

Hyponatremia in Acute Encephalitis Syndrome (AES) in Children: A Prospective Study From a Tertiary Centre in Northern India

Original Article

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Nikita Diwan¹ · Chandra Kanta¹ · Arpita Bhriyuvanshi¹

1 Department of Paediatrics, King George's Medical College, Lucknow, Uttar Pradesh 226003, India.

Correspondence: Nikita Diwan, angelsanddemons.nik@gmail.com; Chandra Kanta, dr_chandrakanta@yahoo.co.in; Arpita Bhriyuvanshi, arpime84@gmail.com

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ABSTRACT

OBJECTIVE

To compare the clinical and biochemical parameters and outcomes in children with acute encephalitis syndrome (AES) with and without hyponatremia.

METHODS

A prospective observational study conducted at a tertiary care teaching hospital included children aged 6 months to 12 years with AES defined as acute fever (< 7 days) and neurological symptoms such as new-onset seizures or altered mental status lasting more than 12 h. AES was categorized as neurological or systemic AES. Serum electrolyte samples were collected upon admission and daily for three days to assess the occurrence of hyponatremia (serum sodium < 135 mmol/L). Outcomes were assessed one-month after discharge using the Pediatric Modified Rankin Scale (mRS).

RESULTS

Out of 200 children with AES, 49 (24.5%) had hyponatremia. Hyponatremia was significantly associated with hepatomegaly (P = 0.002), elevated blood urea (P = 0.033), elevated serum creatinine (P = 0.038), decreased serum albumin (P = 0.013) and decreased serum calcium (P = 0.002). Children with hyponatremia experienced significantly greater mortality (P = 0.020) and a longer hospital stay (P = 0.047). Multivariate analysis revealed significant associations between hyponatremia and hepatomegaly (OR 2.22) and mortality (OR 3.17). Hyponatremia and poor outcomes were more common in children with neurological AES compared to systemic AES syndrome.

CONCLUSIONS

Hyponatremia was found in one-fourth of cases of AES and had a significant association with mortality and longer hospital stay.

Keywords: Encephalitis · Hyponatremia · Mortality · Syndrome

REFERENCES

1. Misra UK, Kalita J. Changing spectrum of acute encephalitis syndrome in India and a syndromic approach. *Ann Indian Acad Neurol.* 2022;25:354–66.

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2. Gankam KF. Adaptation of the brain to hyponatremia and its clinical implications. *J Clin Med.* 2023;12:1714.
3. Srivastava N, Deval H, Mittal M, et al. The outbreaks of acute encephalitis syndrome in Uttar Pradesh, India (1978–2020) and its effective management: a remarkable public health success story. *Front Public Health.* 2022;9:793268.
4. Hieu TH, Hashan MR, Morsy S, et al. Hyponatremia in tuberculous meningitis: a systematic review and meta-analysis. *Indian J Tuberc.* 2021;68:516–26.
5. Misra UK, Kalita J, Singh RK, et al. A study of hyponatremia in acute encephalitis syndrome: a prospective study from a tertiary care center in India. *J Intensive Care Med.* 2019;34:411–7.
6. Bhatia KD, Chowdhury S, Andrews I, et al. Association between thrombectomy and functional outcomes in pediatric patients with acute ischemic stroke from large vessel occlusion. *JAMA Neurol.* 2023;80(9):910–8. <https://doi.org/10.1001/jaman.eurol.2023.2303>.
7. Sambasivam E, Muthaiyan J, Mohan S, et al. Clinical profile and predictors of outcome in children admitted to PICU with acute encephalitis syndrome. *Int J Contemp Pediatr.* 2017;5:96.
8. Basaran S, Yavuz SS, Bali EA, et al. Hyponatremia is predictive of HSV-1 encephalitis among patients with viral encephalitis. *Tohoku J Exp Med.* 2019;247:189–95.
9. Das S, Akhil SU, Deka A. A study of occurrence of acute encephalitis syndrome admitted in PICU and their outcome-a hospital based study. *J Med Sci Clin Res.* 2021;9:118–23.
10. Mittal M, Bondre V, Murhekar M, et al. Acute encephalitis syndrome in Gorakhpur, Uttar Pradesh, 2016: clinical and laboratory findings. *Pediatr Infect Dis J.* 2018;37:1101–6.
11. Damodar T, Singh B, Prabhu N, et al. Association of scrub typhus in children with acute encephalitis syndrome and meningoencephalitis, Southern India. *Emerg Infect Dis.* 2023;29:711–22.
12. Beig FK, Malik A, Rizvi M, et al. Etiology and clinico-epidemiological profile of acute viral encephalitis in children of western Uttar Pradesh, India. *Int J Infect Dis.* 2010;14:e141–6.
13. Rathore SK, Dwibedi B, Kar SK, et al. Viral aetiology and clinicoepidemiological features of acute encephalitis syndrome in eastern India. *Epidemiol Infect.* 2014;142:2514–21.
14. Kakoti G, Dutta P, Ram Das B, et al. Clinical profile and outcome of Japanese encephalitis in children admitted with acute encephalitis syndrome. *Biomed Res Int.* 2013;2013:152656.
15. Zheng F, Ye X, Shi X, et al. Hyponatremia in children with bacterial meningitis. *Front Neurol.* 2019;10:42.
16. Adhikari A, Gajre M, Kothari R, et al. Clinical profile and outcome of children admitted with acute encephalitis syndrome. *Int J Contemp Pediatr.* 2021;8:60–4.