International Journal Dental and Medical Sciences Research
Volume 5, Issue 5, Sep-Oct 2023 pp 221-229 www.ijdmsrjournal.com ISSN: 2582-6018

A Longitudinal Study on Neurological Disorders among Post Partum Mothers in a Tertiary Care Hospital.

Lakshmi Prathyusha Mandapati, G.Balaji, S.Hariharan,
Department of Neurology, Chengalpattu Medical College and Hospital, Chengalpattu, Tamil nadu

Date of Submission: 15-09-2023 Date of Acceptance: 25-09-2023

ABSTRACT

Background: Although neurological disorders are uncommon during pregnancy, they can have a substantial impact on both the obstetric and neonatal outcomes. Notably, most neurological conditions which occur during either pregnancy or postpartum period are reversible. However it is important to know about the clinical profile of cases with neurological disorder presented during postpartum and its outcome.

Methods: From January 2022 to December 2022, the department of neurology at Chengalpattu Medical College and Government Hospital conducted a cross-sectional study on cases that had neurological abnormalities during the first 2 weeks of postpartum period. A total of 82 patients were thus included in the study. A questionnaire was used in the study to collect information about sociodemographic characteristics followed by neurological evaluation and imaging. Blood parameters and neurological imaging were done wherever indicated. Data was entered into Microsoft Excel, and version 20 of the Statistical Package for Social Sciences (SPSS) was used to analyse the data.

Results: Common presenting symptoms were GCTS followed by headache, weakness of limbs, behavioural changes and aggression. On assessing the clinical findings, about 65% had no focal neurological deficit however common findings were papilledema followed by retinopathy, weakness and hemiparesis. On assessing the diagnosis, CVT was the commonest followed by PRES, postpartum eclampsia, migraine, postspinal headache, epilepsy, postpartum psychosis, LS plexopathy, glioma and acute cerebrovascular stroke. Notably only 7.3% were not improved after treatment.

Conclusion: The most prevalent neurological condition in the postpartum period is seizures. During this time, neurological issues necessitate an early, rapid diagnosis and a high degree of suspicion. To maximize maternal and foetal outcomes, appropriate management, preferably under the joint supervision of neurologists and obstetricians, is necessary.

Key words: Neurological disorders, Postpartum, Outcome

I. INTRODUCTION

The development of neurologic complications often occurs during pregnancy and the postpartum period. These times are linked to significant physiological and hormonal changes in women that may result in a new neurological problem, a recurrence of an existing one, or both[1,2]. It is crucial to diagnose and treat these conditions properly to protect both the mother and the foetus. Pregnant women frequently experience neurologic diseases, such as headache, seizures, cerebrovascular accidents, eclampsia/preeclampsia, and mononeuropathies[3,4].

An estimated 20% of maternal deaths are caused by neurological conditions[5]. Pregnancy-related neurological problems can be primary or secondary. Pregnancy-related research on neurological illnesses mostly focuses on epilepsy, cerebrovascular accidents, CNS infections, neoplastic diseases, neuropathies, demyelinating disorders, etc[6]. Metabolic encephalopathies resulting from hypoxia, ischemia, hypoglycemia, hepatic failure, or azotemia are examples of secondary neurological diseases. Headaches, seizures, motor deficits, altered sensorium, visual deficits, aphasia, and cranial nerve palsies are among the prevalent symptoms of neurological illnesses. WHO reports that during pregnancy, headaches have become a relatively prevalent neurological symptom[7]. The most frequent neurological condition that an obstetrician may face is epilepsy (1 in 200), followed by cerebrovascular accidents. Subarachnoid haemorrhage, cortical venous thrombosis (CVT), and stroke—both ischemic and hemorrhagic—are additional categories for cerebral vascular accidents. In affluent nations, there are only 3.5 to 5 ischemic strokes per 100,000 pregnancies, which is a very low rate. Women may get aseptic thrombosis of the cerebral veins and sinuses 3–4 weeks after giving birth[8,9]. The main cause of the 9% mortality rate associated with CVT is intra cerebral haemorrhage[10]. Neuropathies like bell's

International Journal Dental and Medical Sciences Research
Volume 5, Issue 5, Sep-Oct 2023 pp 221-229 www.ijdmsrjournal.com ISSN: 2582-6018

palsy, Guillain-Barre syndrome, meralgia paresthetica, and demyelinating illnesses like multiple sclerosis can manifest in patients. In the third trimester of pregnancy, Bell's palsy, or idiopathic palsy of the seventh cranial nerve, occurs seven times more frequently than anticipated[11].

The development of CT, MRI, and MR venography has proven to be beneficial for the early diagnosis of neurological problems associated with pregnancy. The foetus is just slightly at risk. If a pregnancy with neurological difficulties is detected early, the appropriate course of therapy for the neurological condition can be decided upon, and the pregnancy can be ended at the proper gestational age with better outcomes for the mother and the foetus.

Due to the fact that the patient and her treating physician are both well aware of the disease status, having knowledge of a pre-existing neurological disorder facilitates the search for a multidisciplinary strategy and typically results in a better pregnancy outcome[12,13]. However, when problems are discovered incidentally during pregnancy, the pregnancy outcome can be disastrous and even dangerous for the mother's life[14]. It might be difficult to diagnose neurological diseases during pregnancy because of the fluctuating symptomatology brought on by hormonal changes and heightened physiological reactions[15]. Due to the hazards to the foetus, treating many neurological diseases during pregnancy is difficult. Although neurological disorders are uncommon during pregnancy, they can have a substantial impact on both the obstetric and neonatal outcomes.

II. OBJECTIVES

This study was conducted to assess the clinical profile of cases with neurological disorder presented during first 2 weeks of postpartum and its outcome.

III. METHODS

From January 2022 to December 2022, the department of neurology at Chengalpattu Medical College and Government Hospital conducted a cross-sectional study on cases that had neurological abnormalities during the postpartum period. Cases who present with signs and symptoms of neurological disorders within two weeks of delivery were included and thus a total of 82 patients were included in the study.

Prior to the study's start, the participants' written agreement was obtained after the primary investigator had discussed the study's goals to each one of them. Additionally, it was made clear to the participants that their participation was completely optional and that they could end the interview at any point without facing any repercussions. Every attempt was taken to ensure the confidentiality of all the participant data acquired. A questionnaire was used in the study to collect information about sociodemographic characteristics followed by neurological evaluation and imaging. Blood parameters and neurological imaging were done wherever indicated. Data was entered into Microsoft Excel, and version 20 of the Statistical Package for Social Sciences (SPSS) was used to analyse the data.

IV. RESULTS

In this study the majority of the cases were in the age group of 26-30 years with mean age of 27.3±4.3 years. Also majorities (56.1%) were multigravida and 54.9% had vaginal delivery.

Table 1: Characteristic of study participants

Variables	Frequency	Percentage
Age group		
≤ 20 years	4	4.9
21-25 years	28	34.1
26-30 years	37	45.1
31-35 years	13	15.9
Parity		

International Journal Dental and Medical Sciences Research
Volume 5, Issue 5, Sep-Oct 2023 pp 221-229 www.ijdmsrjournal.com ISSN: 2582-6018

Primi gravida	36	43.9
Multigravida	46	56.1
Mode of Delivery		
Normal	45	54.9
LSCS	37	45.1

Majority of cases (63.4%) presented with neurological symptoms within 3 days of delivery and the common presenting symptoms was GCTS followed by headache, weakness of limbs, behavioural changes and aggression. On assessing the clinical findings, about 65% had no focal neurological deficit however common findings were papilledema followed by retinopathy, weakness and hemiparesis.

Table 2: Clinical picture of neurological disorders

Postnatal day at presentation	**Frequency**	**Percentage**
≤ 3 days	52	63.4
4-7 days	21	25.6
> 7 days	9	11.0
Presenting complaints		
GCTS	46	56.1
Headache	28	34.1
Weakness of limbs	3	3.7
Behavioral changes	3	3.7
Aggression	2	2.4
Past History		
Epilepsy	11	13.4
Migraine	4	4.9
GHTN	14	17.1
Hypothyroidism	1	1.2
CAD	1	1.2
Obesity	2	2.4
H/o in Previous pregnancy		

GHTN	4	4.9
Headache	3	3.7
Clinical findings		
NFND	65	79.3
Papilledema	11	13.4
Retinopathy	3	3.7
Hemiparesis without aphasia	1	1.2
Weakness	2	2.4

On assessing CT findings, 91.5% had normal CT imaging where as the rest had some abnormal findings, commonest being parietal hypodensity followed by MCA hypodensity, frontal hypodensity, temporal white matter edema. On assessing MRI findings, 45.1% had normal MRI imaging. PRES was the commonest condition followed by transverse sinus thrombosis, SSS thrombus, Glioma, Boomerang sign, temporoparietal hypodensity, fronto parietal hypodensity.

Table 3: Findings of radio-imaging modalities

Radio-Imaging	**Frequency**	**Percentage**
CT findings		
Normal	75	91.5
Parietal Hypodensity	5	6.1
MCA hypodensity	1	1.2
Frontal hyperdensity	1	1.2
Temporal white matter edema	1	1.2
MRI findings		
Normal	37	45.1
Glioma	1	1.2
Boomerang sign	1	1.2
PRES	17	20.7
Lt transverse sinus thrombus	6	7.4
Rt transverse sinus thrombus	8	9.8
Lt temporoparietal hypodensity	2	2.4

International Journal Dental and Medical Sciences Research
Volume 5, Issue 5, Sep-Oct 2023 pp 221-229 www.ijdmsrjournal.com ISSN: 2582-6018

Fronto parietal hypodensity with SSS thrombus	2	2.5
SSS thrombus	8	9.8

On assessing the diagnosis, CVT was the commonest followed by PRES, postpartum eclampsia, migraine, postspinal headache, epilepsy, postpartum psychosis, LS plexopathy, glioma and acute cerebrovascular stroke. Notably only 7.3% were not improved after treatment.

Table 4: Diagnosis and outcome of the study participants

Diagnosis	**Frequency**	**Percentage**
Acute CVA	1	1.2
CVT	26	31.7
Epilepsy	6	7.3
Glioma	1	1.2
LS plexopathy	2	2.4
Migraine	9	11.0
Postspinal headache	6	7.3
Postpartum Eclampsisa	12	14.6
Postpartum psychosis	2	2.4
PRES	17	20.7
Treatment		
Heparin, Acitrom, AED	80	97.6
Iv fuilds, Paracetamol	2	2.4
Outcome		
Improved	76	92.7
Not improved	6	7.3

V. DISCUSSION

In this study, majority of cases (63.4%) presented with neurological symptoms within 3 days of delivery and the common presenting symptoms was GCTS followed by headache, weakness of limbs, behavioural changes and aggression. On assessing the clinical findings, about 65% had no focal neurological deficit however common findings were papilledema followed by retinopathy, weakness and hemiparesis.

On assessing CT findings, 91.5% had normal CT imaging where as the rest had some abnormal findings, commonest being parietal hypodensity followed by MCA hypodensity, frontal hypodensity, temporal white matter edema. On assessing MRI findings, 45.1% had normal

MRI imaging. PRES was the commonest condition followed by transverse sinus thrombosis, SSS thrombus, Glioma, Boomerang sign, temporoparietal hypodensity, fronto parietal hypodensity.

Similarly, the incidence, potential etiological variables, pathology, clinical symptoms, features of brain CT scans, treatment, and prognosis of cerebrovascular problems that arise during pregnancy and puerperium were all examined by Radha Bai PT[16]. According to their findings, there were 66 cerebrovascular problems for every 100,000 live births in this study. None of them had ever experienced a seizure problem, renal illness, hypertension, diabetes, or hyperglycemia. There were two women who had heart conditions. Eclampsia and PET were observed in 19 of 26 patients, or 73%. Seven of the ladies had anaemia, and one of them had severe sepsis. The postpartum phase saw the majority of the neurological problems develop. Cases with hemiplegia, facial palsy, and aphasia have been reported. Four cases of intracerebral haemorrhage, five cases of cerebral infarctions, and sixteen cases of cortical vein thrombosis were detected by CT scan imaging. In this investigation, five maternal fatalities occurred. They came to the conclusion that, despite being uncommon, a stroke during pregnancy is a significant condition that can result in maternal death. This study has shown that hypertension is a significant risk factor, hence maintaining normotension throughout pregnancy should be prioritised.

In this study the majority of the cases were in the age group of 26-30 years with mean age of 27.3±4.3 years. Also majorities (56.1%) were multigravida and 54.9% had vaginal delivery. In consistent with this study, Thatokonda AK et al[17]. evaluated the neurological diseases and their clinical characteristics that occur during pregnancy and the first six weeks after delivery. According to their report, 61% of the study's participants were between the ages of 21 and 25. The patients' ages ranged from 19 to 35. 41% of patients first came in after giving birth. The most frequent presentation was seizures (46%) followed by stroke (36%). The majority of individuals who had seizures (45%) were in the second trimester. Patients with stroke made an 87.5% postpartum presentation. Facial paralysis affected 3 victims. Three individuals had chorea, and two patients had astrocytomas. We found 7 different conditions in their analysis, with seizures being the most frequent presentation of those illnesses. It is important to always consider how the ailment, its treatment, and pregnancy may affect one another.

In the present study, on assessing the diagnosis, CVT was the commonest followed by PRES, postpartum eclampsia, migraine, postspinal headache, epilepsy, postpartum psychosis, LS plexopathy, glioma and acute cerebrovascular stroke. Notably only 7.3% were not improved after treatment. Similar to this study, the clinical characteristics of individuals presenting with main and secondary neurological diseases during pregnancy and puerperium were investigated by Gupta S et al[18]. In this study, 76 women were involved, with 46 cases of primary and 30 cases of secondary neurological diseases. Acute disseminated encephalomyelitis, epilepsy, CNS infections, cerebral venous thrombosis, arterial infarctions and haemorrhages, CNS gliomas, traumatic quadriparesis, and arterial infarctions and haemorrhages were among the former. The latter included polyneuropathy, hepatic encephalopathy and enteric encephalopathy. There were no obvious congenital defects in the foetus. CNS diseases that were seen included viral encephalitis, tubercular meningitis, and pyogenic meningitis. In most cases, pregnancy turned out well. Following home birth, all patients of CVT appeared in the postpartum period with fever and neurological symptoms. HE was mostly a problem for patients in the second half of pregnancy or the postpartum period and was linked to 64.3% death. Grading of HE, the Glasgow Coma Scale, liver size, bilirubin levels, and retained foetus all exhibited connection with death in HE. They came to the conclusion that there were a lot of neurological abnormalities throughout pregnancy and the puerperium. The most prevalent primary and secondary neurological conditions were epilepsy and hepatic encephalopathy, respectively. Also, the clinical traits and prognosis of pregnant women with neurological disorders were assessed by Zafarmand S et al[19]. 332 mothers in all were reported to be enrolled in the database. Headache, seizures, unilateral neurological symptoms, multiple sclerosis, neuromuscular problem, and brain tumour were the most common neurological complaints in their population. 54 percent of the patients reported having headaches both during pregnancy and after giving birth. They came to the conclusion that monitoring mothers during the peripartum is important when examining the neurological illnesses individually based on the timing of symptom development. According to their findings, decisions about getting pregnant should take into account the dangers to the mother and foetus, especially with regard to potential pharmaceutical side effects.

In another study, the prevalence of main and secondary neurological problems in expectant

and postpartum patients was evaluated by Gupta M et al[20]. They stated that 1150/100000 births had neurological problems throughout pregnancy. Primary neurological problems were found in 75 patients, including epilepsy, cerebrovascular accidents, CNS infections, neoplasms, neuropathies, and other conditions. In 25 cases, the neurological diseases were subsequent and included septic and hepatic encephalopathy. Cerebrovascular accidents were reported to have the largest frequency among primary disorders (33.3%), followed by epilepsy (32%), whereas hepatic encephalopathy had the highest prevalence among secondary neurological illnesses (92%). While the majority (68%) had recovered, 15% of women still had deficits. 17 (or 17%) incidences of maternal death were reported. Poor foetal and maternal outcomes were significantly correlated with neurological problems. An important diagnostic technique for validating the diagnosis of neurological illnesses is radiological imaging, such as an MRI.

In order to determine how neurological problems affect the course of pregnancy, Renukesh S. et al[21]. undertook a study. The majority (74%) of the 54 women with various neurological symptoms were primigravida. The most frequent sign (63%) was seizure. Eclampsia, a condition specific to pregnancy, epilepsy, and accidental reasons all occurred at rates of 40.8%, 37%, and 22.2%, respectively. 15 (68%) of the 22 eclamptic women experienced seizures in the antepartum interval, while 7 (32%) did so in the postpartum period. The perinatal result was good for the other 19 patients who gave birth to living babies, while three of the 22 patients with eclampsia who suffered intrauterine foetal death on arrival. In this investigation, tubercular meningitis was the accidental aetiology that occurred the most frequently (44%). However, a lady with structural abnormality who experienced extensive intraventricular haemorrhage as a result of a ruptured cerebral cavernoma also experienced maternal and neonatal death. It's possible that a systemic sickness can have neurological manifestations during pregnancy rather than a core neurological problem. According to Thomas DR et al[22]., reported that 2.96% of the 5202 total deliveries had neurological problems during pregnancy or puerperium. Patients' ages ranged from 18 to 44. Epilepsy was the most prevalent neurological condition (60.4%). Eclampsia (7.8%), cerebrovascular diseases (9.1%), brain tumours (4.5%), cranial nerve palsy (3.2%), and various other neurological disorders (14.9%) were among the other ailments. Generalised tonic-clonic seizures were the most typical presentation (82.8%). 13% of patients had caesarean sections, whereas 76.6% of patients delivered naturally vaginally. There were 3 cases of newborn fatalities (1.9%), 5 cases of intrauterine deaths (3.2%), and 5 cases of foetal malformations (3.2%). There was one instance of maternal death brought on by intracranial bleeding. They came to the conclusion that the most prevalent illness with favourable maternal and perinatal outcomes was epilepsy. Higher maternal and foetal morbidity and mortality were linked to vascular diseases and eclampsia.

In consistent with this study, clinical characteristics of patients presenting with neurological symptoms during pregnancy were documented by Ranjith P. et al[23]. According to the study, the incidence of neurological illnesses was 2%. There were two incidences of death brought on by complications or neurological illnesses. Both cases included an uncommon creature. They came to the conclusion that headaches and seizures were the most frequent neurological symptoms in this investigation.

A thorough analysis of the neurological and musculoskeletal conditions that can occur during pregnancy was presented by Singh PK et al[24]. They stated that among peripheral neurological illnesses, CTS (12.37%) and bell's palsy were the two most prevalent. Headaches (26.23%), seizures (12.37%), and eclampsia (2.47%) were the three central neurological illnesses that were most frequently reported, followed by cortical venous thrombosis (CVT) and posterior reversible encephalopathy syndrome (PRES). Also in another study conducted by Gupta S. et al[25]. sought to determine the prevalence of neurological disorders in pregnancy in a tertiary care hospital, as well as the proportion of women who had a given disorder among all women who experienced neurological disorders during pregnancy or puerperium, as well as the potential effects of neurological disorders on pregnancy outcomes. They found that 10.3% of the population had neurological disorders, with primary headache accounting for 30.8% of these, secondary headache for 3.2%, neurological low back pain for 8.5%, epilepsy for 19.1%, cerebrovascular disorders for 6.4%, peripheral neuropathy for 27.6%, and other disorders like neuropsychiatric Wilson's disease, myasthenia gravis, and compressive myelopathy for 4.2%. Additionally, 2.9% of participants in the research had diabetes, and 10.2% had hypertension. Overall, fetomaternal outcomes were positive, with the exception of PRES and cerebro-vascular disease.

VI. CONCLUSION

The postpartum phase is marked by a wide range of neurological manifestations. The most prevalent neurological condition in the postpartum period is seizures. During this time, neurological issues necessitate an early, rapid diagnosis and a high degree of suspicion. To maximise maternal and foetal outcomes, appropriate management, preferably under the joint supervision of neurologists and obstetricians, is necessary. However, the situation can still be changed with intense care management for both the mother and the newborn. Today, it is accurate to say that when a woman becomes pregnant, the question is no longer whether to continue or end the pregnancy with such a disorder, but rather how to identify the disorder early in pregnacy or in the postpartum and manage it appropriately to have a positive outcome for both mother and child.

Declarations
Funding: No funding source
Conflict of interest: None declared
Ethical approval: This study was registered with Institutional Human Ethical Committee.

REFERENCES

1. Block HS. Neurological complications of pregnancy. Curr Neurol Neurosci Rep. 2016 Jul;16(7):67.
2. Kanekar S, Bennett S. Imaging of neurologic conditions in pregnant patients. Radiographics. 2016 Nov;36(7):2102-22.
3. Guntupalli KK, Karnad DR, Bandi V, Hall N, Belfort M. Critical illness in pregnancy: part II: common medical conditions complicating pregnancy and puerperium. Chest. 2015 Nov ;148(5):1333-45.
4. Ferraz Z, Parra J, Areia AL, Vasco E, Moura P. Acute Onset Neurological Disorders during Pregnancy: A Literature Review. Rev Bras Ginecol Obstet. 2017 Oct;39(10):560-8.
5. Berg CJ, Chang J, WM, Whitehead SJ. Pregnancy-related mortality in the united states, 1991-1997. Obstet Gynecol. 2003;101(2):289-96.
6. Gupta S, A Rohtagi, SK Sharma, Gurtoo A. A study of neurological disorders during pregnancy and puerperium. Ann Indian Acad Neurol. 2006;9(3);152 -7.
7. World Health Organization. Headache disorders. http://www.who.int/mediacentre/factsheets/fs277/en/ Accessed on 01 April 2023.
8. Fox MW, Harms RW, Davis DH. Selected neurologic complications of pregnancy. Mayo Clin Proc 1990;65(12):1595–618.
9. Kriplani A, Relan S, Misra NK, Mehta VS, Takkar D. Ruptured intracranial aneurysm complicating pregnancy. Int J Gynaecol Obstet 1995;48(2):201-6.
10. Cantu C, Barinagarrementeria F. Cerebral venous thrombosis associated with pregnancy and Puerperium. Review of 67 cases. Stroke 1993;24(12):1880–4.
11. Hilsinger RL Jr, Adour KK, Doty HE. Idiopathic facial paralysis, pregnancy, and the menstrual cycle. Ann Otol Rhinol Laryngol 1975;84(4 Pt 1):433-42.
12. Haider B, Oertzen JV. Neurological disorders. Best practice & Research Clinical Obstetrics and Gynaecology. 2003;27:867-75.
13. Harden CL, Meador KJ, Pennell PB, Hauser WA, Gronseth GS, French JA, et [2] al. Practice parameter update: management issues for women with epilepsy-focus on pregnancy: teratogenesis and perinatal outcomes: report of the quality standards subcommittee and therapeutics and Technology Assessment Subcommittee of the American academy of neurology and america epilepsy Society. Neurology. 2009;73(2):133-41.
14. Chang J, Streitman D. Physiologic adaptations to pregnancy. [3] Neurol Clin. 2012;30:781-89.
15. Harden CL, Hopp J, Ting TY, Pennell PB, French JA, Hauser WA, et al. Practice [4] Parameter update: Management issues for women with epilepsy—Focus on pregnancy (an evidence-based review): Obstetrical complications and change in seizure frequency. Neurology. 2009;73(2):126-32.
16. Prabhu TR. Cerebrovascular complications in pregnancy and puerperium. The Journal of Obstetrics and Gynecology of India. 2013 Apr;63:108-11.
17. Thatikonda AK, Balasankula TR, Thatikala A, Gudivella SR, Ramchandram R, Bethala A. A clinical study of neurological complications in pregnancy and upto 6 weeks postpartum. Journal of Evolution of Medical and Dental Sciences. 2018 Sep 17;7(38):4961-7.
18. Gupta S, Rohatgi A, Sharma SK, Gurtoo A. A study of neurological disorders during pregnancy and puerperium. Annals of Indian Academy of neurology. 2006 Jul 1;9(3):152-7.

19. Zafarmand S, Javanmardi H, Ameri M, Maneshi M, Mansouri-Mehrabadi S, Zolghadrasli Y, Moazzam M, Aramesh A, Borhani-Haghighi A. Evaluation of the Neurological Complaints during Pregnancy and Postpartum. Galen Medical Journal. 2019;8:e1616.
20. Gupta M, Pradeep Y, Singh R, Shrivastava PK. A study of neurological disorders in pregnancy and puerperium. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2020 Oct 1;9(10):4236-45.
21. Renukesh S, Rai L. Neurological disorders complicating pregnancy-focus on obstetric outcome. Journal of Clinical and Diagnostic Research: JCDR. 2016 Dec;10(12):QC06.
22. Thomas DR, Beenakumari R, Priya V. Maternal and foetal outcome in women with neurological disorders. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2019 Dec 1;8(12):4891-7.
23. Ranjith P, Rao M. Neurological manifestations in peripartum period. Perspect Med Res. 2017;5(1):42-5.
24. Singh PK, Singh R. Spectrum of neurological disorders in pregnancy in a neurology clinic in eastern Uttar Pradesh. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2021 Oct 1;10(10):3779-86.
25. Gupta S, Chakraborty U, Chandra A, Dutta A, Pal J, Ray BK, Gangopadhyay G. Spectrum of Neurological Illnesses in Pregnancy–An Observational Study from a Tertiary Care Centre of Eastern India. The Journal of the Association of Physicians of India. 2022 May 1;70(5):11-2.