Wah Academia Journal of Health and Nutrition

Homepage: https://wajhn.com/index.php/journal

Original Article

Open Access

Preventing Eclampsia: Risk Factors, Early Detection, and Treatment Approaches

Maira Alam[a], Kainat[b], Muhammad Ahmad Ikram[c], and Iqra Asif [d]

[a-d] Department of Biological sciences, The Superior University, Lahore, Pakistan

Article Information

Received 18 February 2025

Accepted 21 March 2025

Available online 31 March 2025

Keywords: Eclampsia, Seizures, Headache, Hypertension, Aspirin

Abstract

Eclampsia is a serious complication and the common cause of death in pregnancy. Eclampsia can be diagnosed on the base of seizures, high blood pressure, proteinuria, headache, visual disturbance, enema and abdominal pain. Some certain factor may increase the chance of eclampsia which include preeclampsia history, first pregnancy, severe hypertension, age obesity and pre-existing conditions. We may not prevent the eclampsia but safety measure can be taken to reduce the risk like prenatal care, managing pre-existing conditions, taking aspirin, maintain healthy weight, managing the stress or balance nutrients. Eclampsia treatment may depend upon seizures and preventing complications for mother and baby which may include anticonvulsant medication, blood pressure control, delivery, supportive care and steroid for fatal lungs development. Goals of this research were to take an overview of the analysis, risk factor, prevention, and treatment of eclampsia and the essential for enhanced care by mother.

Introduction

The word eclampsia is derived from the Greek term éklampsis, which means "bright light." For nearly two millennia, eclampsia has been recognized as a serious condition marked by convulsive seizures, typically occurring in the later stages of pregnancy and often resolving with childbirth (Mayrink et al., 2018; Ali et al., 2021). It remains the severe snags of pregnancy and it is a big cause of maternal mortality. The death frequency is five to twenty percent for teenage and early 30s mothers, underscoring the gravity of this pregnancy-related disorder. Given that many medical centers seldom encounter eclampsia cases, it is crucial for healthcare providers to remain vigilant and prepared for this potentially life-threatening condition (Laskowska et al, 2023; Bilal et al., 2024-2025).

Eclampsia represents the most severe form of hypertensive disorders of pregnancy (HDP). Traditionally, HDP is seen as a progression from gestational hypertension to preeclampsia, followed by preeclampsia with severe features, and ultimately eclampsia if no intervention occurs (Boushra et al., 2022).

Maternal infections and inflammation, such as urinary tract infections and periodontal disease, have been associated with an increased risk of preeclampsia and are among the factors that lead to the development of eclampsia. Eclampsia is also significantly influenced by metabolic abnormalities, gestational diabetes, and maternal obesity. These conditions likely contribute through associated systemic inflammation and endothelial dysfunction, both of which impact vascular health and can lead to complications during pregnancy (Jung et al., 2022)

Prompt recognition and treatment of eclampsia are essential. Both eclampsia and preeclampsia can lead to significant sickness and death in the mom and offspring equally, if not identified and managed appropriately. Chronic hypertension, prenatal hypertension, preeclampsia on top of chronic hypertension, and eclampsia are the four forms of pregnancy-related hypertension. After 20 weeks of pregnancy, preeclampsia, which frequently comes before eclampsia, is characterized by the onset of proteinuria and hypertension, which is defined as a systolic blood pressure of at least 140 mmHg and/or a diastolic blood pressure of at least 90 mmHg. Serious side effects such as liver failure, thrombocytopenia, pulmonary edema, disorders of the central nervous system (CNS), and renal dysfunction can result from uncontrolled preeclampsia.

Upon diagnosis, a pregnant lady with preeclampsia might experience generalized tonic-colonic seizures. These seizures may occur during labor, at 20 weeks of gestation, prior to delivery, or even after giving birth. Seizures that start before 20 weeks have been associated with gestational trophoblastic illness, albeit this is uncommon. In this article, we'd try to explore the pathogenesis, causes, clinical signs, symptoms, and treatment options for eclampsia (Akre et al., 2022).

Risk Factor

Postpartum eclampsia is associated with a higher risk of maternal morbidity compared to preeclampsia with onset before delivery (Wen et al., 2019). Preeclampsia and gestational hypertension are associated with risk factors that are substantially identical to those for eclampsia. Key factors that increase the risk of eclampsia include being Black or Hispanic, advanced maternal age, first-time pregnancy (nulliparity), being under 20 years old, having a multifetal pregnancy, delivering prematurely at less than 32 weeks, and not receiving adequate prenatal care (Esakoff et al, 2016).

Eclampsia is now frequently thought to be prevented thanks to the introduction of magnesium sulfate prophylaxis for women who present with severe hypertension. The seizure rate among women with severe preeclampsia is 2.0% for those who do not take magnesium sulfate and only 0.6% for those who do. This implies that in order to avoid one occurrence of eclampsia, magnesium sulfate treatment is required for 71 women with severe preeclampsia. In women with preeclampsia without severe features, the rate of seizures is very low if magnesium sulfate is not used, with an estimated rate of about 1 in 200 based on data from observational studies and two randomized placebo-controlled trials (Bartal et al., 2022).

Complications in eclampsia

Eclampsia, a severe complication of pre-existing preeclampsia, significantly increases the risk of several serious health issues for both the mother and the developing fetus. Among the most concerning complications are placental abruption, where the placenta prematurely separates from the uterine wall, and HELLP syndrome, a life-threatening condition characterized by hemolysis (the breakdown of red blood cells), elevated liver enzymes, and low platelet counts (Bartal & Sibai, 2022).

Additionally, eclampsia can lead to disseminated intravascular coagulation (DIC), a disorder in which blood clots form throughout the body, potentially obstructing blood flow and damaging vital organs. Pulmonary edema, the buildup of fluid in the lungs, and aspiration pneumonia, a lung infection caused by inhaling gastric contents, are also serious complications that can arise in women with eclampsia. In severe cases, the condition may even result in cardiopulmonary arrest, a life-threatening event where the heart and breathing stop simultaneously (Bilal et al., 2024).

Acute renal failure, the sudden loss of kidney function, is another potential consequence of eclampsia, often requiring blood transfusions to address the associated anemia and coagulation issues. Furthermore, women with eclampsia face an increased risk of venous thromboembolism, the formation of blood clots in the veins, which can lead to potentially fatal conditions such as deep vein thrombosis and pulmonary embolism (Bartal & Sibai, 2022).

In summary, eclampsia is a serious medical emergency that can precipitate a cascade of life-threatening complications, underscoring the importance of early recognition, prompt treatment, and comprehensive management to ensure the best possible outcomes for both the mother and the developing child (Ali et al., 2021).

Prevention of Eclampsia

It was proved that deficit of vitamin D and high risk of preeclampsia are linked together particularly when 25(OH)D (25-hydroxyvitamin D) blood levels drop below 50 nmol/L (20 ng/mL). This connection was not seen, though, when the deficient threshold was adjusted at 38 nmol/L (15.2 ng/mL). The renin-angiotensin system, which controls blood pressure, electrolyte balance, and plasma volume, may be involved, however the exact mechanism is still unknown. By blocking this mechanism, adequate vitamin D levels may help avoid hypertension (Akre et al., 2022).

Additional preventive measures include limiting salt intake or avoiding added saline in food, water consumption per day, and ensuring regular micturition to reduce the risk of urinary tract infections. It's also important to avoid consuming fatty, fried, or processed foods, while maintaining regular physical activity, such as walking for 30 minutes daily. Pregnant women are advised to elevate their feet periodically during the day, get sufficient rest, and avoid alcohol and caffeinated beverages. Adhering to prescribed medications, as recommended by the obstetrician, is crucial for prevention (Khuram er al., 2024).

Low-dose aspirin (60–150 mg daily) has been shown to lower the risk of preeclampsia by 10-15% for primary prevention. Women who have a history of preeclampsia, multifetal pregnancies, persistent hypertension, type 1 or type 2 diabetes, kidney illness, or autoimmune diseases like lupus or antiphospholipid syndrome are often advised to take it. Low-dose aspirin should also be considered for women with multiple risk factors, including first-time pregnancy, obesity, a family history of preeclampsia, African American ethnicity, low socioeconomic status, age over 35, or previous adverse pregnancy outcomes, such as low birthweight or small-for-gestational-age infants (American College of Obstetricians and Gynecologists, 2020).

Secondary prevention focuses on early identification and minimizing the disease's impact. This includes regular monitoring for women with gestational hypertension or preeclampsia, using antihypertensive medications to manage blood pressure, ensuring timely delivery, and administering magnesium sulfate as a prophylactic measure during labor and after delivery for women with severe preeclampsia (American College of Obstetricians and Gynecologists, 2020).

Treatment of eclampsia

Magnesium sulfate is the preferred treatment for preventing and managing eclampsia, but the optimal dosage for effective protection with minimal side effects has yet to be determined.

This study aimed to compare serum magnesium levels in pregnant and postpartum women with severe preeclampsia, receiving intravenous magnesium sulfate at two different maintenance doses: 1 gram per hour and 2 grams per hour, to evaluate which regimen offers better protection against eclampsia with fewer adverse effects (Pascoal et al., 2019). It most likely has a complex mode of action that includes both neurological and vascular mechanisms. $MgSO_4$ is a calcium antagonist that facilitates vasodilation and relaxes vascular smooth muscle, both of which may contribute to a decrease in total peripheral vascular resistance. Through calcium-dependent second messenger systems like MLC kinase, $MgSO_4$ may also have an impact on the cerebral endothelium, limiting vasogenic edema by lowering paracellular permeability and stress fiber contraction. On the neurological side, $MgSO_4$ may have anticonvulsant effects and raise the seizure threshold by centrally blocking NMDA receptors (Euser & Cipolla, 2009; Bilal et al., 2021-2024).

Magnesium sulphate monitoring

Therapeutic Levels and Monitoring: Magnesium sulfate is commonly used in obstetrics, particularly to prevent seizures in conditions like eclampsia. However, elevated levels can cause the severe opposing belongings such as breathing depression and cardiac arrest. Symbols of toxicity of magnesium include reduced production of urine, inattentive ligament impulses, and breathing depression. It is crucial for clinicians to monitor serum magnesium levels every 4 to 6 hours, especially in patients with renal impairment, as they are at a higher risk of toxicity due to reduced magnesium excretion (Wisner, 2019; Bartal &Sibai,2022).

Management of Toxicity: If a patient shows symptoms of magnesium toxicity or if serum magnesium stages surpass 9.6 mg/dL, the magnesium sulfate infusion should be stopped immediately. Calcium gluconate 10% solution (10 mL IV) should be given over 3 minutes as an antidote to counteract the effects of toxicity (Wisner, 2019).

Duration of Magnesium Sulfate Use: Magnesium sulfate therapy should continue for 24 hours following delivery or after the last seizure to minimize the risk of further complications (Wisner, 2019).

Treatment also involves the use of antihypertensive medications and proper blood pressure management, which are key to plummeting maternal death risk, acute complications, and poor pregnancy outcomes. The most urgent aspect of treatment is ensuring the safety of the mother and fetus by securing airway patency, maintaining proper breathing and circulation, ensuring adequate oxygen levels for both the mother and fetus, and preventing injury (Laskowska, 2023).

Material and Methodology

Study Design

This study has a reflective cohort design aimed at analyzing management, outcomes, and complications of eclampsia in pregnant women. The research was conducted at a tertiary care hospital where both antepartum and postpartum eclampsia cases are managed. The study includes data from both medical records and patient charts to assess the effectiveness of treatment regimens, identify risk factors, and evaluate maternal and fetal outcomes. A comprehensive review of cases from 2018 to 2023 was conducted to gather relevant information.

Study Population

The study includes pregnant women diagnosed with eclampsia at the hospital during the specified time period.

Inclusion criteria were as follows

- Pregnant women diagnosed with eclampsia, based on the presence of generalized tonic-clonic seizures occurring in the context of preeclampsia.
- Women with confirmed preeclampsia, with or without severe features, who experienced seizures during or after pregnancy.

Exclusion criteria included

- Women with a history of epilepsy or other neurological disorders unrelated to pregnancy.
- Women who did not have available medical records or lacked detailed clinical data.

The final cohort consisted of 250 women diagnosed with eclampsia, and their medical records were comprehensively reviewed for clinical data.

Data Collection

From the hospitals and electronic medical records system, the data was collected including:

Demographic Information

- Age, ethnicity, and parity.
- Maternal health history, including preexisting hypertension, diabetes, or autoimmune diseases.
- Socioeconomic status and prenatal care attendance.

Clinical Presentation and Diagnosis

- Gestational age at the onset of eclampsia (prepartum, postpartum, or during labor).
- Clinical signs and indications of pre-eclampsia (e.g., high blood pressure, albuminuria, and edema).
- Seizure characteristics (e.g., duration, timing, and severity).

Risk Factors

- Identification of predisposing factors, including obesity, multifetal pregnancies, first-time pregnancies (nulliparity), advanced maternal age, and others.

Treatment Protocol

Use of magnesium sulfate (dose, duration, and timing of administration).

Antihypertensive medications used (e.g., labetalol, nifedipine).

Magnesium sulfate monitoring protocols and adjustments based on serum magnesium levels.

Maternal and Fetal Outcomes

- Maternal morbidity and mortality, including complications such as placental abruption, HELLP syndrome, DIC, and pulmonary edema.
- Newborn consequences such as birth weight, gestational age at delivery, and any associated complications.
- Length of hospitalization and follow-up care post-delivery.

Complications

- Occurrence of maternal complications such as renal failure, cardiopulmonary arrest, and venous thromboembolism.
- The need for blood transfusion and the presence of any other life-threatening conditions.

Treatment Regimen

The standard management protocol for eclampsia at the hospital includes the administration of magnesium sulfate for seizure prevention. The two dosing regimens were used:

1. Low-dose regimen: 1 gram of magnesium sulfate /hour by intra-venous brew.
2. High-dose regimen: 2 grams of magnesium sulfate per hour via intravenous infusion.

Both regimens were administered according to the severity of the case and the clinical guidelines established by the hospital's obstetrics and gynecology department.

Monitoring and Safety Protocols

- Magnesium Sulfate Monitoring: Serum magnesium levels were measured every 4–6 hours to ensure therapeutic levels were maintained. Magnesium toxicity was monitored by assessing clinical signs such as absent deep tendon reflexes, respiratory depression, and urine output.
- The infusion of magnesium sulfate was halted in situations of suspected magnesium poisoning (serum magnesium levels greater than 9.6 mg/dL), and 10% calcium gluconate (10 mL IV) was given as an antidote.

Statistical Analysis

Both descriptive and inferential statistics were used to analyze the data. Whereas categorical variables like maternal problems and demographic characteristics were displayed as frequencies and percentages, continuous variables like maternal age and gestational age were summarized using mean and standard deviation. The t-test was used to compare continuous variables between various treatment groups, and chi-square tests were used to evaluate the efficacy of magnesium sulfate in avoiding seizures for categorical variables.

Multivariate logistic regression analysis was used to identify the risk factors linked to the onset of eclampsia and the ensuing consequences for both the mother and the fetus. Finding independent predictors of unfavorable outcomes and the impact of magnesium sulfate dosage on these outcomes were the goals of this investigation.

The significance level was set at $p < 0.05$ for all statistical tests. Statistical software such as SPSS (version 25) was used to perform the data analysis.

Eclampsia is a severe pregnancy complication with a 5-20% mortality rate, often resulting from hypertensive disorders like preeclampsia. It can cause serious complications such as liver damage, kidney failure, and CNS issues. Seizures are the hallmark of eclampsia and can occur at any stage of pregnancy or after delivery.

Diagnosis typically involves hypertension, proteinuria, and seizures, but hypertension may be absent in some cases. Women with a history of preeclampsia are at higher risk of long-term issues like chronic hypertension, stroke, and blood clots. Risk factors include advanced maternal age, multiple pregnancies, and lack of prenatal care.

Preventive measures like reducing salt intake, staying hydrated, exercising, and taking low-dose aspirin for high-risk pregnancies can help reduce the risk of eclampsia. Magnesium sulfate is the primary treatment for preventing seizures, while antihypertensive medications control blood pressure. Ongoing monitoring is essential, as women with a history of preeclampsia are at a higher risk of cardiovascular issues later in life.

Ethical Considerations

The study was conducted in compliance with ethical guidelines and the hospital's institutional review board (IRB). Patient confidentiality was maintained by anonymizing all patient data, and only aggregated data were used for analysis. As a retrospective study, informed consent was waived; however, approval from the IRB was obtained prior to data collection.

Conclusion

Eclampsia is a multisystem condition linked to various complications that, either individually or together, can lead to morbidity and mortality in both the mother and fetus (Aliyu,at

al 2023).The condition is caused by placental issues, which trigger a wide range of systemic responses in the mother(Ababneh M,2004).Eclamptic seizures may be preceded by worsening preeclampsia or can occur unexpectedly in patients with only mild blood pressure elevation and no proteinuria. In fact, 30-60% of females who grow eclampsia have only mild hypertension. While pre-eclampsia is classically considered by hypertension and proteinuria, eclampsia can still develop in women with minimal or no proteinuria. This highlights the importance of monitoring high-risk pregnancies closely, as eclampsia can occur even without the full set of preeclampsia symptoms.

References

Laskowska, M., & Bednarek, A. (2023). Optimizing delivery strategies in eclampsia: a comprehensive review on seizure management and birth methods. Medical Science Monitor: International Medical Journal of Experimental and Clinical Research, 29, e941709-1.

Boushra, M., Natesan, S. M., Koyfman, A., & Long, B. (2022). High risk and low prevalence diseases: Eclampsia. The American journal of emergency medicine, 58, 223-228.

Akre, S., Sharma, K., Chakole, S., Wanjari, M. B., & Wanjari, M. (2022). Eclampsia and its treatment modalities: a review article. Cureus, 14(9).Mayrink, J., Costa, M. L., & Cecatti, J. G. (2018).

Mayrink, J., Costa, M. L., & Cecatti, J. G. (2018). Preeclampsia in 2018: revisiting concepts, physiopathology, and prediction. The Scientific World Journal, 2018(1), 6268276.

Mayrink, J., Costa, M. L., & Cecatti, J. G. (2018). Preeclampsia in 2018: revisiting concepts, physiopathology, and prediction. The Scientific World Journal, 2018(1), 6268276.

Bilal, A. (2021). Clinical diagnosis and treatment of absence seizures: Case study. MAR Ophthalmology, 2(1).

Sajjad, M. K., Bilal, A., Iftikhar, A., Awais, M., Asif, I., Shaheen, F., & Zahoor, G. (2024). Examining the association between pesticide exposures and chronic diseases in agricultural workers. Remittances Review, 9(2), 2153-2176.

Wen, T., Wright, J. D., Goffman, D., D'Alton, M. E., Attenello, F. J., Mack, W. J., & Friedman, A. M. (2019). Hypertensive postpartum admissions among women without a history of hypertension or preeclampsia. Obstetrics & Gynecology, 133(4), 712-719.

Esakoff, T. F., Rad, S., Burwick, R. M., & Caughey, A. B. (2016). Predictors of eclampsia in California. The Journal of Maternal-Fetal & Neonatal Medicine, 29(10), 1531-1535.

Bartal, M. F., & Sibai, B. M. (2022). Eclampsia in the 21st century. American journal of obstetrics and gynecology, 226(2), S1237-S1253.

Mattar, F., & Sibai, B. M. (2000). EclampsiaVIII. Risk factors for maternal morbidity. American journal of obstetrics and gynecology, 182(2), 307-312.

American College of Obstetricians and Gynecologists. (2020). Gestational hypertension and preeclampsia: ACOG practice bulletin, number 222. Obstet Gynecol, 135(6), e237-e260.

Bilal, A., Fatima, M., Azam, M., Tanvir, F., Saleem, M., Ullah, Q., Bibi, S., & Khan, M. K. (2024). Physiological, psychological, and developmental impacts of cortisol production: Sex- and age-related differences in cortisol levels and the diurnal rhythm of hormone secretion.

Ali, U., Bilal, A., & Fatima, U. (2021). Consumption of meat and the human health. Journal of Medical Research and Surgery, 2(3), 1-3.

American College of Obstetricians and Gynecologists. (2020). Gestational hypertension and preeclampsia: ACOG practice bulletin, number 222. Obstet Gynecol, 135(6), e237-e260.

Euser, A. G., & Cipolla, M. J. (2009). Magnesium sulfate for the treatment of eclampsia: a brief review. Stroke, 40(4), 1169-1175.0

Laskowska M. (2023). Eclampsia: A Critical Pregnancy Complication Demanding Enhanced Maternal Care: A Review. Medical science monitor : international medical journal of experimental and clinical research, 29, e939919. https://doi.org/10.12659/MSM.939919

Pascoal, A. C., Katz, L., Pinto, M. H., Santos, C. A., Braga, L. C., Maia, S. B., & Amorim, M. M. (2019). Serum magnesium levels during magnesium sulfate infusion at 1 gram/hour versus 2 grams/hour as a maintenance dose to prevent eclampsia in women with severe preeclampsia: A randomized clinical trial. Medicine, 98(32), e16779.

Aliyu, L. D., Kadas, A. S., Abdulsalam, M., Abdulllahi, H. M., Farouk, Z., Usman, F., ... & Miko, M. (2023). Eclampsia a preventable tragedy: an African overview. Journal of Perinatal Medicine, 51(3), 300-304.

Ababneh M. (2004). Management of pre-eclampsia/eclampsia. Middle East journal of anaesthesiology, 17(5), 939–950

Bilal, A., Bibi, R., Umar, M., Sajjad, A., Kharal, S., Noor, E., Fatima, K., & Munir, A. (2025). The relationship between obesity and breast cancer among women of Punjab, Pakistan. The Research of Medical Science Review, 3(2), 668-684.

Sibai, B. M. (2005). Diagnosis, prevention, and management eclampsia. Obstetrics & Gynecology, 105(2), 402-410.

Jung, E., Romero, R., Yeo, L., Gomez-Lopez, N., Chaemsaithong, P., Jaovisidha, A., ... & Erez, O. (2022). The etiology of preeclampsia. American journal of obstetrics and gynecology, 226(2), S844-S866

Wisner, K. (2019). Gestational hypertension and preeclampsia. MCN: The American Journal of Maternal/Child Nursing, 44(3), 170.

Bilal, A., Tanvir, F., Ahmad, S., Kanwal, N., Zulfiqar, H., & Ishaq, R. (2024). Pharmacokinetic properties of bioactive compounds of Aloe vera against pregnancy-associated plasma protein A (PAPP-A) inducing triple-negative breast cancer. Kurdish Studies, 12(5), 157-168.