

DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20184267>

Original Research Article

Computed tomography scan findings in eclampsia: a prospective study

K. S. Raja Rajeswari¹, R. Niranjana^{2*}

¹Department of Obstetrics and Gynecology, Perambur, Southern Railway Headquarters Hospital, Chennai, Tamil Nadu, India

²Department of Obstetrics and Gynaecology, Vijaya Hospital, Chennai, Tamil Nadu, India

Received: 1 October 2018

Accepted: 16 October 2018

***Correspondence:**

Dr. R. Niranjana,

E-mail: nirai7.3@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Eclampsia is a leading cause of maternal death, with classical neurological symptoms that include headache, nausea, vomiting, cortical blindness, coma and convulsions. Computed tomography (CT) scan helps in diagnosing and management of eclampsia in pregnant women. The present study was done with the objective to analyse the findings of CT scan of brain in eclampsia, to identify the prevalence of neurovascular complications in these cases and to determine if these findings can be of value in determining the prognosis of this disorder.

Methods: This was a prospective study done on 100 patients with eclampsia. All of the 100 patients were screened with CT scan brain at Institute of Obstetrics and Gynaecology, Egmore, Chennai during the period from August 2008 to August 2009. All the data were analyzed and compared between the groups of positive CT scan and negative CT scan observations.

Results: Out of 100 patients, positive CT scan findings were noticed in 15 patients. Of them, 7 patients expired, and 8 patients survived after treatment. Of the expired patients (7), 5 of them expired due to brain haemorrhage, and 1 patient died with cerebral oedema and 1 with brain infarction. Cerebral odema (46%) was the most common positive CT finding. Parietal region of brain was the most common (40%) affected area.

Conclusions: CT scan of brain provides valuable information in determining the prognosis and the prevalence of neurovascular complications in Eclampsia.

Keywords: CT scan, Eclampsia, Maternal outcome

INTRODUCTION

Hypertensive disorders are one of the most common medical complications of pregnancy. These disorders continue to be a major cause of maternal and perinatal morbidity and mortality worldwide.

Around 50,000 deaths were reported annually due to eclampsia.¹ Eclampsia is defined as seizures that cannot be attributed to other causes in a woman with preeclampsia. Eclampsia affects all the major systems that include cardiovascular, haematological, renal, hepatic and the central nervous system, of which CNS involvement is the most serious complication. When

promptly recognised and treated, symptoms and radiological changes can be reversed. In some women it can progress to ischemia, massive infarction and death.^{2,3}

Besides clinical presentation, neuroimaging is the only mode to assess the CNS involvement. Neuroimaging gives a more accurate assessment of the degrees of CNS involvement in these cases.⁴

Various techniques used for neuroimaging in eclampsia are computed tomography scanning of brain, magnetic resonance imaging of the brain (MRI), magnetic resonance (MR) angiography, magnetic resonance (MR) venography, cerebral angiography, transcranial Doppler

study, single photon emission computed tomography (SPECT). Of these the most common and the most useful techniques are the computed tomography (CT) scan of brain and MRI of brain. CT scan majorly helps in diagnosing cerebral oedema and suggestive features of hypertensive encephalopathy.⁵

Vascular changes in organs that occur during pregnancy have been the subject of intense study. Understanding how pregnancy and the postpartum state affect the structure and function of the cerebrovascular bed may provide important clues as to how eclampsia develops and to potential treatments of this devastating condition.

The present study was conducted with the aim to analyse and to identify the prevalence of neurovascular complications and neurovascular changes in eclampsia.

METHODS

This was a prospective study of CT scan findings of brain conducted on 100 cases of eclampsia admitted at Institute of Obstetrics And Gynaecology, Egmore, Chennai during the period from August 2008 to August 2009. All patients in intensive care unit with a provisional diagnosis of eclampsia were screened for enrolment into the study. Patients with known history of chronic hypertension alone, epilepsy, cerebral tumours and renal disorders were excluded from the study.

After getting approval from institutional ethics committee, informed consent in the form of written consent was obtained from the patients or relatives (in situations where patients is indisposed) after explaining the procedure. Patient's medical history, obstetric history with complication, demographic details were noted in a pre-designed proforma. On admission, patients were first stabilised with antihypertensives and MgSO₄ therapy. In all the patients' neuroimaging was done through computed tomographic (CT) scan. CT scan brain was done within 1 week in the postpartum period. Patients with positive findings in the CT scan brain were followed up after 2 months. All the data was expressed in frequencies and percentages. Chi-square test was used for comparing CT scan positive findings with negative findings. P values less than 0.05 was considered significant statistically.

RESULTS

CT scan of brain was taken for 100 patients with eclampsia. The demographic details of the patients were presented in Table 1. The most common age group in present study was in the range of 20 to 30 years (78%). Primigravida (68%) constituted the majority in present study. Majority of the patients had a normal body mass index of 19.8 to 26 (69%). Most of the patients were in the antenatal period at the time of presentation. 42% of the patients were in the gestational age of 29 to 36 weeks. 27% of the patients were in the postpartum period.

Table 1: Demographic data of the patients (N=100).

Variables	Frequency	Percentage
Age in years		
<20	15	15
20-30	78	78
>30	7	7
Parity		
Primi	68	68
G2	21	21
G3	9	9
G4	2	2
Body mass index		
<19.8	4	4
19.8-26	69	69
26-29	17	17
>29	10	10
Gestational age in weeks		
20-28	7	7
29-36	42	42
37-40	24	24
Post-partum	27	27

Table 2 presents the clinical characteristics of the patients. In present study 75% of the patients with eclampsia had diagnosed hypertension only at the time of presentation.

Table 2: Clinical characteristics of the patients (N=100).

Clinical characteristics	Frequency	Percentage
Duration of hypertension since diagnosis		
0 (at presentation)	75	75
≤4	19	19
5-12	5	5
13-20	1	1
Imminent symptoms		
Present	73	73
Absent	27	27
Haemoglobin measurement (in g%)		
≥11	14	14
10-10.9	22	22
7-10	62	62
4-7	2	2
Convulsions		
Antepartum eclampsia	69	69
Postpartum eclampsia	36	36
Both	5	5

Only 1% of patient had hypertension for more than 13 weeks. 73% of patients had imminent symptoms. 62% of patients with eclampsia in present study had Hb% in the range of 7 to 10 g%.

In present study 69% of patients had antepartum eclampsia and 36% of patients had postpartum eclampsia. In them, 14 and 2 had 4 or more episodes of convulsions respectively.

Table 3: CT scan findings.

Findings	Frequency (n=100)	Percentage
Normal	85	85
Abnormal	15	15
Cerebral oedema	7	7
Haemorrhage	5	5
Infarction	2	2
Not related	1	1
Areas of brain affected	Frequency (n=15)	Percentage
Diffuse	4	26.6
Fronto-temporal	2	13.3
Parietal	6	40
Occipital	2	13.3
Brainstem	1	6.6

As shown in Table 3, out of 100 eclamptic patients 15 patients had positive findings (abnormality) in the CT scan brain. Cerebral odema was the most common abnormal finding noticed in the group.

Out of 15 women, 7 had cerebral odema followed by cerebral haemorrhage (5), cerebral infarction (2). 1 patient had an unrelated finding i.e. old calcified lesion in parietal region.

Parietal region of the brain was the most affected. 6 (40%) patients had lesion in the parietal region, 4 (26.6%) patients had diffuse involvement of the brain, 2 (13.3%) patients had fronto-temporal region involvement, 2 (13.3%) patients had occipital lobe involvement and 1 (6.6%) patient had brain stem lesion.

As given in Table 4, 13.3% in the positive findings group and 2.4 % in the negative CT findings group had past history of eclampsia or thrombocytopenia. 33.3% of patients in the positive CT findings group were unconscious at the time of presentation. 56.5% in negative CT findings group and 80% in positive CT findings group had systolic BP in the range of 140-160 mm of Hg.

None in the positive CT finding group had systolic BP <140 or >200 mm of Hg. 44.7% in negative CT findings group and 33.3% in positive CT finding group had MAP >126 mm of Hg. Grade -3 fundus changes were seen in 13.3% of patients in positive CT findings.

73.3% of patients in positive CT findings group and 30.6% in negative CT findings group had proteinuria of 2+. 20% in positive CT findings group had platelet count less than 1 lakh/mm³. 20% in positive CT findings group and 1.2% in negative CT group had altered liver function test.

Only 1.2% in negative CT group had altered renal function test. 73.3% in positive CT group and 71.87% in negative CT group were treated with standard dose regimen.

73.3% in positive CT group and only 35.3% in negative CT group were treated with phenytoin in addition to MgSo₄ regimen. Maternal outcome was presented in Table 5.

After treatment complete recovery was seen in negative CT scan group. In positive CT scan group, 7 (46.7%) patients showed complete recovery, 1 patient recovered with sequelae and 7 patients died.

Of the expired patients (7), 5 of them expired due to brain haemorrhage, and 2 patients died with cerebral odema and brain infarction in each case respectively.

Parietal region of brain was affected in about 3 cases out of 7 dead patients. Fronto-temporal region was affected in 2 cases and occipital and brain stem region in each case. Out of 8 patients who were alive in the positive findings group, lesion disappeared in 6 cases (75%). In 1 patient (12.5%) lesion persisted and 1 patient lost follow-up (Table 6).

DISCUSSION

Hypertensive disorders predominantly eclampsia in pregnancy was considered to be the major cause of fetal and maternal morbidity and mortality in developing countries.

The prevalence was as high as 20 times when compared to the figures in developed countries.⁶⁻⁸

In this study 100 women with eclampsia were selected according to the inclusion exclusion criteria and CT scan of brain was done. The findings obtained were analyzed. In present study the most common age group was 20 to 30 years (78%). Majority of the patients were primigravida (68%). This was similar to the findings of Patil et al.³ Many studies claim that postpartum eclampsia is more common nowadays.⁹

But in present study, majority of the patients were in the antepartum period at the time of presentation (73%). 27% of patients were in the postpartum period at the time of presentation.

In present study majority (75%) had diagnosed hypertension at the time of presentation. This was in contrast to the findings of Chakravarthy et al.¹⁰ In his study all patients except one did not show any evidence of pre-eclampsia till the last clinical visit.

Table 4: Lab parameters in negative and positive CT scan groups.

Findings	Negative CT findings group (n=85)	Percentage	Positive CT findings group (n=15)	Percentage	P value
Positive past history					
No	83	97.6	13	86.7	0.045
Yes	2	2.4	2	13.3	
Conscious level					
Conscious	68	80	7	46.7	0.000
Drowsy	17	20	3	20	
Unconscious	0	0	5	33.3	
Blood pressure parameters					
Systolic BP (mm of Hg)					
<140	3	3.5	0	0	0.371
140-160	48	56.5	12	80	
161-200	33	38.8	3	20	
200	1	1.2	0	0	
Diastolic BP (mm of Hg)					
90-100	31	36.5	10	66.7	0.088
100-110	29	34.1	3	20	
>110	25	29.4	2	13.3	
MAP (mm of Hg)					
96-116	24	28.2	4	26.7	0.568
116-126	23	27.1	6	40	
>126	38	44.7	5	33.3	
Fundus changes					
Normal	77	90.6	11	73.3	0.000
Grade-1	7	8.2	0	0	
Grade-2	1	1.2	1	6.7	
Grade-3	0	0	2	13.3	
Others	0	0	1	6.7	
Proteinuria					
1+	33	38.8	3	20	0.015
2+	26	30.6	11	73.3	
3+	15	17.6	1	6.7	
4+	11	12.9	0	0	
Platelet count (lakhs/cu mm)					
<1	0	0	3	20	0.000
1-4.5	85	100	12	80	
Liver function test					
Normal	84	98.8	12	80	0.001
Altered	1	1.2	3	20	
Renal function test					
Normal	84	98.8	15	100	0.673
Altered	1	1.2	0	0	
Magnesium sulphate regimen					
Low dose	22	25.9	2	13.3	0.006
Standard dose	61	71.8	11	73.3	
Infusion	0	0	2	13.3	
Not given	2	2.4	0	0	
Anticonvulsant (Phenytoin)					
Yes	30	35.3	11	73.3	0.006
No	55	64.7	4	26.7	

Table 5: Maternal outcome with type and areas of brain affected.

Findings	Recovered	Percentage	Recovered with sequelae	Percentage	Expired	Percentage	P value
Normal (n=85)	85	100	0	0	0	0	P<0.05
Abnormal (n=15)							
Types							
Cerebral oedema	6	85.7	0	0	1	14.2	
Haemorrhage	0	0	0	0	5	100	
Infarction	0	0	1	50	1	50	
Not related	1	100	0	0	0	0	
Areas							
Diffuse	4	100	0	0	0	0	
Fronto-temporal	0	0	0	0	2	100	
Parietal	2	33.31	1	16.7	3	56	0.000
Occipital	1	50	0	0	1	50	
Brainstem	0	0	0	0	1	100	

In present study majority of the patients (73%) had imminent symptoms of headache, vomiting, epigastric pain, blurring of vision, or decreased urine output. These observations were almost similar to the findings of Khandaker et al.¹¹

Table 6: Follow-up in alive positive CT findings group.

Follow-up	Frequency (n=8)	Percentage
Lesion disappeared	6	75
Lesion persisted	1	12.5
Lost follow-up	1	12.5

In present study majority of the patients (69%) had antepartum eclampsia. 36% of patients had postpartum eclampsia and 5% of patients had both antepartum and postpartum eclampsia. 16 patients had 4 or more convulsions. This was in contrast to the findings of Khandaker et al.¹¹ In his study, 31.6% have ante partum eclampsia, 39.8% have intra partum eclampsia and 28.9% have postpartum eclampsia.

In a study conducted by Milliez j et al, CT scan brain was done for 44 women with eclampsia, 18 (40%) had pathological abnormalities in CT scan. Observations of present study also demonstrated similar trends.¹² In present study 15 patients i.e.15% had positive CT scan findings, remaining 85 patients had normal finding. In another conducted by Harandou et al normal findings were observed in 15.78%.¹³

The main difference between these studies and present study is that, present study was a prospective study done in a 1-year period. Almost 70% of patients with eclampsia admitted to our hospital were included in the study to find out the prevalence of CT scan abnormalities in these patients. In order to find out the prognosis and associated factors, patients were divided into 2 groups

based on the positive or negative CT findings and the results obtained were compared and analyzed.

In present study 13.3% in the positive CT group and none in negative group had positive past history of eclampsia or thrombocytopenia with the p value of <0.05 which is statistically significant difference was observed between the groups in terms of positive past history. This indicates the severity and recurrence of preeclampsia and eclampsia.

In present study 33.3% of patients in positive CT findings group were unconscious at the time of presentation with p value of 0.000 which is statistically significant. In this study there was no significant difference between the groups in terms of blood pressure parameters. This was in consistent with the findings of Khandaker et al.¹¹

In the present study, significant grade-3 hypertensive retinopathy fundus changes were seen in 13.3% in positive CT group compared to the group with negative CT scan findings. On contrast, in the study by Chakravarthy et al all patients had fundus changes.¹⁰

Thrombocytopenia and altered liver enzyme levels was observed in 20% of patients each in positive CT findings group. The differences between the two groups were significant statistically with p value of 0.000 and 0.001 respectively when compared with negative CT findings group. In a study by Hira et al 70% had thrombocytopenia and 7% had altered liver function test.¹⁴

In present study only 2 patients were not treated with magnesium sulphate regimen because of renal impairment in one patient, and because of severe hypotension in another patient. Both of them did not have any positive CT finding. 73.3% in positive CT finding group and 71.8% in negative CT group were treated with standard dose magnesium sulphate regimen. But in the

study by Chakravarthy et al none were treated with magnesium sulphate regimen. All the patients in the study were managed by neurologists and not by obstetricians.¹⁰

In present study 73.3% of patients in positive CT finding group and 35.3% in negative CT group needed anticonvulsant phenytoin in addition to MgSO₄ regimen for control of seizures and the difference was statistically significant with P value is 0.006, between the groups. In the study by Chakravarthy et al all patients were treated with intravenous phenytoin.¹⁰

In present study out of 15 patients with positive findings the most common positive CT scan finding was cerebral odema, it was seen in 7 patients (46%). Next common finding was cerebral haemorrhage observed in 5 patients (33%), 2 patients (13.3%) had cerebral infarction and 1 patient (6%) had an old calcified lesion. out of the 7 with cerebral odema in 4 patients the findings were suggestive of posterior reversible encephalopathy syndrome (PRES). These findings were in corroborative with the observations of Richards et al in which cerebral oedema was noticed in 63.79% of the patients.

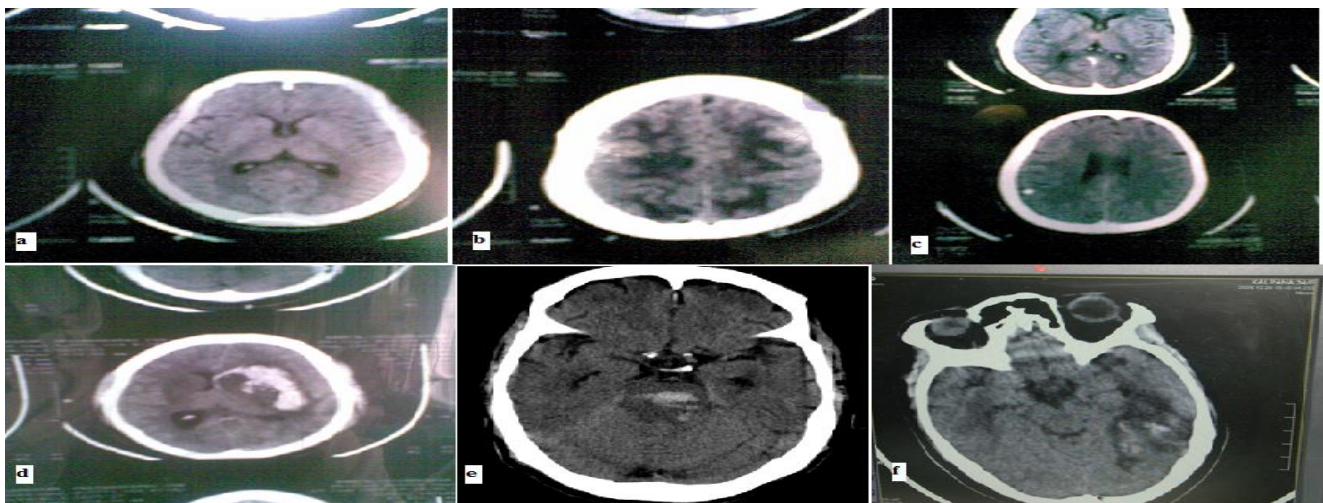


Figure 1: CT scan pictures of pathological changes of brain in eclampsia.

a) White matter hypodensity suggestive of PRES; b) diffuse cerebral odema; c) old calcified lesion seen in right high parietal region; d) left fronto temporal intracerebral haemorrhage with intraventricular extension with mass effect; e) brainstem haemorrhage; f) haemorrhagic infarct in left parietal region.

Regarding area of distribution, parietal region was the most common area affected in 6 patients (40%). 4 (26.6%) had diffuse involvement, 2 (13.3%) had lesion in fronto-temporal region, 2 (13.3%) had lesion in occipital region and 1 (6.6%) had lesion in brain stem. Occipital region was the most affected area in the study by Chakravarthy et al with no lesion in brainstem or basal ganglia.¹⁰ In a study by Zhu cerebral lesions were involved at cortical and subcortical area of bilateral parietal and occipital lobes, secondly at deep basal ganglia and the superior sagittal sinus.⁵

All the patients (85; 100%) who did not have any positive findings in CT scan brain recovered completely. whereas in the positive CT findings group only 7 (46.7%) patients recovered completely, 1 (6.7%) patient recovered with hemiparesis and 7 (46.7%) patients expired. In the study by Chakravarthy et al all patients recovered fully.¹⁰ In the study by Milliez et al, 3 (16%) out of 18 patients expired, remaining 15 recovered fully.¹²

In present study when we compared the maternal outcome with the type of CT scan changes we found that all 5 (100%) patients who had haemorrhagic lesion had expired. Out of 7 patients with cerebral odema 6(85.7%) recovered and 1 (14.2%) patient whose lesion was suggestive of PRES expired. In the 2 patients with cerebral infarction, 1(50%) recovered with hemiparesis and 1(50%) expired. 1 patient who had a calcified lesion also recovered fully. P value is <0.05, thus statistically significant difference was noted between the groups. Similar observations were also noted by Milliez et al.¹²

When the maternal outcome was compared with areas of brain affected; all 4 (100%) patients who had diffuse involvement recovered. All 2 (100%) patients who had frontotemporal region involvement expired. Of the 6 patients with parietal region involvement 2 (33.3%) patients recovered, 1 (16.7%) recovered with hemiparesis, 3 (50%) patients expired. Of the 2 patients with occipital region involvement, 1 (50%) recovered, 1 (50%) expired. The 1 (100%) patient with brainstem

involvement expired and the difference noted was statistically significant ($P=0.000$).

In the present study, out of 8 patients who were alive in the positive findings group, lesion disappeared in 6 cases (75%). In 1 patient (12.5%) lesion persisted and 1 patient lost follow-up. This was in accordance with the findings of Chakravarthy et al.¹⁰

CONCLUSION

The findings of the study conclude that maternal mortality was high in patients with positive CT scan brain findings with cerebral haemorrhage, involvement of frontotemporal region or brainstem region. Hence prognosis in these patients is poor. Cerebral odema was the most common pathological abnormality detected but recovery in these patients and resolution of the lesions were almost complete. Patients with altered liver function, retinal changes and thrombocytopenia were more prone for developing cerebral lesions. Since majority of patients had hypertension diagnosed only at the time of presentation the need for effective screening of hypertension and its management is emphasised. Thus, it is accentuated that CT scan of brain should be included in the investigation protocol for eclampsia if not for all at least for those patients with complications.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Das R, Biswas S. Eclampsia: the major cause of maternal mortality in Eastern India. *Ethiop J Health Sci.* 2015;25(2):111-6.
2. Micheal BB. Eclampsia. *Emer Med J.* 2000;74:1-10.
3. Patil MM. Role of neuroimaging in patients with atypical eclampsia. *J Obstet Gynaecol India.* 2012;62(5):526-30.
4. Cipolla MJ. Cerebrovascular function in pregnancy and eclampsia. *Hypertension.* 2007;50(1):14-24.
5. Zhu XW. Cerebral lesions in severe PIH: 61 cases study with computed tomographic scan. *Zonghua Chan Ke Za Chi.* 1993;28(5):275-7,313.
6. Goldenberg RL, McClure EM, MacGuire ER, Kamath BD, Jobe AH. Lessons for low-income regions following the reduction in hypertension-related maternal mortality in high-income countries. *Int J Obstet Gynecol.* 2011;113(2):91-5.
7. Danso KA, Opare-Addo HS. Challenges associated with hypertensive disease during pregnancy in low-income countries. *Int J Obstet Gynecol.* 2010;110(1):78-81.
8. Dasari P, Habeebullah S. Maternal mortality due to hypertensive disorders of pregnancy in a tertiary care center in Southern India. *Int J Obstet Gynaecol.* 2010;110(3):271-3.
9. Leitch CR, Cameron AD, Walker JJ. The changing pattern of eclampsia over a 60-year period. *Br J Obstet Gynaecol.* 1997;104(8):917-22.
10. Chakravarthy A, Chakrabarti SD. The neurology of eclampsia: some observations. *Neurol India.* 2002;50(2):128-35.
11. Khandaker S, Haldar M, Munshi S. Intra Cerebral Changes Detected by CT Scan of Brain in Eclampsia. *Austin J Obstetrics Gynecol.* 2014;1(3):1-4.
12. Milliez J, Dahoun A, Boudraa M. Computed tomography of the brain in Eclampsia. *Obstet Gynaecol.* 1990;75(6):975-80.
13. Harandou M, Madani N, Labibe S, Messouak O, Boujraf S, Benkirane S, et al. [Neuroimaging findings in eclamptic patients still symptomatic after 24 hours: a descriptive study about 19 cases]. *Ann Fr Anesth Reanim.* 2006;25(6):577-83.
14. Hira B, Moodley J. Role of cerebral computerised tomography scans in Eclampsia. *J Obstetrics Gynaecol.* 2004;24(7):778-9.
15. Richards A, Graham D, Bullock R. Clinicopathological study of neurological complications due to hypertensive disorders of pregnancy. *J Neurol Neurosurg Psychiatry.* 1988;51(3):416-21.

Cite this article as: Rajeswari KSR, Niranjana R. Computed tomography scan findings in eclampsia: a prospective study. *Int J Reprod Contracept Obstet Gynecol* 2018;7:4432-8.