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Carbapenem resistant Enterobacterales (CRE) at Helen Joseph Hospital

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ABSTRACT

Background: Antimicrobial Resistance (AMR), in particular Antibacterial resistance (ABR) is a growing public health concern. The emergence of resistant Gram-negative bacteria coupled with a dwindling antibiotic armamentarium poses a significant threat. In South Africa, there is an urgent need to evaluate this situation and due consideration should be given to prevent the emergence of multidrug Resistant (MDR), extensively drug resistant (XDR), and pandrug resistant (PDR) organisms.

Objectives: The objective of this study was to describe both the clinical and microbiological characteristics of patients at Helen Joseph Hospital (HJH) with confirmed Carbapenem resistant Enterobacterales (CRE) infection and/or colonization. In addition, infection prevention and control practices at HJH were highlighted in this study.

Methods: A single centre retrospective descriptive study was undertaken at a tertiary public sector hospital in Johannesburg, South Africa. All patients with a positive CRE culture collected retrospectively in a twelve month study period were included. Microbiological data was obtained from the NHLS database and clinical data from patient records. A quantitative method of data analysis was performed.

Results: A total of 106 patient files were reviewed. Demographically, 52.83% of patients were males while females represented 47.17%. Ethnically, 64.15% of patients were of African descent. The majority of patients were admitted to the medical wards (35.85%), while 34.9% of all CRE's were cultured in an intensive care setting (27 in the Intensive care unit (ICU) and 10 in High care)**.** The predominant site of culture was urine and blood representing 35.85% and 26.42% respectively. The dominant CRE organism subtype was *Klebsiella pneumoniae* (94/106, 88.68%), followed by *Enterobacter cloacae* (6.6%) and *Escherichia coli* (2.83%). *Bla*$_{\text{OXA-48}}$& variants represented the predominant CRE genotype (70.75%), followed by *bla*$_{\text{NDM}}$ (10.38%).Significant differences in resistance patterns between *bla*$_{\text{OXA-48}}$ and *bla*$_{\text{NDM}}$ isolates to carbapenems were noted with 66.67% of *bla*$_{\text{NDM}}$ isolates being resistant to imipenem, in contrast to *bla*$_{\text{OXA-48}}$ with 12% ($p<0.001$). Seventy-five percent of the *bla*$_{\text{NDM}}$ isolates were resistant to meropenem, while only 21.33% of the *bla*$_{\text{OXA-48}}$ isolates were resistant ($p=0.001$). Patients with a previous hospital admission in the

last six months were more two times more likely to demise (p=0.042). Admissions to the ICU/ high care wards were three times more likely to demise than those admitted in other wards (p=0.009).

Conclusion: There was a high prevalence of CRE at HJH with the three predominant bacteria in our setting being *Klebsiella pneumoniae* followed by *Enterobacter cloacae* and *Escherichia coli*. Genotypically, $bla_{\text{OXA-48}}$ & variants predominates, while bla_{NDM} represents the second commonest carbapenemase. Significant differences in the resistance patterns between $bla_{\text{OXA-48}}$ and bla_{NDM} isolates to imipenem and meropenem was observed. Previous hospitalization in the last six months and current admission to an intensive care independently predicted mortality. Infection prevention and control measures are essential to combat the spread of CRE infection, and the lack of these practices in twenty-five percent of our sample size needs to be urgently addressed.