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Acute respiratory infections among children in the Democratic Republic of the Congo – nasopharyngeal pathogens, antibiotic resistance and vaccination

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademin, Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Medicinaregatan 3, onsdagen den 14 oktober, klockan 13:00

av Archippe Muhandule Birindwa

Fakultetsopponent:
Professor Mats Målqvist
Institutionen för kvinnors och barns hälsa, Uppsala Universitet, Sverige

Avhandlingen baseras på följande delarbeten:

I. Birindwa AM, Tumusifu MJ, Mwinja A, Nordén R, Andersson R, Skovbjerg S. **Decreased number of hospitalized children with severe acute lower respiratory infection after introduction of the pneumococcal conjugate vaccine in the eastern Democratic Republic of the Congo.** Accepted in The Pan African Medical Journal

II. Birindwa AM, Emgård M, Nordén R, Samuelsson E, Geravandi S, Gonzales-Siles L, Muhigirwa B, Kashosi T, Munguakonkwa E, Tumusifu MJ, Cibicabene D, Morisho L, Mwambanyi B, Mirindi J, Kabeza N, Lindh M, Andersson R, Skovbjerg S.
High rate of antibiotic resistance among pneumococci carried by healthy children in the eastern part of the Democratic Republic of the Congo.
BMC Pediatrics. 2018 Nov 19; 18(1): 361.

III. Birindwa AM, Kasereka KJ, Gonzales-Siles L, Geravandi S, Mambo Mwilo M, Kanku TL, Mwinja LN, Muhigirwa B, Kashosi K, Tumusifu MJ, Mungo C, Bugashane BE, Saili MS, Nordén R, Andersson R, Skovbjerg S. **High bacterial and viral load in the upper respiratory tract of children in the Democratic Republic of the Congo.** *Manuscript*

IV. Birindwa AM, Kasereka KJ, Gonzales-Siles L, Geravandi S, Mambo Mwilo M, Kanku TL, Mwinja LN, Muhigirwa B, Kashosi K, Tumusifu MJ, Mungo C, Bugashane BE, Saili MS, Nordén R, Andersson R, Skovbjerg S. **Bacteria and viruses in the upper respiratory tract of Congolese children with radiologically confirmed pneumonia**. *Manuscript*

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Acute respiratory infections among children in the Democratic Republic of the Congo – nasopharyngeal pathogens, antibiotic resistance and vaccination

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ABSTRACT

Acute Lower Respiratory Infections (ALRI) remain a leading cause of morbidity and mortality among children in the Democratic Republic of the Congo (DR Congo). The pneumococcal conjugate vaccine PCV13 was introduced in the in the South-Kivu region in 2013. The aim of this thesis was to investigate the epidemiologic of ALRI, nasopharyngeal bacteria and viruses, pneumococcal serotypes and antibiotic resistance among children after the PCV13 introduction. In **paper I** 2,007 children hospitalized with ALRI during 2010-2015 were retrospectively reviewed and the case fatality rate among these children was 5%. The number of severe ALRI cases per year decreased after the vaccine introduction, while the total number of ALRI cases per year remained unchanged. Five percent of the cases were treated with non-recommended, broad-spectrum antibiotics. In **paper II**, 794 children from the general population attending health centres during 2014 and 2015 were sampled from nasopharynx. The prevalence of pneumococci was higher among children who had not received PCV13, and among those who lived in a house with an open fire used for cooking and with open access to the living areas**.** Multi-resistance among the isolated pneumococci was high (43%), and almost all isolates were resistant to trimethoprim-sulfamethoxazole. Multiplex PCR performed directly on 375 of the nasopharyngeal samples (**paper III**), showed a high load of bacteria and viruses although respiratory syncytial virus (RSV) was rare. Approximately 50% of the pneumococci were identified to a serotype not included in PCV13. **Paper IV** included 116 hospitalized children with radiologically confirmed pneumonia. High levels of any virus or any bacteria in nasopharynx were associated with severe pneumonia, and having a congenital disease as an underling condition was associated with fatal outcome.

Conclusions: There were a high prevalence of bacteria and viruses in the upper respiratory tract of both healthy and sick Congolese children, and the level of antibiotic resistance in carried pneumococci was high. There is a need to modify current treatment guidelines in DR Congo and to reduce the prevalence of pathogens by interventions, including improved living conditions.

Key words: Acute respiratory infections, children, bacteria, viruses and vaccination

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