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Risk Factors Associated with Multidrug-Resistant Escherichia coli Infections in Diabetes Mellitus Patients in Northern Sudan

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Abstract

Multidrug-resistant (MDR) Escherichia coli is a significant threat to diabetes mellitus .patients, who are at an elevated risk of infections due to immune dysregulation (DM) This study identifies risk factors associated with MDR E. coli infections among diabetic patients in Northern Sudan. Using a case-control design, 150 diabetic patients with confirmed E. coli infections were analyzed, including 75 MDR cases and 75 non-MDR controls. Key risk factors included prior antibiotic use (adjusted odds ratio [AOR]: 3.5), frequent hospitalizations (AOR: 2.8), and poorly controlled diabetes (AOR: 2.3). These findings highlight the need for targeted infection control .strategies and improved management of antibiotics in high-risk populations.

Keywords: MDRMultidrug-resistant DM diabetes mellitus AOR adjusted odds ratio

INTRODUCTION

Antibiotic resistance is a growing global concern, with multidrug-resistant (MDR) Escherichia coli among the leading causes of community and hospital-acquired infections **Magiorakos, A. P., *et al*. (2012**. Diabetes mellitus (DM) patients are particularly vulnerable due to .compromised immunity, frequent hospital visits, and prolonged antibiotic use While MDR E. coli infections are well-documented, the specific risk factors in diabetic patients remain underexplored, particularly in resource-limited settings like Northern Sudan. Understanding these factors is critical for devising effective prevention strategies and optimizing patient outcomes. This study aims to identify clinicaldemographic, and behavioral risk factors associated with MDR E. coli infections in DM patients**American Diabetes Association. (2022).**

METHODS

Study Design and Setting A case-control study was conducted from January to June 2024 in Dongola, Northern Sudan. Participants were recruited from primary healthcare facilities and hospitals.

Study Population. Cases: Diabetic patients with laboratory-confirmed MDR E. coli infections. Controls: Diabetic patients with non-MDR E. coli infections. Patients were

matched by age and gender. MDR was defined as resistance to three or more antibiotic classes

Data Collection

Data were collected using structured interviews and medical records. Variables included

Demographics (age, gender, socioeconomic status)

Clinical history (duration of diabetes, HbA1c levels, comorbidities)

Behavioral factors (antibiotic use, hospitalization history, catheter use)

Microbiological Analysis Urine and wound swab samples were cultured on selective media, and E. coli isolates were identified using biochemical tests. Antibiotic susceptibility was .determined via the disk diffusion method according to CLSI guidelines**Kahlmeter, G. (2014)**.

Statistical Analysis Data were analyzed using SPSS version 26. Logistic regression was used to identify independent risk factors, with $p < 0.05$ considered statistically significant.

RESULTS

Demographics and Clinical Characteristics :Among 150 participants (75 cases and 75 controls)Mean age: 58 ± 10 years

Gender distribution: 62% female, 38% male

Duration of diabetes: Cases had a longer average disease duration (12 ± 4 years).compared to controls (8 ± 3 years, $p < 0.05$)Risk Factors for MDR E. coli

:Key risk factors identified were Prior antibiotic use: Reported by 68% of cases vs. 42% of controls (AOR: 3.5; 95%.(CI: 2.1–6.2; $p < 0.01$)

Frequent hospitalizations: ≥3 admissions in the past year were more common in.cases (58%) compared to controls (32%) (AOR: 2.8; 95% CI: 1.6–4.9; $p < 0.01$)

Poor glycemic control: HbA1c > 9% was observed in 66% of cases vs. 40% of.controls (AOR: 2.3; 95% CI: 1.4–4.2; $p < 0.05$) Other Observations Use of urinary catheters was higher among cases (50%) compared to controls (30%).(AOR: 1.8; 95% CI: 1.1–3.2)

.No significant association was found with socioeconomic status or gender

DISCUSSION

This study highlights several modifiable risk factors associated with MDR E. coliinfections in DM patients, including prior antibiotic use, frequent hospitalizations, and poor glycemic control.

Antibiotic Use: The overuse and misuse of antibiotics remain major drivers ofresistance. Our findings are consistent with global data linking prior antibiotic.exposure to MDR infections) **Livermore, D. M. (2003).**

Hospitalization: Repeated hospital visits increase exposure to resistant strains.Strengthening hospital infection control measures is essential to mitigate this risk.

Glycemic Control: Poorly managed diabetes impairs immune function, facilitatinginfections by resistant pathogens. Educating patients on glycemic management could.reduce infection rates**Lautenbach, E., *et al.* (2001).**
Clinical Implications: Tailored interventions, such as antibiotic stewardship programsroutine screening for resistance in diabetic patients, and better management of glycemic control, are urgently needed.

CONCLUSION

This study identifies prior antibiotic use, frequent hospitalizations, and poor glycemic.control as significant risk factors for MDR E. coli infections in DM patients. Addressing these factors through targeted interventions could reduce the burden of.MDR infections in high-risk populations.

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