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Epidemiology of Yellow Fever in Nigeria: Analysis of Climatic, Ecological, Socio-Demographic, and Clinical Factors Associated with Viral Positivity Among Suspected Cases Using National Surveillance Data, 2017-2023.

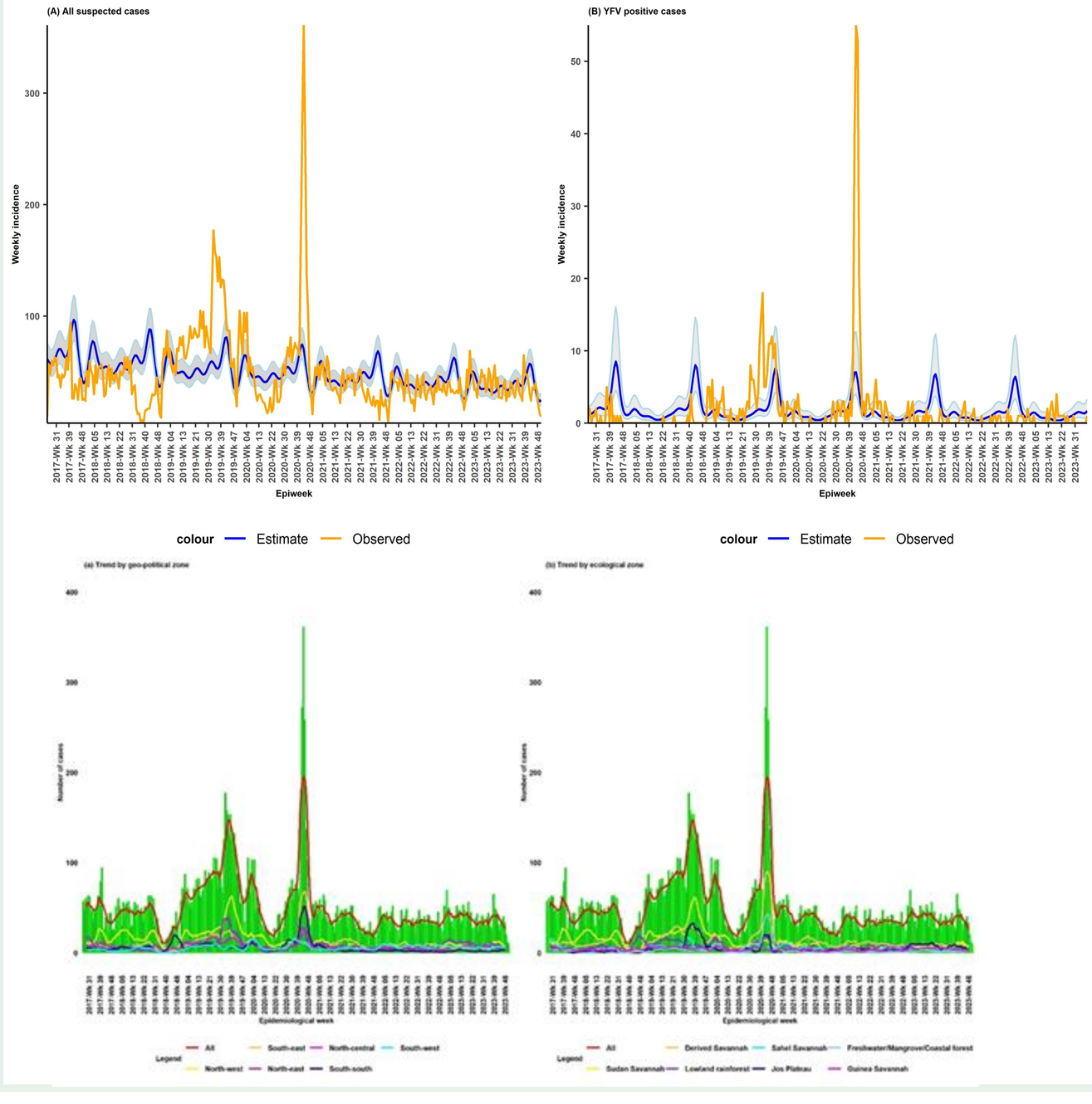
Background

- Yellow fever, a mosquito-borne, viral hemorrhagic illness, caused by the YFV has remained a significant public health concern in Africa and the Americas, accounting for approximately 29,000 to 60,000 deaths annually
- Since its resurgence in 2017, Yellow fever outbreaks have continued to occur in Nigeria despite routine immunization and implementation of several reactive mass vaccinations
- Nigeria, Africa's most populous endemic country, is considered a high-priority country for implementing the WHO EYE strategy

Methods

- We retrospective analyzed national Yellow fever surveillance data abstracted from the Surveillance, Outbreak, Response, Management, and Analysis System (SORMAS) platform of the Nigeria Centre for Disease Control and conducted multivariable binary logistic regression analysis to identify factors associated with YFV positivity
- Variables abstracted from SORMAS include : epidemiological number, socio-demographic information (age, sex, education, occupation), vaccination status, clinical information (date of onset, date of admission, symptoms), location (State), travel history, and laboratory test status (negative, positive, unconfirmed)
- We summarized categorical variables using frequencies and percentages, while numerical variables were summarized using the median and interquartile range
- To estimate the strength of the association between explanatory variables and the outcome variable, we calculated prevalence odds ratios with their corresponding 95% confidence intervals and p-values

Results



- Of 16,777 suspected cases, 8532(50.9%) had laboratory confirmation with overall positivity of 6.9%(585). Median age was higher among YFV-positive cases (median= 20.0 years; IQR= 11.0 – 30.0 years) with the most affected age group being those 15-29 years. Predictors of YFV positivity include:
  - **Epidemic year:**
    - 2019 (aOR: 3.85, 95% CI: 2.46, 6.27),
    - 2020 (aOR: 2.90, 95% CI: 1.87-4.70),
    - 2021 (aOR: 3.42, 95% CI: 2.04-5.90),
    - 2022 (aOR: 1.88, 95% CI: 1.01-3.51), and
    - 2023 (aOR: 2.56, 95% CI: 1.35-4.85) epidemic years compared to compared to 2017;
  - **Annual quarter:**
    - Third quarter (aOR: 3.08, 95% CI: 2.16-4.49) and
    - Fourth quarter (aOR: 5.19, 95% CI: 3.48, 7.86) compared to the second second;
  - **Ecological zone**
    - Jos Plateau (aOR: 6.12, 95% CI: 4.33-8.71),
    - Derived/Guinea Savanah (aOR: 3.46, 95% CI: 2.58-4.70), and
    - Freshwater/Lowland rainforest ecological zones (aOR: 2.11, 95% CI: 1.54-2.92) compared to the Sahel/Sudan savannah;
  - **Climatic season**
    - Dry season (aOR: 1.37, 95% CI: 1.02-1.86) compared to rainy season;
  - **Climatic zone**
    - Hot dry or humid (aOR: 3.26, 95% CI: 2.37, 5.03) compared to the temperate climatic zone;
  - **Socio-demographic factors**
    - Male sex (aOR: 1.49, 95% CI: 1.24-1.80);
    - Age group >= 15 years ((aOR: 1.40, 95% CI: 1.11-1.78) compared to <15 years;
    - Working in outdoor ((aOR: 1.46, 95% CI: 1.08-1.99);
    - Travel within last two weeks (aOR: 1.73, 95% CI: 1.04-2.81);
  - **Clinical factors**
    - Unknown vaccination status (aOR: 1.34, 95% CI: 1.02-1.78) compared to being vaccinated; and
    - Vomiting (aOR: 1.77, 95% CI: 1.19, 2.60).

Conclusions and Recommendations

- Since 2017, outbreaks of YF have continued to occur in Nigeria with majority of cases seen in the hot humid climatic zones and the Derived Savannah ecological zone
- Higher odds of YFV positivity were associated with the third and fourth quarters of the year
- However, inadequate diagnostic capacity has made it difficult to quantify the actual burden of YF incidence in Nigeria since 2017
- The missing epidemic peak seen during the 2021 and 2022 seasons is suggestive of the disruptive effect of the COVID-19 pandemic on YF surveillance activities given that the odds of YFV positivity were significantly higher from 2021 to 2023 compared to 2017
- Socio-demographic, climatic, and ecological factors were found to be drivers of YFV transmission in Nigeria.
- We recommend investments in community-based surveillance and in-country laboratory diagnostic capacity to enhance early case identification and detection
- Clinicians should be suspicious of persons older than 15 years presenting vomiting among other clinical symptoms instead of looking for signs of jaundice with fever

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