



Clinical Audit on Management of Suspected Meningoencephalitis Patients at Lady Reading Hospital, Peshawar

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Authors' Contribution

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ABSTRACT

Background: Meningoencephalitis is a life-threatening neurological emergency requiring rapid diagnosis and prompt initiation of treatment. Clinical audits are essential tools for assessing and improving adherence to evidence-based management protocols, particularly in resource-limited settings. **Objective:** To evaluate the management of suspected meningoencephalitis patients and assess improvement in clinical practices following the implementation of recommendations from the first audit cycle. **Methods:** This second-cycle clinical audit was done in the Department of Internal Medicine, Lady Reading Hospital between January and December 2025. They included 150 adult patients suspected of meningoencephalitis. A structured proforma was used to gather data that were analyzed by SPSS version 25. The main indicators were the time of empirical therapy, the utilization of a lumbar puncture, the use of neuroimaging, and the compliance with clinical guidelines. **Results:** Marked improvements were seen in the second audit cycle. Empirical antibiotics began sooner, 52 to 70, lumbar puncture rates rose to 73, and compliance with investigation protocols upsurged to 76. There was also an increase in documentation practices by 60 to 80. Nevertheless, the loopholes persisted in terms of consistency and adherence to antiviral therapy and guideline universality. **Conclusion:** As evidenced in the audit, structured clinical audits play a significant role in improving the management of suspected meningoencephalitis. We should continue monitoring and make some specific interventions to attain ideal levels of care and enhance patient outcomes.

INTRODUCTION

Meningoencephalitis is a severe and potentially fatal disorder associated with inflammation of the meninges and brain parenchyma, where an infectious agent (usually bacteria, viruses, fungi, and parasites) is a dominant factor (Garber and Glauser, 2024; Ungureanu et al., 2021; Suryadevara, 2025). It is a condition of neurological emergency and must be immediately diagnosed and treated to minimize morbidity and mortality (Meyfroidt et al., 2020; Sonnevile et al., 2023). Although there is an improvement in the methods of diagnosis and antimicrobial treatment, meningoencephalitis still remains a major health challenge in the world, especially in countries that experience low and middle-income levels where late presentation and lack of health facilities are frequent occurrences (Schiess et al., 2021; Liu et al., 2025; Basu Roy et al., 2021).

Clinical manifestation of meningoencephalitis is usually unspecific and variable, and it is usually characterized by fever, headache, impaired level of consciousness, seizures, and local neurological impairments (Ungureanu et al., 2021; Makkawi et al., 2024). This inconsistency often results in difficulties with diagnosis and slowness in starting treatment. The latest initiation and treatment are essential since research has shown that even minor delays in antimicrobial therapy can have a severe impact on patient outcomes, causing death and long-term neurological disabilities (Zainel et al., 2021; Karvouniaris et al., 2022; Sudo et al., 2024).

Quick and precise diagnosis is based on both clinical examination and lab tests with cerebrospinal fluid (CSF) obtained through lumbar puncture being the gold standard of diagnosis (Tumani et al., 2020; Rajasingham et al., 2019; Fleischer and Aronson, 2020). The examination

of CSF can help distinguish between bacterial, viral, and other central nervous system infection causes, which provides the targeted therapy (Olie et al., 2024; Sigfrid et al., 2019). Nonetheless, in practice, lumbar puncture may be delayed or not done because of the raised intracranial pressure, unavailability of neuroimaging services, or hemodynamic instability, particularly in the resource-limited context (Saylor et al., 2023).

Neuroimaging, including that of computed tomography (CT) or magnetic resonance imaging (MRI), is useful in determining contraindications to lumbar puncture and identifying complications, including cerebral edema or abscess (Mahajan & Mahajan, 2024). Nevertheless, pre-lumbar puncture imaging is not necessary in all cases and this practice may add to the delay in the identification and treatment process unless it is performed selectively. This is why it is necessary to follow the evidence-based recommendations to use available diagnostic tools optimally.

In suspected cases of meningoencephalitis, initial therapy is still based on empirical antimicrobial therapy (Karvouniaris et al., 2022). The Infectious Diseases Society of America guidelines advise that broad-spectrum antibiotics and antiviral agents should be initiated immediately upon the suspected hepatic encephalitis of a virus, without exception to acyclovir, in case of suspected herpes simplex virus (Bradshaw and Venkatesan, 2019). The timing of starting the proper therapy has been recognized as a consistent negative factor when it comes to clinical outcomes, making the urgency and aggressiveness of treatment approach a crucial aspect in the disease prevention process (Bradshaw and Venkatesan, 2019).

Besides clinical care, adequate documentation, prompt research, and living up to standardized procedures are other critical aspects of quality patient care (Suryadevara, 2025; Garber and Glauser, 2024). But some studies have also revealed major deficiencies in following the existing guidelines in the treatment of the central nervous system infections, especially in the developing world (Sonneville et al., 2023). Such gaps can be explained by such factors as a high patient load, inadequate diagnostic infrastructure, and inconsistent competence and practice of clinicians (Zainel et al., 2021).

Clinical audit is a seasoned quality improvement tool that methodically assesses the current practice by comparing it to the established standards, detecting gaps, and using corrective actions to improve patient care (Ungureanu et al., 2021). Audit cycle entails periodical evaluations that will ascertain whether the changes carried out have resulted in quantifiable gains. Clinical audits may be instrumental in enhancing early diagnosis and treatment plans and adherence to evidence-based guidelines in the context of meningoencephalitis (Zhang et al., 2022; Ellis et al., 2022; Makkawi et al., 2024).

The present study is the second round of a clinical audit of the Lady Reading Hospital, a primary tertiary care hospital in the area. This audit was conducted by providing the evaluation of current practices in suspected meningoencephalitis patients management, the adherence to the recommended clinical standards, and the effect of the previously introduced measures. This study aims to fill gaps in the current body of care by determining how the

gap has persisted and by how much patient care and clinical outcomes have improved in a healthcare environment with limited resources.

METHODOLOGY

The research was designed to be a second-cycle clinical audit within the Department of Internal Medicine of Lady Reading Hospital over a one-year period, i.e., between January 2025 to December 2025. The audit was to examine and refine the management of patients who present with the suspicion of meningoencephalitis as a result of acting on the first audit cycle recommendations.

A retrospective and a prospective observational design was used. Medical records of patients who were admitted on clinical suspicion of meningoencephalitis served as the source of data. Inclusion criteria included all adult patients (age 18 years and above) who showed signs suggestive of meningoencephalitis such as fever, altered level of consciousness, seizures, a headache or focal neurological deficits. Those who had another confirmed diagnosis, or whose medical records were not complete, could not participate in the study.

The extraction of the relevant data, including demographic information, presenting symptoms, clinical examination data, laboratory investigations (cerebrospinal fluid analysis, blood cultures, neuroimaging), time of lumbar puncture, the use of empirical antimicrobial and antiviral therapy, and standards of treatment adherence was conducted through the use of a structured data collection proforma.

Audit standards relied on recommended international standards such as the World Health Organization and other evidence-based clinical guidelines on the management of pathologies of the central nervous system infections. These performance indicators were timely diagnosis, appropriate utilization of investigations, timely empirical therapy, and recording of clinical management.

The Statistical Package for Social Sciences (SPSS) 25 was used to enter and analyze the data. There was the use of descriptive statistics where categorical variables are given as frequencies and percentages and continuous variables as mean standard deviation. The results of this second audit cycle were compared with the results of the first audit in order to evaluate the changes in clinical practice and the existing adherence to the recommended standards.

The institutional review board of the hospital provided ethical authorization of the audit. All personal identifiers were made anonymous to preserve patient confidentiality during the study.

RESULTS

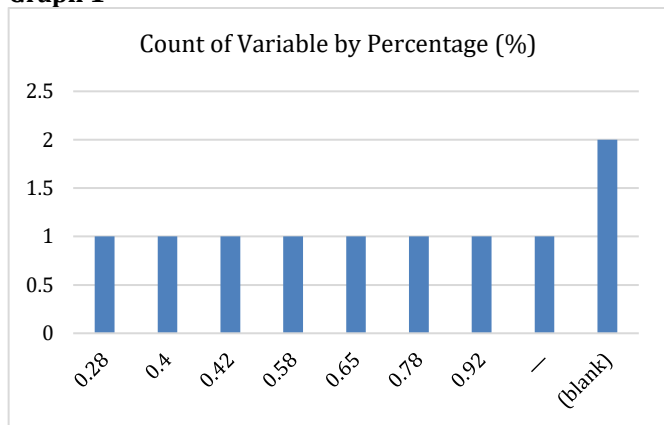
The second audit cycle involving Lady reading hospital incorporated 150 suspected meningoencephalitis patients. The average patient age was 36.8142 years and there was a slight male pre-eminence (58% males and 42% females).

The most frequent presenting complaints were fever (92%), altered consciousness (78%), and headache (65%). Focal neurological deficits were reported in 28% and seizures were identified in 40% of the patients.

Table 1
Demographic and Clinical Characteristics (n = 150)

Variable	Frequency (N)	Percentage (%)
Gender		
Male	87	58%
Female	63	42%
Mean age (years)	36.8 ± 14.2	—
Presenting symptoms		
Fever	138	92%
Altered consciousness	117	78%
Headache	98	65%
Seizures	60	40%
Focal neurological deficits	42	28%

Graph 1



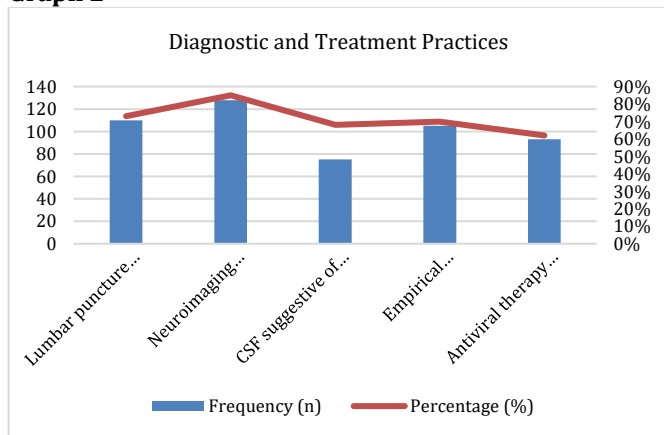
In terms of the diagnostic workup, 110 of the patients (73 percent) received lumbar puncture (LP) and 85 percent had neuroimaging (CT/MRI brain) done before the LP where a procedure was judged necessary. The diagnosis of Cerebrospinal fluid (CSF) indicative of infection was observed in 68 per cent of patients who experienced LP.

It improved in 70% of patients who received empirical antimicrobial therapy within 1 hour of admission, which was an improvement compared to the first audit cycle (previously 52%). Antiviral therapy (acyclovir) was used in 62% of the suspected viral cases.

Table 2
Diagnostic and Treatment Practices

Parameter	Frequency (N)	Percentage (%)
Lumbar Puncture Performed	110	73%
Neuroimaging Performed	128	85%
CSF Suggestive of Infection	75	68%
Empirical Antibiotics within 1 hour	105	70%
Antiviral Therapy (Acyclovir) given	93	62%

Graph 2



In the second audit cycle, there was significant improvement in compliance with clinical guidelines. Clinical findings were well documented (80) as compared to 60% during the first cycle. Likewise, compliance with the prescribed investigation guidelines increased by 55 to 76 percent.

Table 3
Comparison Between First and Second Audit Cycle

Indicator	First Cycle (%)	Second Cycle (%)
Timely antibiotic administration	52%	70%
Lumbar puncture performed	65%	73%
Adherence to investigation protocol	55%	76%
Proper documentation	60%	80%

The second audit cycle, in general, showed that there is a substantial increase in the timely management, early diagnosis, and adherence to clinical guidelines, though there are still gaps in reaching the best criteria, especially in performing lumbar puncture universally and using antivirals.

DISCUSSION

This second-cycle clinical audit carried out in Lady Reading Hospital indicated that there was a significant change in how the patients with suspected meningoencephalitis were treated during their visits, particularly with regards to early diagnoses, prompt start of empirical treatment and adherence to the clinical guidelines (Garber and Glauser, 2024). The results indicate the power of audit-based interventions to improve patient care outcomes and clinical practice (Ungureanu et al., 2021).

Among the main advances added to this study, the rate of early empirical antibiotic administration was one of them, increasing to 70 per cent during the second audit cycle, in comparison with 52 per cent during the first audit cycle (Sudo et al., 2024). Immediate antimicrobial treatment is paramount in suspected infections of the central nervous system because the later it is, the higher the morbidity and mortality rate (Meyfroidt, Kurtz, and Sonneville, 2020; Bradshaw and Venkatesan, 2019). Recent recommendations by the Infectious Diseases Society of America strongly encourage prompting the use of antibiotics, preferably within the first hour of hospital presentation, even before other diagnostic tests provide a positive answer (Sigfrid et al., 2019). The positive change in this audit indicates that more clinicians are more aware and are more inclined to follow these recommendations.

The percentage of those who received lumbar puncture (73) also increased in comparison to the first cycle (Tumani et al., 2020). The most reliable method of diagnosing meningoencephalitis and distinguishing between bacterial and viral etiology is the cerebrospinal fluid (CSF) analysis (Hasbun et al., 2001; Rajasingham et al., 2019). There was, however, an event that one-quarter of patients did not receive lumbar puncture, which points to the presence of potential underlying obstacles, including raised intracranial pressure concerns, the absence of timely neuroimaging, or clinical instability (Saylor et al., 2023). The same difficulties are mentioned in other resource-limited studies (Ungureanu et al., 2021).

The proportion of patients undergoing neuroimaging was 85, which is a sign of relevant clinical caution before the lumbar puncture procedure in the patients identified with contraindications (Mahajan & Mahajan, 2024). Although pre-LP imaging is advised in specific situations, its excessive use can postpone a final diagnosis and treatment (Bradshaw and Venkatesan, 2019). Hence, balancing early imaging with prompt examination of the CSF continues to be critical in the best management.

Other key outcomes included moderate adherence to guidance on suspected viral encephalitis as observed in 62% of the individuals taking empirical antiviral therapy (acyclovir) (Garber and Glauser, 2024). Herpes simplex virus (HSV) encephalitis is a widespread and potentially fatal cause of encephalitis, and acyclovir early therapy can considerably decrease the lethality and neurological consequences of disease (Osterman et al., 2020; Suryadevara, 2025). The inappropriate use of antivirals during this audit implies additional training of clinicians and strengthening of protocols.

The practice of documentation also improved, being 60 per cent to 80 per cent, clinically better record-keeping and accountability (Ungureanu et al., 2021). Effective documentation is not only necessary in the context of patient care continuity, but also in the medico-legal domain and quality improvement efforts (Karvouniaris et al., 2022).

The general compliance with the investigation guidelines had risen to 76 compared to 55, which proves the effectiveness of the audit cycle in harmonizing clinical practice with evidence-based guidelines (Makkawi et al., 2024; Ungureanu et al., 2021). The application of clinical audits as an effective way to enhance the quality of healthcare has been extensively established due to the ability to detect opportunities and gaps in care delivery, promote change, and reevaluate results (Suryadevara, 2025).

With such improvements, some gaps still exist. All patients were not timely treated with lumbar puncture or

antiviral therapy, and full compliance with guidelines was not recorded (Garber and Glauser, 2024; Saylor et al., 2023). These outcomes align with the results of developing healthcare systems, where the infrastructural shortcomings, the large patient number, and the differences in the training of clinicians may influence the delivery of standard care (Liu et al., 2025).

Overall, the second-cycle audit proves that systematic clinical audits have the potential to impact the management of suspected meningoencephalitis significantly (Ungureanu et al., 2021). One, however, needs to monitor continuously, to train regularly, and to implement clinical procedures rigorously to ensure the most excellent standards of care and determine even better patient outcomes (Sigfrid et al., 2019).

CONCLUSION

The second-cycle clinical audit that was undertaken at Lady Reading Hospital showed significant changes in the management of suspected meningoencephalitis patients especially in early initiation of empirical treatment, increased utilization of lumbar puncture and increased adherence to clinical guidelines. The results indicate the usefulness of clinical audit process as a means of healthcare quality improvement and evidence-based practice.

In spite of these developments, there are loopholes in meeting ideal standards particularly in facets of ensuring that diagnostic guidelines are followed universally as well as the cases where antiviral treatment is warranted. The following deficiencies demonstrate the necessity of ongoing medical training, enhancement of evidence-based treatment guidelines, and better resource distribution.

To maintain improvements and additional optimize patient outcomes in this severe neurological disorder, ongoing cycles of audit, along with specific interventions, are needed.

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