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Original Research Article

"THE FREQUENCY OF NEUROLOGICAL COMPLICATIONS OF ECLAMPSIA"

Article History:

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Abstract: ***Background***: Eclampsia is a serious pregnancy complication, which is manifested by the development of seizures in preeclamptic women and is linked with high morbidity and mortality in mothers. Among the most severe effects are neurological ones, including mild effects and life-threatening ones. ***Objective:*** To identify how and how often neurological complications occur in women with a diagnosis of eclampsia in a tertiary care hospital. ***Methods:*** The study was a cross-sectional study that was carried out in Dr. Ruth K. M. Pfau Civil Hospital, Karachi, between 23 September 2025 and 22 December 2025. Non-probability consecutive sampling was used to include 252 women with the diagnosis of eclampsia. The structured proforma was used to gather the information, such as demographic information, obstetric history, and the findings of the neurology. Neurological problems like headache, visual disturbances, disturbed consciousness, posterior reversible encephalopathy syndrome (PRES), stroke, and elevated intracranial pressure were documented. The statistical software was used in analyzing the data, and the results were presented in the form of frequencies and percentages. ***Results:*** In 38.5, the patients encountered neurological complications. Severe headache (27.4%), visual disturbances (22.2%), and altered consciousness (18.6) were the most prevalent ones. Extreme complications that included PRES (9.5%), stroke (4.8%), focal neurological deficits (6.3%), and elevated intracranial pressure (7.1%) were also detected. The majority of patients were cured without deficits in the long term, but a small percentage of patients suffered persistent neurological deficits and maternal mortality. ***Conclusion:*** Eclampsia is associated with neurological complications that have a high likelihood of impacting the outcome of the maternal condition. Morbidity reduction through early diagnosis and prompt management is necessary to enhance prognosis.

Keywords: Eclampsia, Neurological complications, Preeclampsia, Maternal health, Seizures, PRES, Stroke.

INTRODUCTION

Eclampsia is a life-threatening and dangerous complication of pregnancy where women experience generalized seizures due to preeclampsia, but it is one of the most dangerous conditions in obstetric care across the globe. It is directly linked to hypertensive disorders of pregnancy and leads to a high level of maternal and perinatal morbidity and mortality, especially in developing nations where access to timely healthcare can be constrained. The morbidity of eclampsia goes further than complications

associated with obstetric practice since it is also known to have a long-term neurological outcome, such as cognitive impairment and cerebrovascular conditions (1). Neurological complications are a key point of view in determining the clinical severity and prognosis of eclampsia, a case that notes the importance of thorough examination and early intervention measures. The neurological symptoms of eclampsia occur mainly because of cerebral effects through endothelial dysfunction, vasospasm, and damage to the blood-brain barrier, resulting in cerebral edema and ischemia. Such pathophysiological processes may lead to a range of problems, including headaches and visual impairments, seizures, stroke, and coma.

Recent developments in neuro-obstetrics have underscored the need to learn these brain processes, which are critical in the short-term care and the outcome effects (2). The brain is especially susceptible in the case of eclampsia because of sudden changes in blood pressure, as well as the inability of autoregulation, which only worsens the neurological damage. Eclampsia is an obstetric emergency with high risks and with serious neurological consequences, even though it is a relatively rare situation. It usually comes out unpredictably and can be pre- or post-delivery, peripartal, or postpartum, which is why it is hard to identify early. The literature on emergency medicine states that the prevalence is low, but the level of complications requires immediate diagnosis and treatment of the patient to avoid irreversible neurological damage (3). The variability of the seizure onset and the possibility of its rapid progression support the relevance of the detection of risk factors and close observation of the neurological symptoms in patients with the condition.

The association between preeclampsia and neurological complications has been widely studied, with results that indicate that the neurological sequelae may linger on despite the cessation of pregnancy. It is proven that women who were exposed to preeclampsia and eclampsia are at a higher risk of developing neurological disorders in the future, such as stroke and dementia (4). It points out the long-lasting consequences of these conditions and the need to detect and prevent the occurrence of neurological complications at an early stage during pregnancy. Possible signs of the neurological involvement of preeclampsia and eclampsia have also been tested using biomarkers. Recent studies have found particular cerebral biomarkers that could be correlated to the extent of neurological complications, which sound as promising opportunities for early diagnostic and focused treatment (5). These biomarkers can offer useful information on the level of brain injury and even allow clinicians to classify patients by risk, thereby enhancing clinical outcomes.

It is presumed that eclampsia is epileptic and that the phenomenon of epileptic seizure is considered to be the main neurological symptom of eclampsia. These seizures are usually generalized tonic-clonic based and may be heralded by warning signs like headaches of a severe nature, visual problems, and altered intellectual state. The condition is linked to multiple maternal and fetal dangers, such as intracranial bleeding, hypoxia, and even fatality in case of absence of timely treatment (6). To be able to treat and prevent the development of complications, it is necessary to understand the neurological basis of these seizures. Eclampsia diagnosis and treatment entail the use of a multidisciplinary team of obstetricians, neurologists, and critical care experts. Clinical practice developments have enhanced the process of diagnosing and treating eclampsia, and magnesium sulfate is the basis of seizure prophylaxis and treatment. Nevertheless, in spite of these developments, neurological complications still remain a major challenge, especially in resource-constrained environments (7). Having the chance to identify the neurological symptoms early and administer timely treatment is of crucial importance in promoting reduced morbidity and mortality.

Besides maternal complications, adverse neonatal outcomes are also correlated with eclampsia, which can be determined by the degree of involvement of the maternal brain. Research has indicated that complications that may result due to preeclampsia and eclampsia include preterm birth, low birth weight, and admission to the neonatal intensive care unit (8). These results also reiterate the role of effective management of neurological complications to enhance the health conditions of mothers and babies. Neurological complications in pregnancy and the puerperium are clinical situations that need close clinical assessment since they can imitate or intersect with other neurological disorders. Diagnosis must be accurate in order to distinguish eclampsia from other causes of seizures and neurological impairments, including epilepsy or intracranial infections. There has been a shift in clinical approaches to making diagnoses of neurological complications, whereby imaging technologies and clinical assessment instruments are used to improve the level of diagnostic accuracy (9). This is especially significant in making proper management and preventing misdiagnosis.

Preeclampsia is a preceding disorder, a multisystem disorder that presents with hypertension and dysfunction of organs. The pathogenesis of it is characterized by abnormal placentation, disruption of the immune system, and endothelial damage, which lead to systemic and cerebral problems. It is important to understand the mechanism of preeclampsia in order to recognize the patients who are at risk of developing eclampsia as well as the neurological complications associated with it (10). Early diagnosis and follow-up

can be significant in disease prevention. The other aspect of the disease that bears significance is postpartum eclampsia, where neurological complications may occur even after delivery. This indicates that further follow-up of the patients in the postpartum phase is necessary because the potential for seizures and other neurological occurrences may still exist. Clinical guidelines also stress the need to identify postpartum symptoms and give them the right management to avoid negative consequences (11). Otherwise, there is a risk of late diagnosis and greater complications.

Different modalities of treatment have been tried to treat eclampsia and minimize the effects of eclampsia on the brain. Besides magnesium sulfate, antihypertensive treatment and care are also critical in the management. These treatments are used to manage blood pressure, prevent seizures, and minimize neurological damage. Nevertheless, there are still issues with providing quality and timely treatment, especially in low-resource environments where the healthcare infrastructure might be poor (12). This highlights the issue of enhanced access to healthcare and education. Some neurological signs, like high intracranial pressure, have been examined as signs of severe disease. The non-invasive measurement of intracranial pressure in patients with severe preeclampsia and eclampsia has been done by techniques such as optic nerve sheath diameter measurement. These diagnostic instruments would be helpful in the provision of valuable information on the neurological status and may contribute to the early identification of complications (13). The application of these techniques in clinical practice can help to monitor patients and improve their outcomes.

Eclampsia remains a severe complication of pregnancy, which needs increased maternal attention and monitoring. Although the levels of obstetric care have improved, it has continued to be a major contributor to maternal morbidity, especially in developing nations. The severity of the neurological complications attributed to eclampsia emphasizes the necessity of continuous research and better clinical management approaches (14). It is necessary to address these challenges in order to reduce the global burden of the disease. Among the most remarkable neurological issues related to eclampsia is the posterior reversible encephalopathy syndrome (PRES), which includes headaches, seizures, visual problems, and an altered state of consciousness. This has been established by systematic reviews, which showed that there is a strong relationship between PRES and severe preeclampsia and eclampsia, with the inability to avoid irreversible neurological damage without initiating treatment at the earliest stage (15). Early treatment may very well result in total remission, which highlights the reversibility of the condition with proper management.

Non-invasive diagnostic methods, including ultrasonographic measures of optic nerve sheath diameter, have attracted interest as a way of identifying elevated intracranial pressure in preeclampsia. Such techniques provide a safe and efficient means to determine the level of neurological disorders without necessarily employing an invasive procedure, which comes in handy especially in limited-resource facilities (16). Their application can help to enhance the early identification and treatment of neurological complications. Preeclampsia and eclampsia belong to a wider range of hypertensive disorders of pregnancy, which is one of the major international health issues. Such conditions are linked to high morbidity and mortality rates of the mothers and fetuses, and the neurological complications they cause only worsen their effects. Developments on pathophysiology and management of the disorders have enhanced the outcomes, although there are still issues in ensuring there is equity in accessibility to the care (17). Further inquiry and community health initiatives are necessary in order to handle these issues.

Lastly, the association between neurological complications and cognitive outcomes of women with preeclampsia and eclampsia has been investigated recently. It is indicated that the conditions can be long-term in terms of their impact on cognitive performance, which could be mediated by cerebral damage and the alteration of biomarkers. These are long-term consequences that need to be understood to give comprehensive care and follow-up to the affected women (18). This accumulating evidence shows the significance of the frequency and nature of neurological complications in eclampsia in future research to enhance clinical outcomes and other research.

Objective: To identify the rate and trend of neuro-related issues in women with a diagnosis of eclampsia who were hospitalized in a tertiary care unit, and to examine the related clinical features.

MATERIALS AND METHODS

Study Design: Cross-Sectional Study

Study Setting: The study was conducted at Dr. Ruth K. M. Pfau Civil Hospital, Karachi.

Duration of Study: 23 September 2025 and 22 December 2025.

Sample Size: The computerized determination of the sample size was done through the OpenEpi online calculator. The parameters that were adopted were the following: frequency of neurological complications among the women who had eclampsia, 20.63% (15), margin of error 5, and confidence level 95. The obtained sample size was 252 participants.

Sampling Technique: Non-probability consecutive sampling

Inclusion Criteria: The study included all pregnant women who contracted eclampsia without reference to parity and gestational age. Patients who arrived with new-onset generalized tonic-clonic convulsions related to hypertension and proteinuria, or met clinical criteria related to eclampsia, were recruited. Women admitted to emergency departments or outpatient departments and those who developed eclampsia in the course of their hospital stay were also considered. Patients who consented to take part in the study either by offering informed consent or by having their attendants consent on their behalf were only eligible to participate in the study.

Exclusion Criteria: The patients who had a previous history of epilepsy, seizure disorders that were not associated with eclampsia, or patients who had a neurological-related disease were not allowed to participate in the study. There were also no women having intracranial infections or brain tumors, or those with metabolic causes of seizures. Moreover, incomplete medical records of the patients were to be excluded, as well as those who did not want to participate in the study, to guarantee the accuracy and reliability of the data.

Methods

All the eligible patients diagnosed with eclampsia were enrolled in a consecutive manner after getting ethical approval from the institutional review board within the research period. Patients or their attendants had been informed in advance before inclusion. Demographic characteristics, obstetric history, clinical findings, and neurological complications were documented using a structured data collection proforma. A more detailed neurological examination was conducted, including the assessment of the level of consciousness, the presence of seizures, visual impairment, limited neurological disorders, and the existence of elevated intracranial pressure. The available laboratory investigations and neuroimaging results were also recorded in case they were relevant. Patients were treated according to the protocols that involved magnesium sulfate and antihypertensive therapy. Data were fed into statistical software to be analyzed. The frequency and percentages of neurological complications were computed, whereas continuous variables were computed by mean and standard deviation. Variables were compared where necessary to establish patterns of relationship between variables in terms of neurological outcomes.

RESULTS

This study was conducted on a sample of 252 women who had eclampsia. The demographic and obstetric attributes of the patients were evaluated to learn about the distribution of cases. The average age of the respondents was 26.8 ± 5.4 years. Most of the patients were in the 20-30 years age group, which means that eclampsia was more prevalent among young women within the reproductive age. Primigravida women had a higher proportion in terms of parity than multigravida patients.

Table 1: Distribution of Patients by Age Group and Parity (n=252)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	<20 years	42	16.7
	20–30 years	147	58.3
	>30 years	63	25.0
Parity	Primigravida	154	61.1
	Multigravida	98	38.9

The age of gestation at which it was presented was also measured. The majority of patients were presented in between the second and third trimester and the postpartum period. This implies that eclampsia and its complications are more prevalent during later stages of pregnancy, especially in late gestation.

Table 2: Distribution of Patients by Gestational Age (n=252)

Gestational Period	Frequency (n)	Percentage (%)
Second Trimester	55	21.8
Third Trimester	163	64.7
Postpartum	34	13.5

A significant number of patients were found to have neurological complications. Although all cases contained seizures, other neurological manifestations occurred at different frequencies. Severe headache and visual disturbances were the most prevalent, followed by changes in consciousness. These results indicate that childhood neurological symptoms are common and can be used as early indicators of serious complications.

Table 3: Frequency of Common Neurological Symptoms (n=252)

Neurological Symptom	Frequency (n)	Percentage (%)
Severe Headache	69	27.4
Visual Disturbances	56	22.2
Altered Consciousness	47	18.6

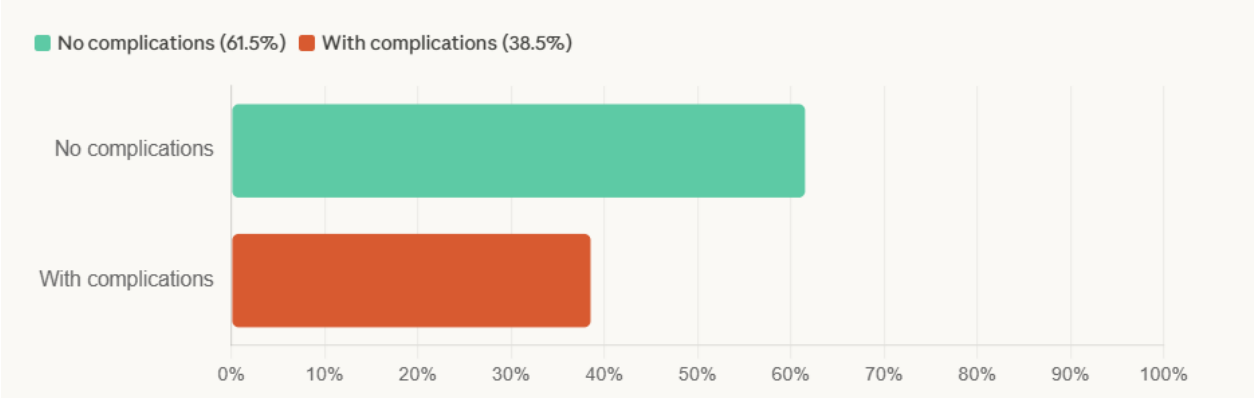
Greater neurological complications were reported as well. A subset of patients were found to have conditions including posterior reversible encephalopathy syndrome (PRES), stroke, focal neurological impairments, and elevated intracranial pressure. Even though these complications were less common, they showed increased morbidity and negative outcomes.

Table 4: Frequency of Severe Neurological Complications (n=252)

Complication	Frequency (n)	Percentage (%)
PRES	24	9.5
Stroke	12	4.8
Focal Neurological Deficits	16	6.3
Raised Intracranial Pressure	18	7.1

The discussion of neurological complications has shown that about 38.5% of patients were found to have one or more non-seizure complications. The patterns of these complications indicate that although the mild symptoms prevail, severe neurological outcomes are still a serious clinical issue.

Graph 1: Overall Frequency of Neurological Complications



Generally, the findings prove that neurological problems are common among women with eclampsia, with a range of mild symptoms up to life-threatening diseases. There is a need to identify and manage the risk of adverse maternal outcomes early and promptly.

DISCUSSION

The objectives of the present study were to establish the frequency and pattern of neurological complications in women with eclampsia, and the results showed that a significant rate of patients were neurologically involved. Such findings are in line with the available literature that emphasizes the key issue of the centrality of neurological dysfunction in the clinical spectrum of eclampsia. The frequency of complications was a result of the high burden of disease, as it was observed in this study that the outcomes of the disease, especially in developing healthcare settings, might worsen due to late presentation and lack of access to care (1). The results support the need to identify neurological complications as a serious element of maternal morbidity. The large percentage of patients who present with the neurological symptoms of headache, distortion of vision, and altered consciousness is consistent with the current knowledge about the neuro-pathophysiology of eclampsia. The symptoms are mainly explained by endothelial dysfunction, cerebral vasospasm, and disintegration of the blood-brain barrier, resulting in cerebral edema and the ineffectiveness of autoregulation. These mechanisms are thoroughly described in the literature on neuro-obstetrics, and it is important to note that early neurological symptoms usually precede serious complications and cannot be neglected in clinical practice (2). Timely identification of such warning signs can help drastically improve patient outcomes.

Eclampsia is a relatively rare high-risk obstetric emergency because it has an unpredictable course and may cause rapid neurological degradation. The evidence provided in this study confirms the findings of earlier reports that, although the prevalence is low, the nature of the neurological complications is severe and requires immediate action. Management can cause irreversible neurological damage, including

intracranial hemorrhage and hypoxic injury, in the case of delayed management, resulting in increased maternal mortality (3). This brings out the need to have effective emergency response mechanisms and health practitioners who are well-trained in dealing with such cases. Other past studies have also focused on the relationship between hypertensive conditions of pregnancy and long-term neurological outcomes. Women with preeclampsia or eclampsia risk are also more prone to developing neurological disorders in the future, such as stroke and cognitive impairment. This association is further evidenced by the findings of this study, especially the incidence of severe complications such as stroke and altered consciousness, which indicates the need to follow up on affected patients on a long-term basis (4). This view expands the area of care to extend well past the obstetric stage.

This study has identified neurological complications, including posterior reversible encephalopathy syndrome (PRES), and these results are in line with other researchers who have indicated that PRES is closely related to eclampsia. PRES is reflected in reversible vasogenic edema and is frequently accompanied by such symptoms as seizures, visual disorders, and altered mental state. Imaging and the use of biomarkers have enhanced the interpretation and diagnosis of such conditions, which can be interfered with in time, and prognosis can be increased (5). PRES is mostly reversible through proper management due to which considerable emphasis should be placed on detecting it early. The characteristic of seizures is the dominant feature of eclampsia, and it was noted in all of the patients involved in this study. Nonetheless, the appearance of other neurological complications means that the disease spectrum is more severe. These results are consistent with the existing literature, which characterizes eclampsia as a disease with various neurological symptoms other than the occurrence of seizures. The development of complications like focal deficits and elevated intracranial pressure further points to the necessity of an extensive neurological evaluation in such patients (6). The ideality of seizure control is an element of management.

It is impossible to overestimate the role of timely diagnosis and proper treatment in minimizing neurological complications. Recent clinical practice guidelines focus on magnesium sulfate as the default intervention for seizure prevention and control, and antihypertensive intervention to control blood pressure. In spite of these improvements, the neurological complications that persist in this study indicate that other causes, including late presentation and poor follow-up, could also be the cause of poor outcomes (7). It is therefore important to strengthen health care organizations. Besides complications being experienced by the mother, eclampsia also has a great impact on the babies. This study concentrated mostly on maternal neurological complications, but past studies showed that there is a significant correlation between hypertensive disorders of pregnancy and poor neonatal outcomes, such as preterm birth and low birth weight. These results underscore the interdependence between maternal and fetal health and the need to involve extensive management approaches (8). Direct positive effect on the neonatal outcomes can be achieved through better maternal care.

The diagnosis of neurological complications in pregnancy may be complicated, as it shares clinical features with other neurological disorders. Proper diagnosis is achieved through a proper clinical assessment and administration of good diagnostic instruments, which include imaging and lab tests. The differentiation between eclampsia and other causes of seizures has also been enhanced with the development of different diagnostic methods, leading to the management of the syndrome (9). This comes into play especially with regard to the provision of the best patient care. Pathophysiology of preeclampsia, which is a precursor of eclampsia, involves intricate coordination of placental abnormalities, immune reactions, and vascular dysfunction. These processes cause systemic and cerebral complications, which eventually develop into neurological manifestations. The knowledge of these mechanisms is critical in recognizing those patients who are at high risk and preventing them (10). Early diagnosis and surveillance are important in preventing the development of diseases.

Even after delivery, neurological complications can arise, and this is an added problem as postpartum eclampsia is a phenomenon. The results of this research, which incorporated cases of postpartum, indicate the need for follow-up during postpartum. Underdiagnosis of postpartum symptoms may result in complications and delayed diagnosis (11). This highlights the importance of long-term surveillance after delivery. The different modalities of treatment have been investigated to treat eclampsia and minimize the neurological effects of the same. Magnesium sulfate is the gold standard; however, supportive care and blood pressure are also significant. Responsiveness of such interventions is conditioned by the timely initiation of the interventions and compliance with clinical standards (12). Access to these treatments should also be enhanced, especially in the low-resource context.

Non-invasive methods of assessing intracranial pressure, including the measurement of optic nerve sheath diameter, have received increased interest over the last few years. These procedures help to gain significant information about the neurological condition of patients, as well as facilitate early

identification of complications. Implementation of these diagnostic tools in everyday clinical practice can promote patient outcomes (13). Their extensive use should be supported by further studies. Eclampsia remains a leading cause of maternal morbidity, especially in the developing world. This study needs to improve maternal healthcare services and increase awareness of the condition. It is important to minimize the burden of neurological complications through early detection, timely intervention, and effective management (14). The public health programs must be aimed at empowering the maternal care systems. The presence of PRES in this paper also highlights the need to identify reversible neurological conditions that are related to eclampsia. They can be fully recovered due to early diagnosis and proper control, which makes it necessary to raise clinical awareness levels (15).

Late identification could cause permanent brain injury. The use of non-invasive diagnostic methods, including ultrasonography in the measurement of intracranial pressure, provides great opportunities in enhancing the treatment of patients. The approaches are especially applicable in environments where sophisticated imaging equipment is not easily accessible, and, therefore, they are effective in resource-constrained settings (16). Their inclusion in clinical practice could positively impact the early detection. The hypertensive disorders of pregnancy are one of the biggest health concerns in the world, with far-reaching consequences on maternal and fetal health. The results of this research correspond to the global tendencies, which point to the necessity to conduct further research and enhance the clinical management practices (17). To overcome these issues, it is necessary to apply a multidisciplinary approach. Lastly, the neurological and cognitive outcomes of eclampsia are also becoming known in the long term. Research has revealed that women who have suffered eclampsia in the past can develop long-lasting cognitive disability as well as other neurological disabilities. The results of this research justify the necessity of the long-term follow-up and multifaceted care of the impacted patients (18). These long-term outcomes should be understood in order to enhance maternal health and life in general.

Conclusion

This paper comes to the conclusion that neurological complications are a common and important problem in women with eclampsia, and they occur in a large proportion of patients. The spheres of complications may include such common symptoms as headache and visual disturbances, as well as serious conditions like the syndrome of posterior reversible encephalopathy, stroke, and altered consciousness. The findings suggest that primigravida, advanced gestational age, advanced hypertension, and delayed visits to healthcare facilities are the key contributing factors towards the development of the said complications. Even when most of the patients recovered without long-term deficits, the occurrence of long-term neurological deficits and maternal mortality indicates the severity of the condition. To enhance maternal outcomes, it is necessary to early identify warning signs, make a prompt diagnosis, and manage them in a timely way. Antenatal care services should also be reinforced, access to emergency obstetric care should be enhanced, and healthcare providers should be made more aware of the problem of the burden of neurological complications in relation to eclampsia.

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