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Prevalence of Carbapenemase Producing Gram Negative Bacteria in Diabetic Patients.

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ABSTRACT

The aim of the present study was to determine the prevalence of carbapenemases in gram-negative bacterial isolates from diabetic patients. A total of 50 diabetic and 50 non-diabetic patients in a tertiary care hospital were included in the study. Gram-negative bacterial isolates from various clinical samples from January 2015 to June 2015 were further subjected to antibiotic susceptibility testing using Kirby-Bauer disc-diffusion method. The isolates resistant to the third generation cephalosporins were tested for carbapenemase production using double-disc synergy test (DDST) and Modified Hodge test. Carbapenem resistant *E. coli, Klebsiella* spp., *Pseudomonas* spp., *Proteus* spp., were reported in 20%, 16%, 30%, 12% diabetic patients and 18%, 10%, 24%, 10% in non-diabetic patients respectively. Diabetes is itself not a risk factor for resistance as the prevalence of carbapenemases is not enormously higher in diabetic patients when compared to non-diabetic patients.

Keywords: carbapenemases, antimicrobial resistance, diabetes

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INTRODUCTION

Diabetic patients are susceptible to a variety of infections and poor outcomes. This is because hyperglycaemic state facilitates development of infections [1]. In addition, immunocompromised status, frequent antibiotic usage are related to antimicrobial resistance in bacteria, such as *Staphylococcus aureus, Escherichia coli, Klebsiella species, Pseudomonas aeruginosa, Acinetobacter* spp [2]. Early diagnosis of diabetes and causative organisms of infections followed by prompt antimicrobial susceptibility testing and good glycemic control are of highest importance in the treatment of antimicrobial-resistant infections in diabetic patients [3].

Aim and Objectives

To analyze the prevalence of carbapenemase producing Gram-negative bacteria in diabetic patients and to compare the results with that of non-diabetic patients.

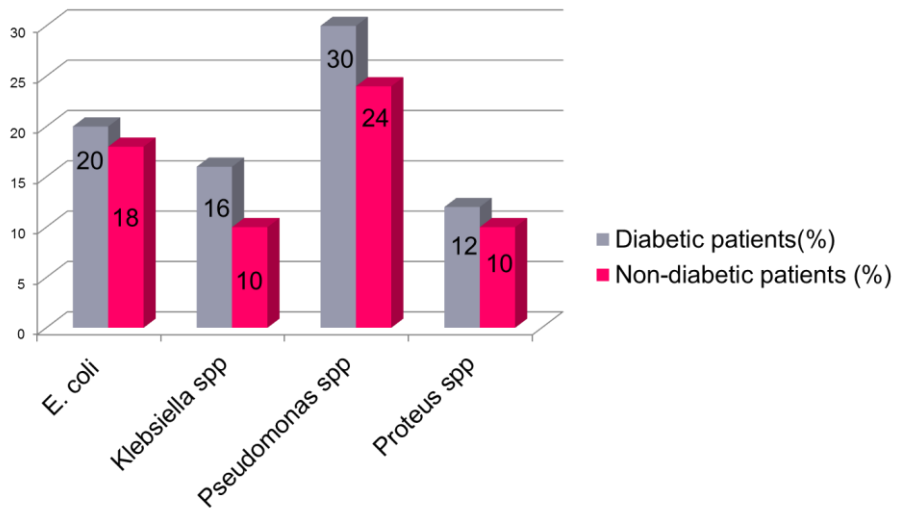
MATERIALS AND METHODS

This study was conducted in a tertiary care hospital from January 2015 to June 2015. Fifty diabetic and fifty non-diabetic patients of age 40 – 65 years were randomly selected. Specimens such as urine, pus, wound swab, sputum were collected from them and cultured in the Department of Microbiology, Central laboratory. The samples were processed and identified by standard bacteriological techniques and antimicrobial susceptibility to carbapenems was done by Kirby-Bauer disc diffusion method. Zone sizes were interpreted according to CLSI guidelines. The isolates which showed intermediate or resistant zones for meropenem, i.e 16mm-21mm, were tested for carbapenemase production by Modified Hodge test (MHT). A lawn culture (0.5 McFarland) of the ATCC control strains of E. *coli*/*Klebsiella* spp./*Pseudomonas* spp., were streaked on Mueller-Hinton agar plate. A 10 µg meropenem disc was placed in the center of the agar plate and the test organism along with positive and negative control organisms were streaked in a straight line from the edge of the disk to the edge of the plate. The plate was incubated overnight at 37°C. Quality control of the carbapenem disks were performed according to CLSI recommendations. After 24 hrs, MHT positive test showed a clover leaf-shaped indentation of the control strains along the test strain whereas a MHT negative test showed no indentation along the test organism [4].

RESULTS

Gram-negative organisms such as *Escherichia coli* (43%), *Klebsiella* spp. (35%), *Pseudomonas* spp. (14%), *Proteus* spp. (8%) were the bacterial pathogens isolated in culture. Carbapenem resistant *E. coli, Klebsiella* spp., *Pseudomonas* spp., *Proteus* spp., were reported in 20%, 16%, 30%, 12% diabetic patients and 18%, 10%, 24%, 10% in non-diabetic patients respectively. (Figure 1).

Figure 1: Prevalence of Carbapenemase Producing Gram-Negative Isolates in Diabetic and Non-Diabetic Patients



DISCUSSION

Gram negative bacilli (GNB) such as E. *coli*, *Klebsiella* spp and *Pseudomonas* spp were more prevalent in diabetic patients; GNB such as E. *coli* and *Klebsiella* spp were more prevalent in non-diabetic patients). Carbapenemase production was higher in *Pseudomonas* spp. in both diabetic (30%) and non-diabetic (24%) patients. The prevalence of carbapenemase producers were predominant in pus sample, followed by urine, sputum.

According to Meiland *et a*l, the resistance of E. *coli* in non-hospitalized women with diabetes mellitus is not higher than that seen in routine isolates of E. *coli*. [5]. According to Alsultan *et al* , diabetic patients were significantly more likely to carry carbapenem-resistant isolates. Carbapenem-resistant A. *baumannii* is a serious problem in diabetic patients. Molecular detection of resistance mechanisms in these isolates is required [6]. According to Murugan *et al,* high level of resistance to carbapenems was detected in P. aeruginosa [7].

CONCLUSION

The antimicrobial resistance of Gram-negative bacteria in patients with diabetes mellitus is not enormously higher than that of Gram-negative bacteria isolated from non-diabetic patients. This suggests that diabetes in itself is not a risk factor for resistance.

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