Detection of Respiratory Pathogens using Multiplex TaqMan Array Card (TAC) among Stillbirths and Under-five Deaths in Eastern Ethiopia

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Background

Respiratory infections are an important cause of morbidity and mortality in lower income countries like Ethiopia. The Child Health and Mortality Prevention Surveillance (CHAMPS) network has adapted a custom multiplex real-time PCR 384-well microfluidic array, TaqMan Array Cards (TACs), to identify multiple pathogenic microorganisms. The aim of this study is to identify potential respiratory pathogens in post-mortem samples among stillbirths and under-five deaths.

Methods

Among children aged <5 years in Harar/Kersa, Eastern Ethiopia, we examined postmortem specimens of lung tissue (all deaths) and nasopharyngeal/oropharyngeal (NP/OP) swabs (deaths in liveborn children only). We used the TAC panel for detection of 46 respiratory pathogens. Total nucleic acid (DNA and RNA) were extracted using Qiagen EZ1 DSP Virus Kit and the TAC runs were performed using reverse transcriptase real-time PCR on the QuantStudio 7 Flex real-time PCR system. .

Results

A total of 137 deaths were investigated; 73 (53%) were stillbirths. Among 64 deaths in live-born children, 50 (78%) lung tissue samples and 59 (92%) NP/OP swabs contained nucleic acid of one or more organisms; a total of 358 pathogen-specific target detections were identified from lung tissue (36%) and NP/OP swab (64%). These consisted of bacteria (81.6%), viruses (17%) and fungi (1.4%). Bacteria detected included *K. pneumoniae* (24%), *A. baumanii* (12%), *S. aureus* (9.2%), *M. catarrhalis* (7.8%) and *H. influenzae* (7.5%).

Among viral detections, Rhinovirus (6.4%) was most commonly detected, followed by Human Cytomegalovirus (3.1%), and Measles virus (1.7%). Among stillbirths, 20% of lung tissue samples processed were positive for a pathogen; only 18 pathogen-specific targets were detected. Two-thirds (61%) of those detected were *A. baumanii,* Human Cytomegalovirus and *P. aeruginosa*.

Fig 2. Type and Frequency of pathogens detected (n=358)

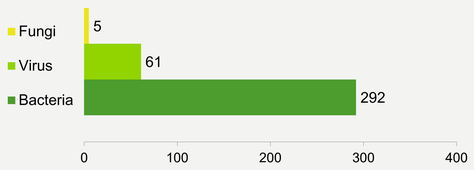


Fig 1. Diagram on showing study cases Vs TAC results

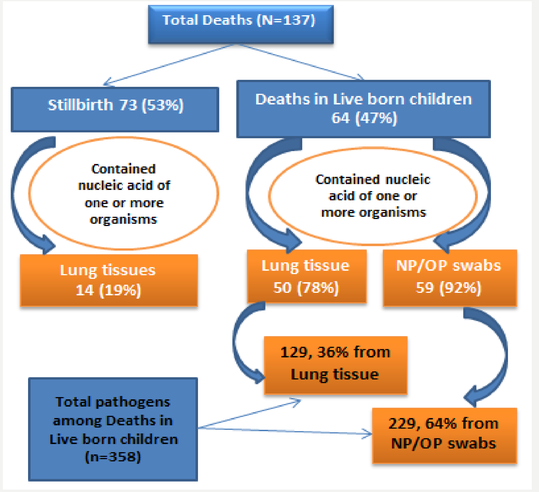
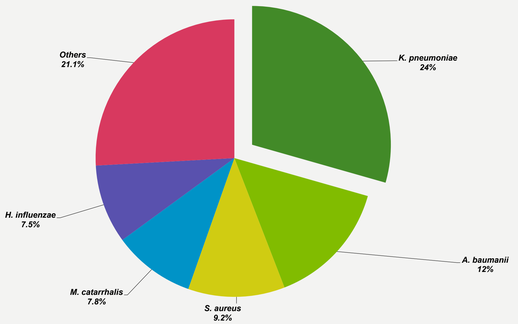


Fig 3. Type and Frequency of Bacteria detected (n=292)



Conclusions

Bacterial pathogens were commonly detected as respiratory pathogens among post-mortem respiratory specimens from recently deceased children aged < 5 years. The multi-pathogen detection platform using TAC provided an efficient laboratory method to detect a variety of infectious organism.

Recommendations

- FMoH-Ethiopia and other stake holders should initiate and implement the TAC multi-pathogen detection platform as disease surveillance outbreak investigation and sever case diagnostics and possibly can be evaluated and used in studies for identification potential pathogen.
- We emphasize further investigation of *K. pneumoniae* in sequencing, serotyping, virulence, and development of vaccine.

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