Frothing	0	0	1	1	3	0	2	7
Incontinence	0	0	1	0	1	0	1	3
Unconscious	0	7	1	8	12	1	23	52
Total	1	11	3	10	20	1	29	75

	MRI AND CT	MRI AND CT	
Neurologicalsymptoms	POSITIVE	NEGATIVE	TOTAL
Positive	44	7	51
Negative	2	22	24
Total	46	29	75

Sensitivity:95%, specificity:75.86%, positive predictive value:86.2,

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negative predictive value:91.6, dianostic accuracy:88%.
Chi square value:42.17 degree of freedom:1
P value <0.05 statistically significant

Table 12: Distribution based on comorbid conditions

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
Anaemia	9	30.0%	0	0.0%	15	34.9%	24	32.0%
GDM	2	6.7%	0	0.0%	3	7.0%	5	6.7%
Heart Disease	1	3.3%	0	0.0%	1	2.3%	2	2.7%
Obesity	2	6.7%	0	0.0%	1	2.3%	3	4.0%
Pre-History ofEclampsia	1	3.3%	0	0.0%	0	0.0%	1	1.3%
Sepsis	0	0.0%	0	0.0%	1	2.3%	1	1.3%
Nill	15	50.0%	2	100.0%	22	51.2%	39	52.0%
Total	30	100%	2	100%	43	100%	75	100%
Chi square test=4.64 p =0.7 Inference : Is Not Statistically Significant								

Table 13: Distribution based on mode of delivery

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
Vaginal	9	30.0%	1	50%	34	79.1%	44	58.7%
LSCS	20	66.7%	1	50%	9	20.9%	30	40.0%
Hysterotomy	1	3.3%	0	0%	0	0.0%	1	1.3%
SpontaneousExpulsion	0	0.0%	0	0%	0	0.0%	0	0.0%
Total	30	100.0%	2	100%	43	100.0%	75	100%
Chi square test=18.14 p <0.001* Inference : Is Statistically Significant								

Table 14: Distribution based on maternal outcome

	Antepartum		Intrapartum		Postpartum		Total	
	N	%	N	%	N	%	N	%
PlacentalAbruption	2	6.7%	0	0.0%	0	0.0%	2	2.7%
DIC	1	3.3%	0	0.0%	9	20.9%	10	13.3%
CVA	2	6.7%	0	0.0%	2	4.7%	4	5.3%
AKI	3	10.0%	0	0.0%	1	2.3%	4	5.3%
Blindness	2	6.7%	0	0.0%	0	0.0%	2	2.7%
HELLP	2	6.7%	0	0.0%	4	9.3%	6	8.0%
PulmonaryEdema	1	3.3%	1	50.0%	2	4.7%	4	5.3%
PPH	5	16.7%	0	0.0%	0	0.0%	5	6.7%
Death	1	3.3%	0	0.0%	3	7.0%	4	5.3%
AspirationPneumonitis	1	3.3%	0	0.0%	0	0.0%	1	1.3%
NoComplications	10	33.3%	1	50.0%	22	51.2%	33	44.0%
Total	30	100%	2	100%	43	100%	75	100%
Chi square test=23.67 p =0.002 Inference : Is Statistically Significant								

Table 15: Distribution of maternal deaths

Onset of eclampsia	GA in weeks	Mode of delivery	Seizure to delivery interval	Delivery time and onset of eclampsia indays	Seizure to death interval indays
Antepartum	31	LSCS	<12 hours		
Intrapartum					
Postpartum		LSCS		12	4
Postpartum		Vaginal		4	1
Postpartum		Vaginal		2	1

DISCUSSION

Neurologic manifestations in eclampsia were headache, blurring of vision, confusion, visual hallucinations and blindness. The central nervous system changes characterise a form of hypertensive encephalopathy. Loss of cerebral auto regulation leads to disruption of blood brain barrier with end result of cerebral edema. Such changes are responsible for many symptoms in eclamptic patients and evident on CT, MRI as witnessed in our study. Sudden cause for death in eclampsia due to massive cerebral haemorrhage or edema.

Mean age of study population was 24.29. 54.7% of women between the age group of 20-24 years. This result correlates with the Ugran SM et al,[4] where mean age was 23.89 years, 50% aged between 22-25years.[4] A similar study from Mishra R showed majority of women belonged to age group between 20-25 years which was comparable with this study.[3] Mean systolic blood pressure was 150.5; mean diastolic blood pressure was 95.5. Worldwide studies showing that postpartum eclampsia more common. In this study 57.3% women has postpartum eclampsia and 40% has antepartum eclampsia. Similar study from Krishna Dahiya et al,[2] showed 66% women

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presented with postpartum eclapmsia and 34% had antepartum eclampsia

Parity: In this study 72 % are primiparous which is comparable with Ugran SM et al 4 study.

Proteinuria: In our study proteinuria grade 2+ found in most of the women 3

Fundoscopy examination: 17.3% women presented with blurring of vision, most of them had only blurring of vision , no visual field defect. 2 cases presented with cortical blindness.[3]

Cortical blindness is absence of vision with intact pupillary reflexes. Fundus examination will be normal. Cortical blindness is due damage to primary visual cortex. This may be permanent or temporary depending on the cause.

In our study both woman recovered well within 24 hours of treatment, whose MRI showed PRES.

There is no correlation found between onset of eclampsia and severity of hypertension, fundoscopy findings and amount of proteinuria with Chi square pvalue is not statistically significant.

Radiological Findings: In our study 61.3% have positive radiological findings, 38.7% women had normal findings. The cause for normal finding might be due to temporal relationship of scan to seizure. CT enable early noninvasive diagnosis of CVT. Plain CT or MRI will be helpful in confirmation of pituitary apoplexy.

The most common abnormal finding is PRES accounts for 26.7% followed by CVT with infarct-14.7%, Hypertensive leuco encephalopathy - 4%, cerebral atrophy - 1.3%, Sub arachnoid haemorrhage accounts for 1.3%.The commonest neurological presentation in PRES was unconsciousness 63.15 The myogenic cerebral autoregulation effect in PRES with hypertension diminished with increased blood pressure. The control of cerebral perfusion isnow handled by the neurogenic autoregulatory mechanism, which also made the brain more susceptible to blood pressure increases, resulting in vasogenic edoema. The pathophysiology of PRES without hypertension is believed to be caused by direct endothelial damage, which may increase blood-brain barrier permeability. Clinical and radiological outcomes of PRES lesions may be completely reversible if they are quickly recognised and treated.

Radilogical findings	Our study	Ugran et al,[4]
CVT with infarct	14.7%	23%
Infarct	13.3%	14%
PRES	26.7%	6%
Hypertensiveleukoencephalopathy	4%	5%
Sub arachnoid haemorrhage	1.3%	-
Cerebral atrophy	1.3%	1%
No abnormality	38.7%	48%

Kokila et al,[8] from Karnataka, India reported 46.4% of women had noneclamptic organic cause for postpartum convulsions, 28.6%of postpartum convulsions were due to CVT.

In our study 61.3% of women had abnormal radilological findings, among these considerably higher number 44 women had neurological signs and symptoms and 7 cases did not have neurological signs and symptoms.($p<0.05$). The sensitivity, specificity, positive predictive value, Negative predictive value were found to be 95%, 75.86%, 86.2%, 91.6% respectively. These findings suggest that, signs and symptoms during admission helps to predict the neurological involvement and aiding to arrive the likely diagnosis. A prospective study from Jindal et al,[7] to compare CT and MRI findings in eclampsia patients in relation to neurological signs and symptoms. This study concluded that MRI found to co- relating more than CT with respect to neurological signs and symptoms and had 90% sensitivity and 100% specificity. MRI can be superior compared to CT in eclampsia patients.

Co Morbid Condition: 32% of women has anaemia as associated comorbidity, 4% were obese,1. 3%has history of eclampsia in the previous pregnancy

Clinical Presentation: In our study commonest clinical presentation is unconsciousness 69.3% followed by 17.3% altered sensorium, 8.2% frothing,5.2% presented with incontinence. The unconscious state more common with postpartum eclampsia

	Unconsciousness	Altered sensorium	Frothing	Incontinence
Ugran SM et al,[4]	35%	14%	11%	6%
Our study	69.3%	17.3%	8.2%	5.2%

Imminent symptoms: In this present study commonest imminent symptom is headache.

A similar study from Mishra R reported as headache was most common symptom that is 40%, slurring of speech in 44% of women, 10.7% were disoriented. In this study headache is more commom in postpartum eclampsiathat is 44.2%.[3]

Mode of delivery: Out of 75 women 58.7% delivered vaginally, 40% delivered by caesarean section.[2]

	Vaginal	Cesarean section	Hysterotomy	Spontaneous expulsion
Mahalakshmi et al,[9]	52.9 %	47.1%	-	-
Our study	58.7 %	40%	1.3%	0%

Admission to Delivery Interval: Most of the women (73.81%) delivered with in 12 hours of admission.

	< 12 hours	>12hours
Mahalakshmi et al 9	64.7%	30.3%
Our study	73.81%	26.19%

Delivery to Seizure Interval in Postpartum Eclampsia: The mean was 3.88 days in this study.

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Postpartum eclampsia occurs usually first 24 hours of delivery and hardly may it occur 48-72 hours after delivery.

Cause of Maternal Death: In this study, maternal death were 5.3%, most common cause was cortical vein thrombosis, occurred in cases of postpartum eclampsia. Ghimire S 10 studied the fetomaternal outcome in eclampsia, maternal death rate was found to be 5.36%.[10]

CONCLUSION

Eclampsia is preventable, still remains a major cause for maternal morbidity and mortality. Maternal morbidity includes placental abruption with resulting DIC, pulmonary edema, acute renal failure, aspiration pneumonia, postpartum haemorrhage. Neuroimaging may be indicated in all eclampsia patients, specific attention has to be given to atypical cases with onset of eclampsia before 20 weeks of gestation or more than 48 hours after delivery and those resistant to anticonvulsant therapy, where neurological signs and symptoms fails to predict the diagnosis. More awareness should be created for the women while attending the antenatal clinics. Women from low socio-economic status should be educated about nutrition, pregnancy, information about premonitory symptoms and the need for regular antenatal and postnatal checkups.

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