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Healthy under-five children in day care centres of Accra, Ghana, harbour multidrug resistant bacteria in their nasopharynx: A Call for Further Research!

Reference: Osei, M.-M. et al. Alarming Levels of Multidrug Resistance in Aerobic Gram-Negative Bacilli Isolated from the Nasopharynx of Healthy Under-Five Children in Accra, Ghana. **Int. J. Environ. Res. Public Health 2022, 19, 10927. https://doi.org/10.3390/ijerph191710927.**

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Key Messages

- *Did you know that healthy under-five children could harbour pathogenic bacteria in their nasopharynx?*
- In this first-ever, cross-sectional study conducted in Accra Ghana, we found that about **14% of under-five children attending day care centres** harboured pathogenic bacteria (technically termed as aerobic Gram-negative bacteria) in their nasopharynx.
- *Escherichia coli*, *Klebsiella pneumoniae* and *Enterobacter cloacae* were the most common bacteria isolated.
- About **67% of the bacteria were multidrug resistant** (MDR, defined as resistance to three or more classes of antibiotics).
- These findings are concerning and pose two risks: i) a risk of future illness among carriers and ii) potential spread of infection to other vulnerable children. We recommend that the **Ghana Health Services and the Ghana Education Services jointly commission follow-up research** to quantify the extent of these risks and develop strategies to address them.

What is the problem and why is it important?

- It has been commonly observed that healthy infants and under-five children harbour pathogenic bacteria in their nasopharynx. These include both Gram-positive and Gram-negative bacteria.
- Whilst there are many studies on nasal carriage of Gram-positive bacteria, there are no studies on Gram-negative bacteria from Ghana.
- Such information is crucial for two reasons:
    - It helps in understanding the common Gram-negative bacteria prevalent in Ghana and the most appropriate antibiotics to treat them.
    - It serves as a baseline for monitoring future trends.
- Hence, we undertook a study to assess the prevalence of nasopharyngeal carriage of Gram-negative bacteria and their antibiotic resistance patterns in under-five children of Ghana.

Children in a Day care centre in Greater Accra region, Ghana

How did we measure it?

- We conducted a cross-sectional study among healthy under-five children attending randomly selected, seven day-care centres in the Accra metropolis of the Greater Accra region of Ghana from September to December 2016.
- Frozen nasopharyngeal swabs of children collected in 2016 were re-analysed in 2021-22 for the presence of Gram-negative bacteria and their antibiotic resistance patterns.
- All the tests were conducted using standard, quality-assured protocols in an accredited laboratory at the University of Ghana Medical School.

What did we find?

- We examined a total of 410 children, of whom 57 (14%) had Gram-negative bacteria.
- A total of nine bacterial species were isolated – the most common ones were *E. coli* (26%), *K. pneumoniae* (25%) and *E. cloacae* (18%).
- MDR was observed in 67% of isolates.
- The organisms were highly resistant to cefuroxime (74%), ampicillin (65%) and amoxicillin/claulanic acid (60%).
- The organisms were least resistant to gentamicin (7%), followed by amikacin (9%) and meropenem (9%) – indicating these are the most effective antibiotics for treatment.

Implications and Recommendations

- There is a risk that nasal carriage leads to future illness and spread of infections to other children. We recommend that the Ghana Health Service and the Ghana Education Service jointly commission follow-up research to quantify the extent of these risks and develop strategies to address them.
- A single study from one city may not be nationally representative. We recommend that the University of Ghana/College of Health Sciences undertake a national survey.
- The resistance patterns are useful in informing the choice of antibiotics, in case of invasive infections caused by Gram-negative aerobic bacteria. We recommend that the Ministry of Health considers updating the national treatment guidelines in light of these findings.