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MOLECULAR EPIDEMIOLOGY AND PREDICTABILITY OF MENINGOCOCCAL OUTBREAKS IN UPPER EAST REGION OF NORTHERN GHANA

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ABSTRACT

Background:, *Outbreaks of Cerebrospinal meningitis, which occur seasonally and periodically continue to be a burden in the African meningitis belt in spite of improved control and preventive mechanisms. Although, immunoprophylaxis remains the most effective strategy to manage meningococcal meningitis, early detection of the causative pathogen could improve the prognosis. However, Hospital (Case) Based Surveillance System (HBSS) is limited at providing information (lags-in-time) on the identity of the causative pathogen. Therefore, this study explored the use of Population (Carriage) Based Surveillance System (PBSS) as a screening tool to predict epidemic (leads-in-time) for early control and preventive therapy.*

Methodology: *The study design was a prospective population carriage- and hospital case based surveillances; conducted in the Upper East Region of Northern Ghana, from 2006-2012. The demographic and clinical data were analyzed using classical and molecular epidemiologic techniques. The past temporal contact data was modeled using dynamic deterministic approach to prospectively predict outbreaks of meningococcal meningitis.*

Results: *Within the period, three major outbreaks of meningococcal meningitis were recorded at an attack rate of 2.6/100,000/Week and Crude Incidence of 24/100,000/Year. The causative pathogen was N.meningitidis, clone A: ST-2859 (CC5) that was transiently replaced by clone W: ST-2881(CC175). Using PBSS, the emergence of these clones in the population were detected at an average of 6.5 months 'lead-in-time'. This enables early preventive strategy to manage threatening epidemics by reactive vaccinations (23% coverage) and public health education (76% coverage). PBSS was 89% sensitive and 80% specific. Relative to HBSS, PBSS was more predictive by 20%, and its application saved 53% of the sub-districts in alert threshold from outbreak. Relatively, there were significant reductions in attack rate by 91% and mortality rate by 42% by using PBSS as a screening tool.*

Conclusion: *The use of PBSS to optimize forecast of CSM outbreaks in Northern Ghana was relatively valid, reproducible and reliable. The application is cost-effective, and has significant potential to reducing the burden of epidemic meningitis.*