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Case Report

Challenges in maritime evacuation during pre-hospital emergency anesthesia on a remote island in Indonesia: A case report

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Abstract

Preeclampsia and eclampsia remain significant contributors to maternal and perinatal mortality. Managing these conditions is particularly challenging in remote areas in many islands of Indonesia, where access to medical care is severely limited. The aim of this study was to analyze the pre-hospital anesthetic management of an eclampsia patient during maritime evacuation to a higher-level facility, highlighting the complexities of medical transport in resource-limited settings. A 38-year-old multiparous woman from a remote village on Pagerungan Island, Indonesia, at 37 weeks of gestation, presented with tonic-clonic seizures consistent with eclampsia. The absence of antenatal care necessitated urgent intervention. Upon presentation, the patient had a Glasgow Coma Scale (GCS) score of 5, tachycardia, and irregular breathing, requiring rapid-sequence intubation and magnesium sulfate administration. Given the geographic constraints, the patient was evacuated by sea under challenging conditions. Despite significant waves, a multidisciplinary team successfully performed an emergency cesarean section onboard, delivering a male infant who required neonatal resuscitation. Postoperatively, both mother and neonate were transferred to a higher-level facility. However, engine failure extended the journey to 18 hours, leading to depletion of oxygen and essential medications, necessitating critical decision-making. This case underscores the significant challenges of emergency eclampsia management in remote settings, particularly during maritime evacuation. Effective stabilization, anesthesia, monitoring, and timely transport are crucial. This case highlights the need for optimized evacuation protocols and increased healthcare resource allocation to enhance maternal and neonatal outcomes in maritime and other resource-limited settings.

Keywords: Maritime evacuation, eclampsia, remote, anesthetic management, Indonesia

Introduction

Preeclampsia represents a critical obstetric complication and remains a significant contributor to maternal and perinatal morbidity and mortality, affecting approximately 4.6% of pregnancies worldwide [1]. In Indonesia, the annual incidence of preeclampsia is estimated at 128,273 cases, accounting for 5.3–11% of pregnancies and constituting the second leading cause of maternal mortality after hemorrhage [2]. If left untreated, preeclampsia can progress to eclampsia, a life-threatening condition characterized by seizures, which significantly increases the risk of maternal and fetal complications [3]. The United Nations Annual Report on Maternal and Child Health (2015) estimated the prevalence of eclampsia at 1.4 cases per 1,000 pregnancies, with significant regional variability [4]. In developing countries, prevalence rates may reach 10 cases per 1,000 pregnancies due to limited access to adequate prenatal care [5-6].

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International Society for the Study of Hypertension in Pregnancy (ISSHP) defines preeclampsia as new-onset hypertension (systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg) occurring after 20 weeks of gestation, accompanied by proteinuria or signs of end-organ dysfunction, such as thrombocytopenia, renal insufficiency, elevated liver enzymes, pulmonary edema, or persistent headaches/visual disturbances unresponsive to treatment [7]. If left untreated or poorly managed, preeclampsia can progress to eclampsia, which is characterized by the onset of seizures in pregnant women without other identifiable causes [8]. This condition is a major cause of maternal mortality, particularly in resource-limited settings [7]. Effective anesthetic management and comprehensive multidisciplinary care are essential in mitigating the risks associated with eclampsia and optimizing outcomes for both mother and neonate.

Pagerungan Island, located at the easternmost edge of Java Island, Indonesia, has a population of approximately 6,000 people [9]. This remote region faces major challenges in accessing advanced medical care due to its small population and limited healthcare infrastructure [10]. In remote and underdeveloped island regions, disparities in the distribution of healthcare facilities often hinder residents from obtaining adequate medical services [11]. For complex medical conditions requiring advanced care, patients must travel to larger islands or the mainland, as Pagerungan Island lacks a fully equipped hospital [12]. Access to comprehensive healthcare is therefore heavily dependent on timely evacuation to better-resourced facilities [9].

Emergency medical challenges are particularly pronounced in remote island regions of Indonesia, where patients frequently face significant barriers to accessing adequate medical care [13]. Prolonged scene times have been associated with higher mortality rates, underscoring the importance of timely pre-hospital interventions [14]. Emergency Medical Services (EMS) often prioritize reducing scene times through pre-hospital evacuations [15], particularly when advanced critical care teams are available to perform on-site interventions [16]. Floating pre-hospital evacuation has emerged as a viable strategy to address healthcare disparities in Indonesia's remote islands [17]. While pre-hospital critical care teams, such as Helicopter Emergency Medical Services (HEMS), are well-established in trauma patient evacuation [18], the unique challenges associated with sea transportation evacuations remain inadequately explored.

To the best of author's knowledge, this case report is the first to describe the unique challenges of utilizing sea transportation for evacuating critically ill eclampsia patients requiring pre-hospital emergency anesthetic management in the remote island regions of Indonesia. Therefore, the aim of this study was to present the evacuation of a critically ill 38-year-old multiparous woman with eclampsia requiring pre-hospital emergency anesthetic management. This case offers valuable insights into the complexities of managing such emergencies in resource-limited settings and highlights the critical issues encountered when conventional medical facilities and resources are unavailable.

Case

A 38-year-old multiparous woman from a remote village on Pagerungan Island, Indonesia, with a body mass index (BMI) of 23.9 kg/m² and at 37 weeks of gestation, presented to a local primary healthcare center at 8:30 A.M. with tonic-clonic seizures consistent with eclampsia. The patient had previously experienced acute-onset headaches and nausea. Due to residing in a remote village, antenatal care monitoring had not been conducted. The patient was in her third pregnancy, with a prior history of insufficient antenatal care. A previous pregnancy resulted in an uncomplicated vaginal delivery. No significant history of comorbidities or medication use was reported.

The initial evaluation demonstrated a Glasgow Coma Scale (GCS) score of 5 (eyes 1, verbal 2, motor 2), a respiratory rate of 22–26 breaths per minute, a snoring airway, and irregular spontaneous breathing with peripheral oxygen saturation (SpO_2) levels that were difficult to detect. The patient had cold extremities, a pulse rate of 130 beats per minute that was regular and strong at the radial artery, a blood pressure of 138/92 mmHg, and a body temperature of 37.5°C. Vulvar inspection revealed no signs of bleeding. Abdominal examination indicated a normal fundal height of 37 cm, a soft uterine consistency, absence of tenderness on palpation, and

palpable uterine contractions. The fetal position and presentation were normal, with signs of fetal viability noted.

Due to the patient's eclampsia, a cesarean section was scheduled for immediate pregnancy termination. Given the island's remote location and the lack of advanced medical facilities, urgent evacuation to a higher-level healthcare facility was required. The Ksatria Airlangga Medical Team (KAMT), an emergency health response team initiated by Universitas Airlangga, Surabaya, Indonesia, to provide medical care in remote Indonesian islands, encountered the patient at the port. However, due to the large size of the evacuation boat, docking was not possible. The patient was initially transported using a traditional wooden boat before being transferred to the KAMT's medical boat, which was equipped with essential emergency medical supplies, including oxygen, intravenous fluids, resuscitation equipment, and medications for anesthesia and seizure control. The onboard team consisted of an anesthesiologist, emergency physician, general practitioners, and trained paramedics, ensuring continuous monitoring and intervention during the evacuation. During the transfer, the triple airway maneuver was performed for 15 minutes on the traditional boat, successfully clearing the airway. The transfer to the boat took 20 minutes due to high waves. Upon arrival, the patient was administered magnesium sulfate ($MgSO_4$) to control convulsions, receiving a 20% loading dose of 4 g (20 cc) intravenously over a 5-minute period.

The patient was intubated using rapid-sequence induction and closely monitored in preparation for the cesarean section. Intubation was indicated due to decreased consciousness and the need for immediate pregnancy termination. The intubation process proceeded without significant difficulty. Essential airway management tools, along with sedation and analgesia medications, were delivered. Non-invasive blood pressure monitoring, pulse oximetry, and other vital signs were used for effective monitoring. The procedure started with checking and preparing suction equipment to clear any airway obstructions. Necessary tools, such as laryngoscopes and endotracheal tubes, were gathered. The airway was assessed and prepared for intubation. Tape or tubes were used to secure the airway post-intubation. Intravenous (IV) access was established for administering anesthetic and paralytic medications, and appropriate sedation was administered to ensure the patient was adequately anesthetized during the procedure.

Before performing intubation, several factors were carefully considered, and the environment was adjusted according to the standard operating procedures (SOP) for pre-hospital emergency anesthesia (PHEA) guidelines [19]. Despite turbulent sea conditions, environmental factors such as ambient light, noise, and adverse weather were assessed to determine the safest time and location for intubation. Factors that could influence the success of intubation were optimized, including ensuring 360-degree access to the patient. After intubation, no significant hemodynamic instability was observed such as severe hypotension, bradycardia, or cardiac arrhythmias.

In this case, the anesthesiologist made swift decisions to determine the safest and most effective anesthesia approach during the obstetric emergency. Coordination with the obstetrician and nursing staff ensured a smooth and timely delivery process. Anesthesia considerations included the decision to delivery interval (DDI), with a target of under 30 minutes to achieve optimal outcomes for both mother and baby. The anesthesiologist played a crucial role in meeting this target, collaborating effectively with the obstetric team to prepare the anesthesia and facilitate the rapid transfer of the patient to the operating room on the boat.

The team consisted of seven members, including an anesthesiologist, an obstetrician, an anesthesia resident, an anesthesia assistant, two surgical assistants, and one circulating nurse. Each member had completed training in emergency care and had a minimum of 8 to 9 years of experience in hospital-based anesthetic practice, as well as ten years of experience in emergency and acute medicine. All team members were carefully selected based on qualifications and experience, with particular emphasis on expertise in maritime transport. Each member demonstrated resilience against seasickness and the ability to act swiftly, even in high waves and rough sea conditions. This expertise was essential for managing the challenging conditions encountered during the mission.

The team was equipped with essential airway management tools, including bag-mask ventilation devices, endotracheal tubes, standard laryngoscopes with both Macintosh and Miller blades (the latter for infants and neonates), intubation stylets, standard and intubating laryngeal

masks, pediatric laryngoscopes, cuffed and uncuffed tracheal tubes in various sizes, syringes for cuff inflation, bag-valve-masks with oxygen reservoirs, carbon dioxide monitoring equipment, a spare oxygen cylinder, suction devices, second-generation supraglottic airway devices, and surgical airway equipment such as scalpels, tracheal dilators, and tube ties. Emergency medications included ephedrine, atropine, lidocaine sulfate, propofol, diazepam, fentanyl, and rocuronium, as well as three large and two small oxygen cylinders and a resuscitation kit. Rocuronium was used as a neuromuscular blocking agent. For monitoring, non-invasive blood pressure devices, pulse oximeters, and thermometers were available.

General anesthesia was considered due to the patient's seizures and decreased level of consciousness, which required airway management through intubation. At 08:50 A.M., the patient was pre-oxygenated with 100% oxygen for five minutes while the obstetrician performed disinfection and draping. Subsequently, rapid-sequence induction was carried out with cricoid pressure, using 100 mg of propofol IV and 100 mcg of fentanyl IV for induction. After sedation, the Sellick maneuver was performed, and 60 mg of rocuronium IV was administered based on the estimated body weight. Anesthesia was maintained with isoflurane at one minimum alveolar concentration (MAC) inhalation and intermittent administration of 50 mcg of fentanyl IV. A rapid preoperative assessment was conducted, focusing on critical aspects of pre-labor evaluation, including the risk of difficult airway, assessment of hemorrhage risk, and management of aspiration risk.

At 09:10 A.M., an emergency cesarean section was performed, resulting in the delivery of a live male infant weighing 2800 grams. The Apgar scores were 5 at one minute and 8 at five minutes. The newborn was admitted for neonatal resuscitation due to neonatal asphyxia, although the amniotic fluid was clear. Magnesium sulfate of 4g (20cc) intravenously was administered for 24 hours post-delivery to prevent complications. Oxytocin 10 units IV drip was given after delivery to stimulate uterine contractions. The patient did not experience postoperative complications such as postpartum hemorrhage, thromboembolism, or infection. No complications related to the anesthetic procedures were observed. The surgery proceeded smoothly with a duration of one hour, despite some difficulty due to the boat being hit by waves. Overall, the procedure was successful. After the cesarean section, the patient's hemodynamic condition was stable, no recurrent seizures occurred, and the patient was closely monitored while intubated.

Neonatal resuscitation began with an assessment of the newborn's condition, focusing on muscle tone, reflex response, color, respiratory effort, and heart rate. The airway was cleared by gently suctioning the mouth and nose, drying the baby, ensuring warmth, and placing the baby in the sniffing position. Stimulation was provided to encourage spontaneous breathing. The baby's breathing effort, heart rate, and muscle tone were observed. Since the heart rate was below 100 beats per minute, positive pressure ventilation was administered using a bag-mask device. An IV line was established to administer 300 mL of 10% dextrose over 24 hours for maintenance. Following neonatal resuscitation, the baby's condition stabilized, with the heart rate rising above 100 beats per minute. Continuous monitoring confirmed that the baby remained stable, with no signs of distress or complications. Effective monitoring and stabilization ensured that the newborn was in a favorable state for further medical care.

The intubated patient and the baby were referred to the nearest hospital in Sumenep City, Madura Island, East Java, Indonesia, by sea where the Intensive Care Unit (ICU) was available, as hemolysis, elevated liver enzymes, and low platelet count (HELLP) syndrome was suspected, indicated by the patient's black urine. The journey, which began at 11:00 A.M., took 11 hours. During the trip, a stop was made at Sapeken Island, Madura Island, East Java, Indonesia, to transfer to a larger electric generator boat to avoid crashing waves. The journey then continued to Sumenep City. At 6:15 P.M., the boat's engine failed while crossing the westernmost border of Kangean Island, Madura, East Java, Indonesia, resulting in limited supplies of medication and oxygen. To facilitate a coordinated rescue effort, the boat's crew sent a coordinate signal to notify the search and rescue team of their exact location. This was crucial due to the emergency nature of the evacuation and the limited availability of medical resources on board, requiring swift decision-making to ensure patient safety during transport. The estimated transfer time to the

nearest hospital in Sumenep City was typically 11 hours by sea. However, because of the engine failure, the journey to the hospital was extended to 18 hours.

As the remaining oxygen and medications were nearly depleted, the situation became critical. The remaining supply of medication was carefully estimated in relation to the time until reaching the destination. Prompt recognition of the situation led to the implementation of timely interventions. The decision to extubate was deemed crucial to prevent complications and airway obstruction while maintaining vigilance over the airway and breathing. The patient, who had been intubated and was in a compromised state, required regular suctioning to prevent airway obstruction and ensure adequate ventilation with a bag-valve mask. In the absence of an oxygen supply aboard the boat, extubation was performed, and a manual triple airway maneuver was employed to maintain the airway. Additionally, the boat was being rocked violently by waves and was at risk of sinking. If the boat were to capsize with the patient still intubated, it would have posed a significant danger, making extubation a necessary precaution under the circumstances.

The patient was gradually extubated starting at 8:00 P.M. Clinical assessment indicated adequate breathing, with SpO_2 at 97% using a nasal cannula set at two liters per minute, although full consciousness had not yet been achieved (GCS score of 10: eyes 3, verbal 2, motor 5). The triple airway maneuver was alternated periodically. Monitoring included regular checks of the clinical pulse, breathing pattern, and chest movement. Other monitoring devices, such as pulse oximetry and battery-powered blood pressure monitors, were no longer functional due to depleted batteries.

At 4:15 A.M. the following day, the Indonesian navy military boat, *Kapal Perang Republik Indonesia* (KRI), found the Ksatria Airlangga Medical Team's boat, and the patient and newborn were evacuated to the nearest island for stabilization. The boat arrived at Kangean Island at 8:00 A.M., with the patient's GCS score of 13 (eyes 3, verbal 5, motor 5) and stable vital signs (respiratory rate of 18–20 breaths per minute, SpO_2 of 98% in room air, a regular heart rate of 130 beats per minute, blood pressure of 118/82 mmHg, and a body temperature of 37°C). The general condition of the patient began to improve. No complications, such as hypoxia, hypotension, arrhythmias, aspiration, or displacement of the tracheal tube, were observed. The patient was referred to Kangean Hospital, Madura, East Java, Indonesia, a type D hospital. On the island, additional equipment was borrowed and essential medications were obtained. The patient received 4 mg of magnesium sulfate intramuscularly. Both the patient and the newborn were warmed, provided with intensive care, and monitored overnight at Kangean Hospital.

On Kangean Island, the type D Kangean Hospital only had limited equipment and no ICU was available. As a result, the decision was made to refer the patient to a hospital in Sumenep City the following day, with an estimated travel time of 4–5 hours. The patient was transported to Sumenep City the next day using a fast boat for further recovery. During the journey to Sumenep City, no significant issues arose, and the patient's condition continued to stabilize. The boat arrived within the expected travel time. Upon arrival, the patient was transferred to Sumenep City Hospital for intensive care in the ICU. The patient and the newborn were discharged from the hospital on the seventh day after admission with normal vital signs, full consciousness, and satisfactory condition. The Ksatria Airlangga Medical Team then returned to the boat and resumed the community service mission to several other islands.

Discussion

This case highlights the critical importance of effective emergency management strategies in obstetric emergencies, particularly in remote maritime regions of Indonesia, where access to healthcare may be severely limited. The successful stabilization, transfer, and care of a patient experiencing eclampsia during pregnancy in this instance also reinforces the essential need for preparedness, resource allocation, and collaboration among medical personnel. Eclampsia presents significant risks to both maternal and fetal health, especially in low-resource settings where immediate medical intervention may not be readily available [3,4]. The implications of delayed treatment can lead to detrimental outcomes, underscoring the necessity for healthcare professionals to be adequately trained for such emergencies [14,15].

This case exemplifies how effective teamwork, dynamic decision-making, and a thorough understanding of emergency protocols can significantly influence patient outcomes, even when faced with substantial logistical challenges. In this case, the patient's clinical presentation required immediate intubation to secure the airway, prevent aspiration, and facilitate effective ventilation. The use of rapid-sequence induction with rocuronium enabled swift and controlled airway management, minimizing risks associated with prolonged seizure activity. General anesthesia was preferred due to the patient's decreased consciousness and unstable clinical condition, as regional anesthesia is contraindicated in cases exhibiting signs of increased intracranial pressure or coagulopathy.

The patient remained intubated during transport, necessitating periodic suctioning to prevent airway obstruction. The decision to maintain the patient's airway via intubation during transport was based on the risks of aspiration and hypoventilation. Periodic suctioning was performed to prevent airway obstruction, while fluid balance was carefully managed to minimize the risk of pulmonary edema, a common complication during the postpartum period due to fluid shifts into the intravascular space [7]. Oxygen saturation, heart rate, temperature, and arterial pressure were continuously monitored, with emergency medications and suction devices kept readily accessible.

The challenges encountered during this case were multifaceted. One of the most pressing issues was the prolonged transportation time due to the unforeseen engine failure of the boat. The evacuation, initially anticipated to take approximately 11 hours, was extended to 18 hours, during which crucial medical supplies, including medications and oxygen, became limited. This situation underscored the critical importance of timely treatment for preeclampsia, as it can progress to eclampsia, posing life-threatening risks to both the mother and fetus [4].

Furthermore, adverse sea conditions and limited equipment, such as portable ventilators and advanced monitoring devices, posed additional challenges. Manual ventilation was employed throughout the transport, necessitating constant vigilance to ensure adequate oxygenation and ventilation. The turbulent waters created an unstable environment, making it increasingly difficult to monitor vital signs and secure the airway. Medical professionals trained to handle emergencies within controlled hospital settings found it complex to adapt these skills to the chaotic circumstances of maritime transport. The lack of access to advanced medical facilities further exacerbated the situation.

The team relied on simplified monitoring tools, including non-invasive blood pressure monitors and pulse oximeters, to track the patient's clinical status during transport. The management strategy was adapted based on available resources, requiring a comprehensive assessment of both human and material resources. As outlined in emergency medical protocols, access to comprehensive medical supplies, including medications and advanced monitoring equipment, is critical for managing eclampsia [8,11]. However, the constraints necessitated adjustments to standard treatment protocols.

In an ideal scenario, rapid access to an ICU would have facilitated comprehensive management, including the availability of advanced monitoring systems, rapid transfusion protocols, and a constant oxygen supply [7]. However, due to maritime constraints and the remote location, the treating team made essential modifications to the management approach based on the available resources. Initial management for patients with eclampsia typically includes supportive care, positioning to prevent aspiration, oxygen supplementation, monitoring of vital signs, and the administration of magnesium sulfate [7]. Magnesium sulfate was selected as the primary medication to control seizures, as it remains the gold standard treatment for eclampsia [5]. In this case, the team administered a loading dose promptly, despite the logistical challenges posed by the sea conditions. Rapid sequence intubation was also performed, demonstrating an adaptation to the urgency of the situation. Although ideally conducted under controlled conditions, the intubation was carried out with careful consideration of environmental factors, ensuring the patient's safety throughout.

Sedation was achieved with continuous propofol and diazepam infusions [26,27]. Propofol was chosen for its rapid onset, short half-life, and minimal plasma fluctuations, making it suitable for maintaining consistent sedation. In this case, propofol was diluted in 500 ml of 0.9% NaCl, with a sedation dose of 3–5 mg/kg/hour, administered through a macro drip. These medications

were prepared and administered with attention to their pharmacological properties and compatibility with available solvents, ensuring effective sedation and seizure control throughout the transport.

Monitoring techniques also had to be adapted. As some of the standard electronic monitoring equipment were malfunctioning or unavailable, the team relied on manual assessment of vital signs and physical examination. This adjustment required constant vigilance and a systematic approach to ensure the patient's stability despite the limitations imposed by the environment. The adjustments made in the management of this case were necessitated by the recognition that standard protocols could not be fully implemented due to constraints imposed by the maritime environment and limited resource availability. While the ideal management plan for eclampsia would include comprehensive supportive therapies and continuous monitoring, these resources were not accessible in this situation. The medical team faced immediate life-threatening challenges that required swift and, at times, unorthodox measures. For example, the decision to extubate the patient due to dwindling oxygen supplies was far from ideal, but it was essential to prevent airway obstruction and the potential risk of drowning if the boat encountered disaster while the patient remained intubated. This situation highlighted the need for dynamic decision-making in emergency medicine, where risk versus benefit must constantly be evaluated, particularly in critical and resource-limited circumstances.

It is essential to distinguish between the ideal management approach and the adjustments made in this case. In a typical medical setting, full-scale resuscitation efforts could be initiated, supported by advanced monitoring systems and immediate airborne evacuation capabilities. However, the adjustments in this case involved prioritizing immediate threats to the airway and breathing, focusing on patient safety when conventional standards of care could not be followed due to the lack of available resources. These modifications were driven not only by systemic limitations but also by a steadfast commitment to maintaining life support and ensuring the best possible outcome under extraordinarily challenging conditions. Postpartum management of eclampsia requires close monitoring for at least 48 hours to detect and manage complications such as recurrent seizures, pulmonary edema, and hypertension [4]. ICU management focuses on supporting organ function, addressing critical conditions, and enabling collaborative interventions from obstetricians, anesthetists, and intensivists. The patient's condition improved with supportive care, underscoring the importance of timely and coordinated efforts in managing eclampsia.

This case highlighted several strategies to enhance medical response in similar emergencies. Medical teams stationed in remote locations should undergo regular training focused on maritime emergency management protocols. Simulating various scenarios, including patient evacuation under challenging conditions, could improve preparedness and confidence during real emergencies. Furthermore, future research should explore optimized logistical strategies for maritime medical operations. Insights gained from systematic review and research could contribute to the development of standardized guidelines for managing obstetric emergencies at sea, with a focus on resource allocation, real-time decision-making, and communication protocols. Improving access to telemedicine consultations during emergency maritime evacuations would also enable remote healthcare professionals to provide guidance in real time, offering frontline responders valuable support during acute situations.

The limitations and strengths of this case emphasized the complex nature of emergency medical services. The primary limitations stemmed from geographic and logistical difficulties. Limited access to advanced medical facilities created a situation where providing optimal patient care was not feasible. The absence of real-time communication with higher-level medical support and the lack of necessary equipment made it impossible to implement rapid-care protocols. These factors not only delayed immediate care but also posed substantial risks to patient safety during the extended evacuation. The approach in this case was based on a comprehensive understanding of pathophysiology, carefully adjusted to the patient’s condition, environmental factors, and existing risks, all while managing with the available limited resources.

This case also demonstrated significant strengths, particularly in the resilience and resourcefulness of the medical team. The team's ability to adapt to the unpredictable maritime environment and make swift decisions under pressure reflected exceptional competency in crisis

management. The collaborative effort among team members, each with extensive experience in emergency care, underscored the critical importance of teamwork in managing complex patient scenarios effectively.

This case report may represent a pioneering study of the unique challenges involved in utilizing sea transportation for evacuating critically ill eclampsia patients requiring pre-hospital emergency anesthetic management from remote Indonesian islands. It provides a crucial learning opportunity for future maritime medical missions, shedding light on the limitations of healthcare delivery in remote settings and emphasizing the need for proactive measures to enhance clinical outcomes in obstetric emergencies. Understanding these aspects could inform the creation of more effective protocols, enabling medical teams to address the complexities of maritime evacuations with greater efficiency and improving maternal and neonatal care in underserved regions.

Conclusion

The case indicates that managing eclampsia with limited resources poses significant challenges, particularly during sea evacuations from remote islands. Effective stabilization of the patient, administration of appropriate support and anesthesia during surgical procedures, postoperative monitoring, and safe transportation to higher-level healthcare facilities are critical. Despite resource constraints, managing critically ill patients could be feasible with comprehensive planning of preparation and stringent monitoring. This case highlights the impact of maritime challenges on pre-hospital care and underscores the need for research to optimize evacuation protocols and resource allocation in such settings.

Ethics approval

Written informed consent was obtained from the patient for participation and publication, with assurances of confidentiality and anonymization.

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Competing interests

The author declares no competing interest.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

Declaration of artificial intelligence use

This study used artificial intelligence (AI) tool and methodology of which AI-based language model ChatGPT was employed in the language refinement (improving grammar, sentence structure, and readability of the manuscript). We confirm that all AI-assisted processes were critically reviewed by the authors to ensure the integrity and reliability of the results. The final decisions and interpretations presented in this article were solely made by the authors.

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References

1. Wilkerson RG, Ogunbodede AC. Hypertensive disorders of pregnancy. Emerg Med Clin North Am 2019 5;37(2):301-16.
2. Abalos E, Cuesta C, Grosso AL, *et al*. Global and regional estimates of preeclampsia and eclampsia: A systematic review. Eur J Obstet Gynecol Reprod Biol 2013;170(1):1-7.
3. Indarti J, Al Fattah AN, Dewi Z, *et al*. Teenage pregnancy: Obstetric and perinatal outcome in a tertiary centre in indonesia. Obstet Gynecol Int 2020 (3)26:1-5.
4. Erez O, Romero R, Jung E, *et al*. Preeclampsia and eclampsia: The conceptual evolution of a syndrome. Am J Obstet Gynecol 2022;226(2S):S786-S803.
5. Okonkwo M, Nash CM. Duration of postpartum magnesium sulphate for the prevention of eclampsia: A Systematic Review and Meta-analysis. Obstet Gynecol 2022;139(4):521-528.
6. Akre S, Sharma K, Chakole S, Wanjari MB. Eclampsia and its treatment modalities: A review article. Cureus 2022;14(9):e29080
7. Wisner K. Gestational hypertension and preeclampsia. MCN Am J Matern Child Nurs 2019;44(3):170.
8. Laskowska M, Bednarek A. Optimizing delivery strategies in eclampsia: A comprehensive review on seizure management and birth methods. Med Sci Monit 2023;29:e941709.
9. BPS. Badan Pusat Statistik Kabupaten Sumenep. 2024. Available from: https://sumenepkab.bps.go.id/id.
10. Boushra M, Natesan SM, Koyfman A, Long B. High risk and low prevalence diseases: Eclampsia. Am J Emerg Med 2022;58:223-228.
11. Hauspurg A, Jeyabalan A. Postpartum preeclampsia or eclampsia: Defining its place and management among the hypertensive disorders of pregnancy. Am J Obstet Gynecol 2022;226(2S):S1211-S1221.
12. Bartal MF, Sibai BM. Eclampsia in the 21st century. Am J Obstet Gynecol 2022;226(2S):S1237-S1253.
13. Yerubandi S, Kallur SD, Gala A, *et al*. Eclampsia reduction with maternal early warning trigger tool. Pregnancy Hypertens 2024;35:6-11.
14. Brown JB, Rosengart MR, Forsythe RM, *et al*. Not all prehospital time is equal. J Trauma Acute Care Surg 2016;81(1):93-100.
15. Cowley A, Durham M, Aldred D, *et al*. Presence of a pre-hospital enhanced care team reduces on scene time and improves triage compliance for stab trauma. Scand J Trauma Resusc Emerg Med 2019;27(1):86.
16. Cameron NA, Everitt I, Seegmiller LE, *et al*. Trends in the incidence of new-onset hypertensive disorders of pregnancy among rural and urban areas in the United States, 2007 to 2019. J Am Heart Assoc 2022;11(2):e023791.
17. Laskowska M. Prevalence, Diagnosis, and management of eclampsia and the need for improved maternal care: A review. Medical Science Monitor 2023 (5) 30;29.
18. Aliyu LD, Kadas AS, Abdulsalam M, *et al*. Eclampsia a preventable tragedy: An African overview. J Perinat Med 2023 Mar 28;51(3):300-304.
19. Crewdson K, Lockey D, Voelckel W, *et al*. Best practice advice on pre-hospital emergency anaesthesia & amp; advanced airway management. Scand J Trauma Resusc Emerg Med 2019;27(1):6.
20. Abdillah HN, Masroeri AA, Artana KB, Edfi RD. Hospital ship design for public health services in the foremost, outermost, and remote (for) areas in Indonesia. IOP Conf Ser Earth Environ Sci 2020;557(1):012011.
21. Harimurti P, Prawira J, Hort K. The republic of indonesia health system review: Asia pacific observatory on health systems and policies. India: WHO; 2017.
22. Newman C, Petruzzi V, Ramirez PT, Hobday C. Hypertensive disorders of pregnancy. Methodist Debakey Cardiovasc J 2024;20(2):4-12.
23. Sailaja KB. Critically Ill obstetric admissions to an intensive care unit: A prospective analysis from a tertiary care university hospital in south India. Indian J Crit Care Med 2019;23(2):78-82.
24. Parthasarathy S, Kumar VR, Sripriya R, Ravishankar M. Anesthetic management of a patient presenting with eclampsia. Anesth Essays Res 2013;7(3):307-312.

25. Shafer A, Doze VA, Shafer SL, White PF. Pharmacokinetics and pharmacodynamics of propofol infusions during general anesthesia. Anesthesiology 1988;69(3):348-356.
26. Singhi S, Murthy A, Singhi P, Jayashree M. Continuous midazolam versus diazepam infusion for refractory convulsive status epilepticus. J Child Neurol 2002;17(2):106-110.
27. Onuki Y, Hasegawa N, Kida C, *et al*. Supersaturated state of diazepam injection following dilution with infusion fluid. J Pharm Health Care Sci 2015;1:9.