POLICY BRIEF

A point prevalence survey of paediatric antimicrobial use and healthcare-associated infections in three academic hospitals in South Africa

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Background

In South Africa, a high HIV and tuberculosis (TB) prevalent low-middle income country (LMIC) with a significant COVID-19 burden, antimicrobial usage for paediatric community-acquired infections (CAI) and healthcare-associated infections (HAI) are largely unknown.

This study aimed to provide antibiotic and antifungal point prevalence estimates for the treatment of CAI and HAI, or for prophylaxis, in the setting of academic hospitals in South Africa.

Aim

To evaluate antimicrobial usage for the treatment of neonatal and paediatric CAI and HAI, or prophylaxis, among hospitalised children at three academic hospitals in South Africa.

Study design

This cross-sectional study included all newborns and children (0-15 years) admitted to three hospitals in KwaZulu-Natal and Gauteng provinces, South Africa. We used the World Health Organization (WHO) methodology for conducting antimicrobial point prevalence surveys in hospitalised children.

Study sites

Inkosi Albert Luthuli Central Hospital, Steve Biko Academic Hospital and Chris Hani Baragwanath Academic Hospital.

Participants

All children (newborn and children up to 15 years of age) in the wards at 08h00 on each Wednesday during the study period were eligible. Study duration varied by site, as recruitment ended once approximately 400 children were enrolled at each site.

Inclusion criteria:

- All children hospitalised at the respective neonatal and paediatric wards (including neonatal and paediatric intensive care units (ICUs)) at 08h00 on each day of the survey; and
- All hospitalised children with an antimicrobial prescription.

Exclusion criteria:

- Children previously recruited into the study during the same admission;
- Children undergoing treatment and discharged on the same day;
- Children presenting to outpatient departments or awaiting transportation; and
- Children receiving outpatient parenteral antibiotic therapy, or hospitalised children receiving only topical or ophthalmologic antibiotics.

Data collection: Anonymised data were collected from 22 September 2021 to 05 January 2022.

Data Analysis

Descriptive statistical methods were used to assess frequency distributions and cross-tabulations. Overall antimicrobial prescribing prevalence, and prescribing prevalence stratified by ward and site were calculated. For the purposes of reporting, antimicrobials analysed included antibiotics, antimycobacterial agents, and antifungals. Key indicators included: (i) the antimicrobial prescription prevalence rate; (ii) the indication for an antimicrobial prescription (CAI, HAI, or prophylaxis); (iii) the antimicrobial spectrum prescribed (antibacterial, antimycobacterial, antifungal) and the proportional contribution to overall antimicrobial usage; (iv) the WHO AWaRe classification of prescribed antibiotics. Multivariable logistic regression analyses were conducted to test associations with HAI.

DESCRIPTION OF THE STUDY POPULATION

- At least one antimicrobial was prescribed for 1191 (22.9% (95 confidence interval (CI) 15.5-32.5%)) of the 5200 children that were hospitalised in the surveyed wards during the study period.
- Of the hospitalised children on antimicrobials (n=1191):
  - children under one year of age comprised 66.7% of the study population on antibiotics and antifungals
  - children aged 1-5 years and >5-15 years comprised 27.2% and 19.5% of the study population, respectively
  - 54 (4.5%) had COVID-19
  - 33 (2.8%) were living with HIV

ANTIMICROBIAL USE IN THREE ACADEMIC HOSPITALS

- Overall, 1,946 antimicrobials were prescribed to 1,191 children.
- The commonest prescribed antibiotics in children less than 1 year of age were beta-lactamase sensitive penicillins, aminoglycosides and carbapenems. Older children (1-15 years) were frequently prescribed combination penicillins and carbapenems, respectively (Figure 1).
- Antimicrobials were selected appropriately at the three academic hospitals in line with the AWaRe classification (Figure 2).
- The primary reason for which antimicrobials were prescribed were HAI, clinical sepsis, surgical prophylaxis (SP), medical prophylaxis (MP) and lower respiratory tract infections (Figure 3). HAI more commonly occurred in children with an underlying diagnosis of congenital anomalies.

Special Situations

COVID-19: High rates of antibiotic use (48.2%) in SARS-CoV-2 infected participants was due to high rates of co-infection in these children. However, given the small sample size (n=54), more data are needed to understand the appropriateness of antibiotic use in these children.

HIV infection: Few HIV-infected children were enrolled on this study (n=33), and almost all (84.8%) were on antiretroviral therapy, reflective of a well-functioning PMTCT programme. HIV infection was not a risk factor for HAI or the excessive use of antimicrobials.

Accumulative percentage of drug classification

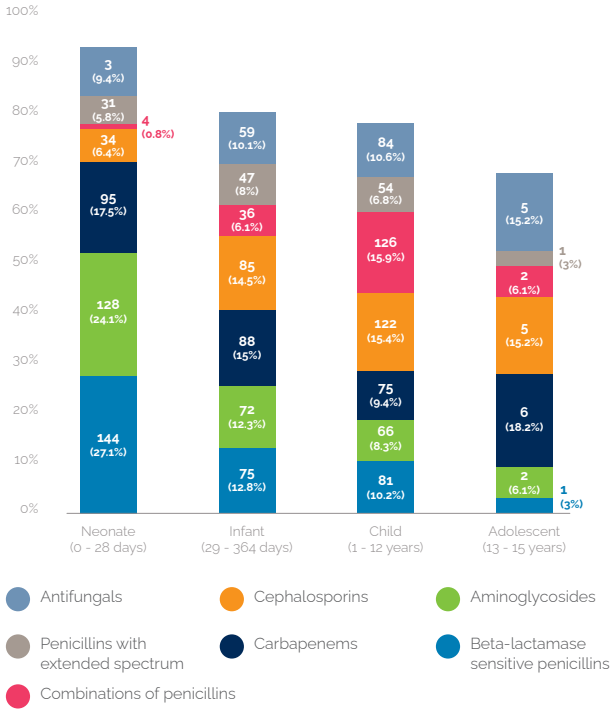

Figure 1. Classification of antimicrobial use by age group and WHO Anatomical Therapeutic Chemical (ATC) classification at three academic hospitals in South Africa, 22 September 2021 – 05 January 2022 – Most prescribed

Percentage prescriptions according to AWaRe classification

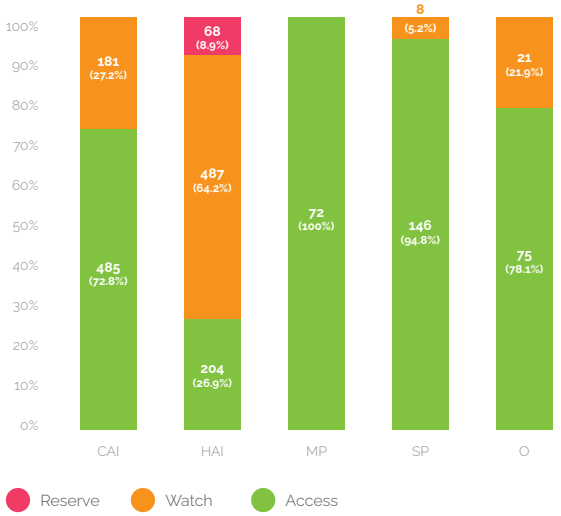

Figure 2. Classification of antimicrobial use by indications and AWaRe classification

*CAI = Community acquired infections; HAI = Healthcare-associated Infections; MP = Medical prophylaxis; SP = Surgical prophylaxis; O = Other

Primary reason for antimicrobial use

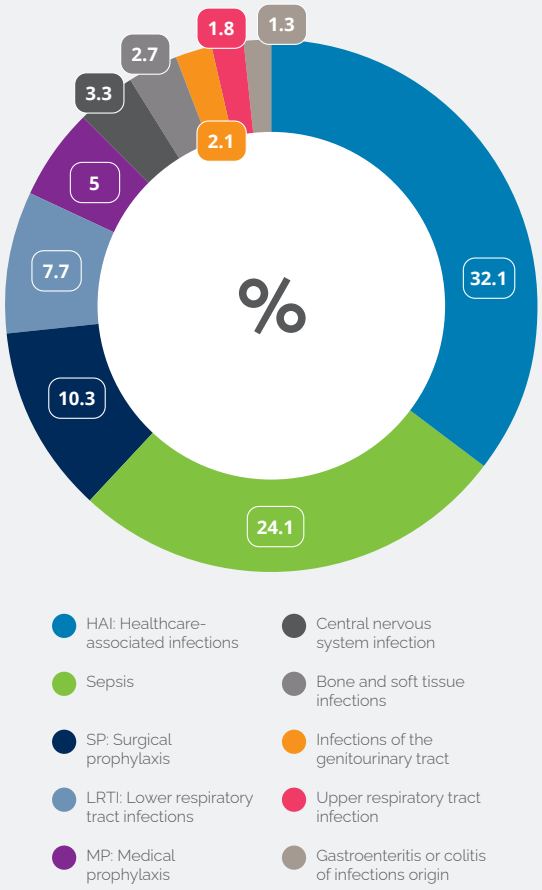

Figure 3. Primary reason for antimicrobial use in 1191 children at three academic hospitals in South Africa, 22 September 2021 – 05 January 2022

The study had 4 main findings, for which we make the following recommendations

Finding 1

There was variation in overall antimicrobial prescribing prevalence between sites (29.1% at Hospital A, 40.8% at Hospital B and 14.1% at Hospital C). The site with the lowest antimicrobial prescriptions had a policy of routinely stopping all empiric antimicrobial use at 72 hours.

Recommendation 1

Health care facilities need policies to routinely de-escalate or stop all empiric antimicrobials at 72 hours, with justification required for recontinuation of antimicrobial therapy. The use of electronic technology to link microbiological results to antimicrobial prescribing should be explored, especially where there is a shortage of medical personnel. This could help reduce AMR.

Finding 2

Most children were distributed across paediatric medical (24.6%), surgical (20.3%), and high-risk wards (20.2%).

Recommendation 2

Antimicrobial stewardship programs should target wards/units/ sub-specialties with high antimicrobial point prevalence.

Finding 3

The prevalence of antimicrobial prescribing to treat **HAI was extremely high (45.6%).** This was attributed to the study sites serving as referral facilities for children with complicated illnesses whose prolonged hospitalisation placed them at risk for developing HAI.

Recommendation 3

Health care personnel should optimise infection prevention and control (IPC) practices, in general, and especially for children with prolonged hospitalisation or using invasive or advanced monitoring or fluid delivery systems. While there was an appropriate selection of antimicrobials according to the AWaRe classification, the duration, dose, and relationship to microbiological isolates need to be considered.

Finding 4

Neonates and infants had a ~1.6-fold and adolescents had ~2.1-fold greater risk of an antimicrobial prescription for HAIs compared to children 6-12 years of age. Being preterm and underweight was also associated with having an antimicrobial prescription for HAIs.

Recommendation 4

A special focus on antimicrobial policies in younger children, preterm and underweight children is warranted. Antimicrobial policies should also focus on adolescents with oncological conditions.

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