

# $\beta$ -lactamase Producing *Pseudomonas aeruginosa* Recovered From Disinfectants Frequently Used in Tertiary Care Hospitals in Khartoum

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## Introduction

Disinfectants are an important tool for infection control in hospitals. However, some bacteria are resistant to these disinfectants and/or can indeed be found in them as contaminants. The purpose of this study is to examine the presence of *Pseudomonas aeruginosa* (*P. aeruginosa*) as a possible contaminant in disinfectants used in a sample of hospitals in Khartoum, Sudan.

## Method

### • Study design and study period

Cross sectional study, November 2020 to October 2021, Nine Khartoum tertiary hospitals.

### • Sample collection

45 disinfectant samples.

### • Isolation of *P. aeruginosa*

Selective ceftrimide agar plates.

### • Phenotypic identification of *P. aeruginosa*

Pigment production, Gram staining, Oxidase, Catalase and Motility test.

### • DNA extraction and genotypic identification *P. aeruginosa*

Boiling method.

PCR targeting oprL gene.

### • Antibiotic susceptibility testing

Standard disc diffusion method.

Ampicillin (AM) 10 $\mu$ g, Ceftriaxone (CRO) 30 $\mu$ g, Cephalexin (CL) 30 $\mu$ g, Cefotaxime (CAZ) 30 $\mu$ g. Ceftazidime (CAZ) 30 $\mu$ g and Aztreonam (ATM) 30 $\mu$ g.

### • Molecular detection of $\beta$ -lactamase resistant genes

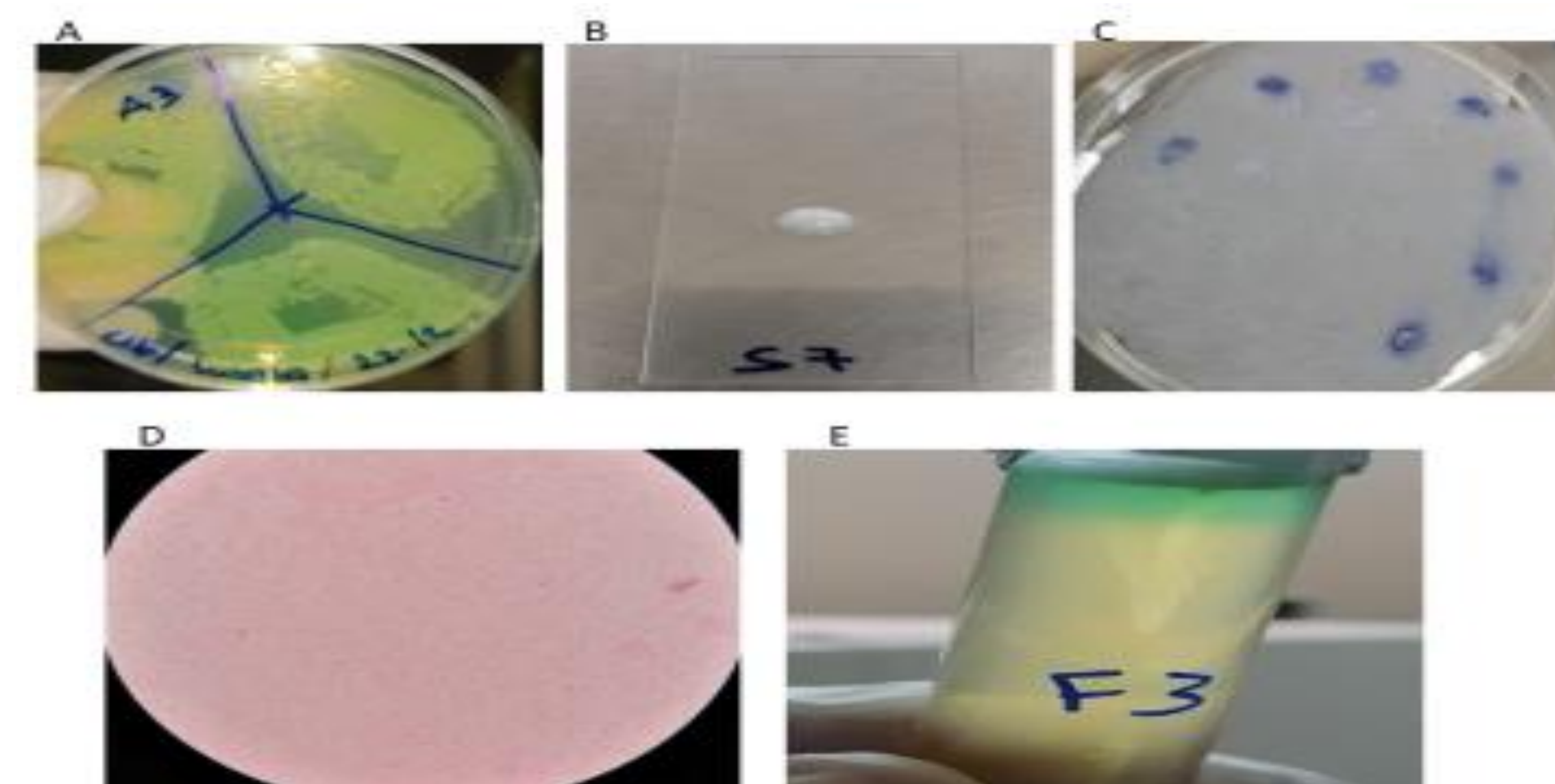
Five primers (blaTEM-1, blaCTXM, blaSHV, blaVEB and blaOXA-1).

## Results

- Of the 45 disinfectant samples that were collected, seven samples successfully showed bacterial growth (**Table 1**).
- Based on either conventional methods (Gram staining, biochemical tests and culture) (**Figure 1**) and molecular methods (**Figure 2**), all isolates were *P. aeruginosa*.
- Antimicrobial susceptibility testing showed a high resistance rate to ampicillin and cephalexin (100%), followed by cefotaxime (85%) and ceftriaxone (57%), and high susceptibility to ceftazidime (100%) followed by aztreonam (71.5%) (**Figure 3**).
- Molecular detection of  $\beta$ -lactamase genes showed that all isolates carried TEM-1 gene, while CTX-M, SHV, VEB, and OXA-1 were not detected in any of the isolates

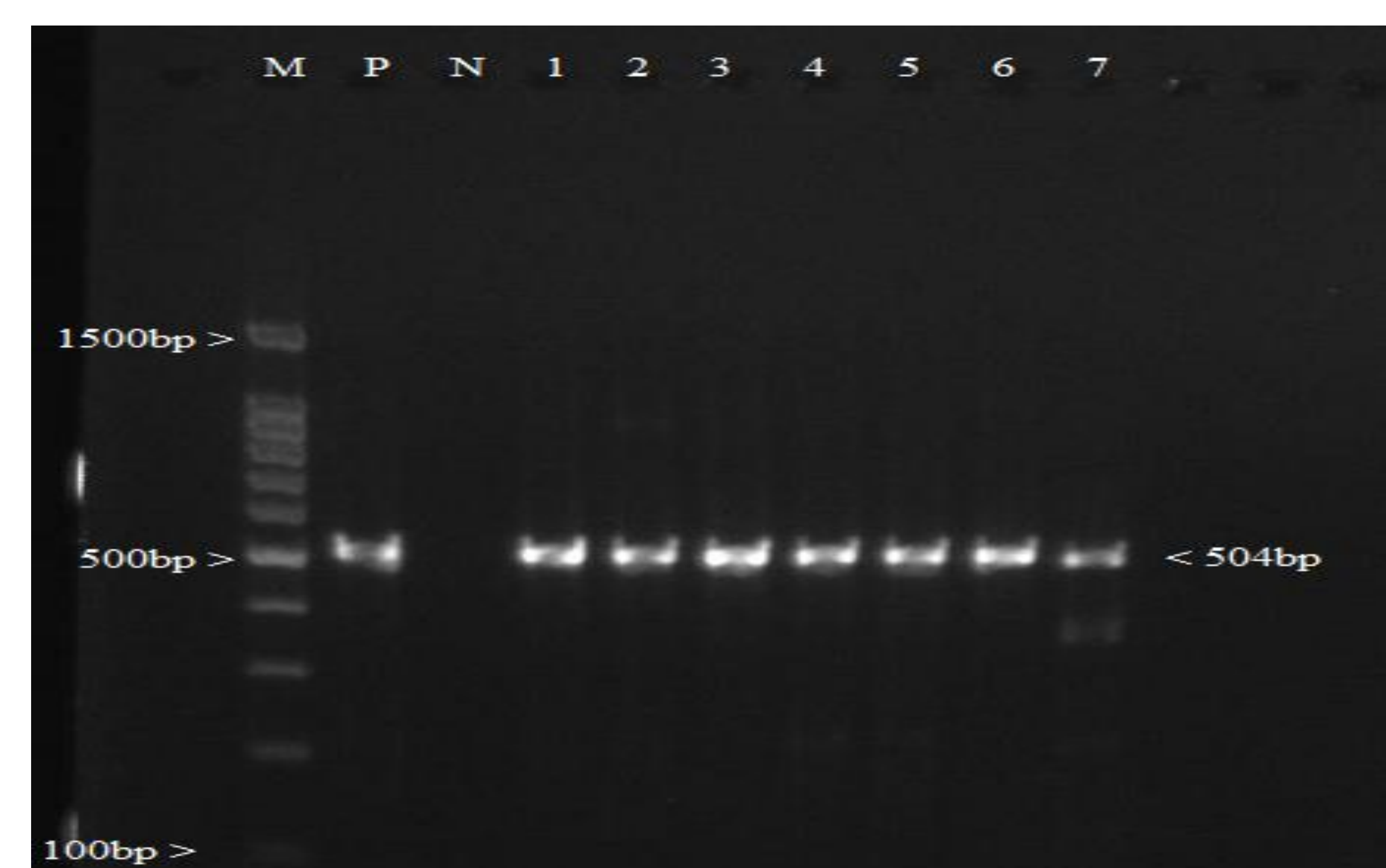
NO	Type of disinfectants.	Frequency	Samples positive for <i>P. aeruginosa</i> .
1.	Chloroxylenol	9	5
2.	Sodium hypochlorite	7	0
3.	Hydrogen peroxide	2	0
4.	Formaldehyde	1	0
5.	Alcohol	6	0
6.	Chlorohexidine gluconate and cetremide	1	1
7.	povidone iodine	2	0
8.	Quaternary ammonium chloride	16	0
9.	Chlorine tab	1	0
	Total	45	7 (15.5%)

**Table (1)**

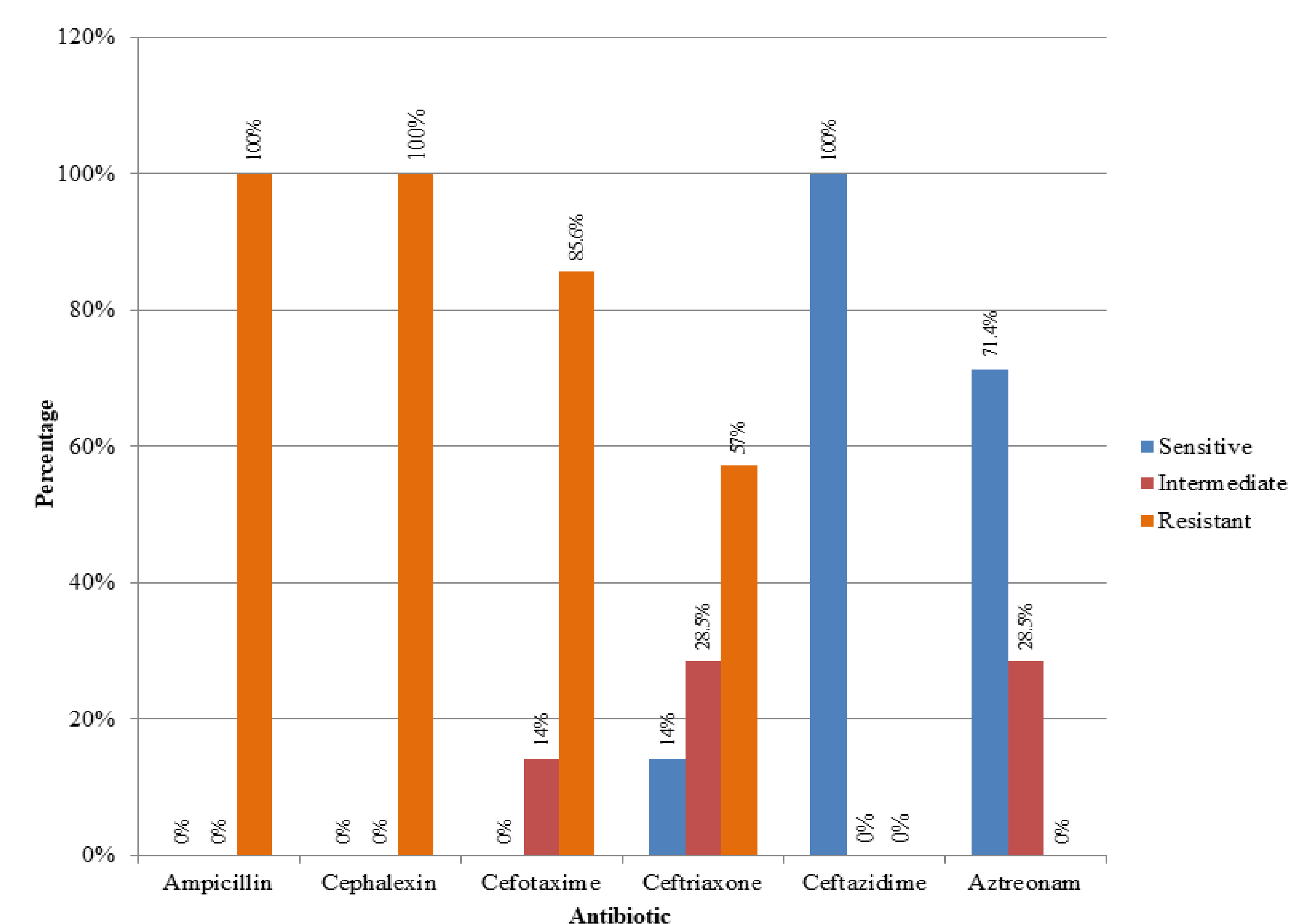


**Figure (1)**

- (A) Pigment production.  
(B) Catalase test.  
(C) Oxidase test  
(D) Gram staining.  
(E) Motility test.



**Figure (2)**



**Figure (3)**

## Conclusion

- The investigation showed a considerable amount of contamination with *P. aeruginosa*.
- Resistance to both penicillins and cephalosporins is present in all *P. aeruginosa*.
- 30% of the isolates have shown intermediate sensitivity to Aztreonam.
- TEM-1  $\beta$ -lactamase was found in all *P. aeruginosa* isolates

## References



## Acknowledgment

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