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Bacterial meningitis as a secondary headache disorder: temporal trends, vaccination coverage and epidemiological profile in Brazil

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Introduction

Headache is one of the most common neurological symptoms and may result from either benign conditions or potentially life-threatening diseases. Among the causes of secondary headache, bacterial meningitis stands out due to its high morbidity/mortality and the need for early diagnosis. In this context, understanding its temporal behavior and epidemiological profile is essential to strengthen diagnostic suspicion, especially in light of recent changes in vaccination coverage. Furthermore, identifying the most affected groups supports prevention and public health surveillance strategies.

Objective

To analyze the temporal trend of hospitalizations for bacterial meningitis in Brazil, its association with meningococcal C vaccination coverage, and the epidemiological profile of hospitalized individuals.

Methods

This ecological time-trend study was conducted using secondary data on hospitalizations for bacterial meningitis in Brazil from 2016 to 2025 and meningococcal C vaccination coverage from 2013 to 2022, obtained from DATASUS. Data were collected from the Hospital Information System and the National Immunization Program Information System, including year, region, sex, age group, race/skin color, number of hospitalizations for bacterial meningitis, and vaccination coverage. Temporal trends were assessed using Prais–Winsten regression. The association between vaccination coverage and hospitalizations was evaluated using Pearson's and Spearman's correlation tests with a two-year lag, considering the delayed population-level effect of immunization. Hospitalization rates were calculated using data from the 2022 Brazilian Census (IBGE).

Results

Between 2016 and 2025, 37,330 hospitalizations for bacterial meningitis were recorded in Brazil. The Southeast accounted for the largest proportion of cases (43.4%), while the South showed the highest cumulative hospitalization rate (25.9/100,000 inhabitants). Prais–Winsten analysis demonstrated a stationary national trend (APC=4.62%; p=0.356), with significant growth only in the Northeast (APC=8.33%; 95%CI: 3.75–13.10; p=0.003). Vaccination coverage declined in all regions, with an annual reduction of 2.55% nationwide (p<0.001). Significant negative correlations were observed between vaccination coverage and hospitalizations in both Pearson's (r=-0.775; p=0.008) and Spearman's analyses (=-0.733; p=0.025). Hospitalizations predominated among males (57.2%), children under 5 years (27.4%), and individuals of mixed race/skin color (44.8%).

Conclusion

Hospitalizations for bacterial meningitis increased only in the Northeast, concomitant with declining vaccination coverage nationwide. The negative association between vaccination coverage and hospitalizations suggests a potential impact of reduced immunization on disease occurrence. Males, children under 5 years, and individuals of mixed race/skin color were the most affected groups, highlighting priority populations for epidemiological surveillance and preventive strategies.

Keywords:
Epidemiology
Secondary headache disorders
Bacterial meningitis
Vaccination coverage

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