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Original Article

Phenotyping and Genotyping Evaluation of *E. coli* Produces Carbapenemase Isolated from Cancer Patients in Al-Basrah, Iraq

Ali Albadery, A[1] *, Shakir Mahdi Al-Amara, S[1], Abd-Al-Ridha Al-Abdullah, A[2]

1. Department of Biology, College of Science, University of Basrah, Basrah, Iraq
2. Department of Pathological analyses, College of Science, University of Basrah, Basrah, Iraq

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Corresponding Author: aseelsweely@gmail.com

Abstract

One of the most important nosocomial organisms that cause urinary tract infections (UTIs) in cancer patients is *Escherichia coli*. A significant cause of concern in managing UTIs is the development of carbapenem-resistant bacteria. *Escherichia coli* with carbapenem resistance has become a more serious problem, particularly in Iraq. In this regard, the present study aimed to estimate the prevalence of carbapenem-resistant *E. coli* in Al-Basrah, Iraq. Conventional tests and the Vitek®2 system were used to identify the isolates and determine the susceptibility of *E.coli* isolates to antimicrobials. In addition, *E.coli* isolates were tested by mCIM and eCIM methods. Moreover, the major carbapenemase genes, including bla_{SPM}, bla_{IMP}, $bla_{VIM,}$ and bla_{KPC} were detected by polymerase chain reaction. In total, 120 urine samples were collected from cancer patients who were suspected of having urinary tract infections at Basrah Center of Oncology Al-Sader Teaching Hospital, Basrah, Iraq. Identification of bacterial growth by using biochemical tests revealed different bacterial species. The most frequent bacteria were *E. coli* (n=22, 53.65%) isolates. The results showed that 13 (59.09%) and 11 (50%) out of 22 *E. coli* isolates were positive for the production of carbapenemase, based on the eCIM and sCIM, respectively. The majority of *E.coli* in this study possessed the bla_{VIM} gene (n=13, 59.1%), followed by the bla_{KPC} gene (n=5, 22.73%), bla_{IMP} gene (n=5, 22.73%), and bla_{SPM} gene (n=4, 18.18%). There is a spread of more than one type of carbapenemase among the *E. coli* isolates collected from UTI cancer patients in Basrah Hospital. The *E. coli* identified in the current study had a strong capacity to produce carbapenemase enzymes against the four generations of antibiotics, including imipenem and meropenem antibiotics.

Keywords: Cancer, Carbapenemase, *E.coli*, Urinary tract infections

1. Introduction

The immune system of cancer patients is compromised due to underlying malignancy, such as leukemia, as well as the harmful side effects of cancer treatment, such as chemotherapy, radiation, and bone marrow transplantation. This could result in prolonged immunosuppression, increasing the risk of infection and possibly worsening the prognosis (1).

Urinary tract infection (UTI) is one of the most prevalent infections in cancer patients (2). The UTI is identified as one of the most common microbial infections in humans, and in the community and healthcare organizations, its control and prevention is a significant health issue (3). Enterobacteriaceae is the most prevalent UTI, with uropathogenic *Escherichia coli* accounting for around 80-90% of all infections (4, 5).