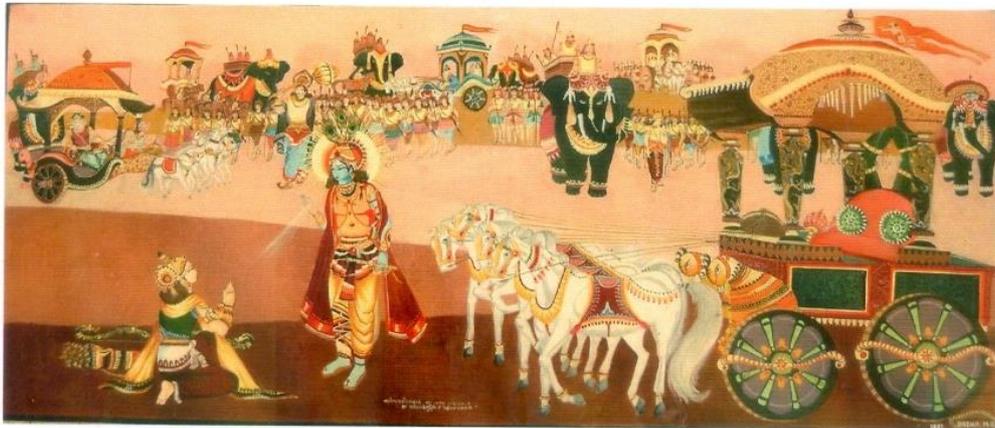


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Lessons from diagnosis-prescribing and antibiotic resistance surveillance in Ujjain, India:

The lull before the storm



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Abstract

Background: The evolution of antibiotic resistance is a global public health crisis building over decades. In this build-up antibiotic use has been the main driver for antibiotic resistance. To develop context-specific interventions, effective surveillance of antibiotic use and resistance are needed in countries like India, which have witnessed a rapid rise in resistance recently and where the need for effective antibiotics is high.

Aim: The main aim of this thesis is to increase the knowledge regarding antibiotic prescribing patterns and prevalence of resistance in an Indian setting, so as to identify targets for interventions aimed to improve clinical practice for common infections.

Methods: This thesis includes five cross-sectional studies. Paper I and paper II describe the patterns of antibiotic prescribing for outpatients with suspected infectious etiology and among admitted patients, respectively. The defined daily doses (DDDs) were calculated per 1000 patients per diagnosis considered in paper I. The focus of infection, specific DDDs were calculated per 100 patient days in paper II. In paper III, prescriptions for children with diarrhea were analyzed for adherence to treatment guidelines and factors associated with adherence were explored. In paper IV healthy children were screened for nasal carriage of *S.aureus* to identify factors associated with nasal carriage and to describe the resistance patterns. Paper V describes the antibiotic susceptibility pattern of pathogens isolated from patients with suspected infections. Antibiotic susceptibility testing was performed by Kirby-Bauer disk diffusion method. All the studies were done using structured, pilot tested questionnaires.

Results: Overall antibiotic prescribing was 66.3%, 3732 out of 5623 outpatients (Paper I) and 92%, 5531 out of 6026 admitted patients (Paper II). Quinolones have been the most frequently prescribed antibiotic groups among outpatients and third generation cephalosporins among the admitted patients (Paper I and II). For diarrhea in children only 6 out of 843 prescriptions adhered completely to treatment guidelines. Oral rehydration solution (ORS) was prescribed for 58%, ORS with zinc for 22% and antibiotics for 71% of the cases (Paper III). The prevalence of nasal carriage of *S.aureus* was 98 out of 1562 i.e. 6.3% (95% confidence interval [CI] 5.1-7.5). Of these, 16.3% were methicillin-resistant *S.aureus* (MRSA). Overcrowding was associated with nasal carriage of *S.aureus* (Paper IV). Among pathogens (n=716) isolated from admitted patients (n=2568), Gram-negative pathogens predominated (62%). Extended spectrum β -lactamase (ESBL) production in *E.coli* isolates (n=149) was 69% (95% CI 61.6–76.6) and in *K. pneumonia* isolates (n=107), 41% (95% CI 31.6–50.5). MRSA constituted 30% of all *S.aureus* isolates (n=221).

Conclusions: The targets identified for interventions were: high antibiotic prescribing rates for diarrhea (Paper I, II and III) and upper respiratory tract infection (Paper I). Other targets include, longer than the recommended duration of prophylaxis (86% of 1846 patients) and lack of distinction between prophylaxis and therapy among surgical patients, irrational antibiotic prescribing in gastroenteritis, overuse of quinolones and lack of use of penicillin in pneumonia, overuse of quinolones and lack of use of doxycycline and macrolides in genital infections, and over reliance on antibiotics in treating skin and soft tissue infections (Paper II). The high rate of antibiotic prescribing among admitted patients together with the high rates of ESBL producing pathogens shows the urgent need to curb antibiotic use when there is no indication for it (Paper V).

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