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### Introduction

The emergence of multidrug-resistant bacteria (MDRB) represents a major public health challenge, often exacerbated by the inappropriate use of antibiotics (ATB). This study aimed to assess the relationship between antibiotic consumption and the evolution of MDRB rates in an orthopedic institute over a three-year period.

### Materials and methods

A retrospective study was conducted in the pharmacy department between January 2022 and December 2024. Data on antibiotic consumption were extracted from the STKMED software and expressed as Defined Daily Doses (DDD) per 1000 Hospitalization Days (HD). Microbiological data were collected using the MicroScan WalkAway 40 plus system. Statistical analyses were performed with Excel 2021 and SPSS version 25. Pearson's correlation test was used to examine associations between antibiotic consumption and MDRB rates.

### Results

The overall MDRB rate over the three-year period was 15.82% peaking at 18.56% in 2024 (figure 1). Extended-spectrum beta-lactamase (ESBL)-producing Enterobacteriaceae were the most frequent isolates (40.58%) (figure 2). Antibiotic consumption reached its highest level in 2023 with 31,744,939 DDD/1000 HD (figure 3).

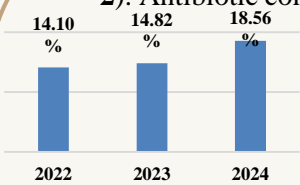


Figure 1: MDRB rate

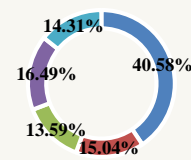


Figure 2: Frequency of bacteria

- ESBL producing Enterobacteriaceae
- Hyperproducing cephalosporinase-producing Enterobacteriaceae
- Carbapenemase-producing Klebsiella pneumoniae
- MRSA
- Others

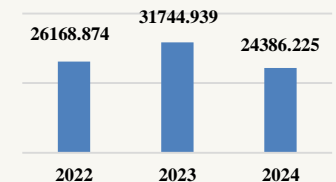


Figure 3: Antibiotic consumption in DDD/1000HD

The highest DDD values were observed for glycopeptides (23,592.466 DDD/1000 HD) followed by carbapenems (18,378.767 DDD/1000 HD) (figure 4). MDRB distribution by department showed the highest rates in the infectious diseases unit (33.152%) followed by external consultation service (13.587%). Antibiotic consumption was also highest in the infectious diseases unit (58,241.020 DDD/1000 HD), followed by the intensive care unit (6,197.793 DDD/1000 HD) (figure 5).

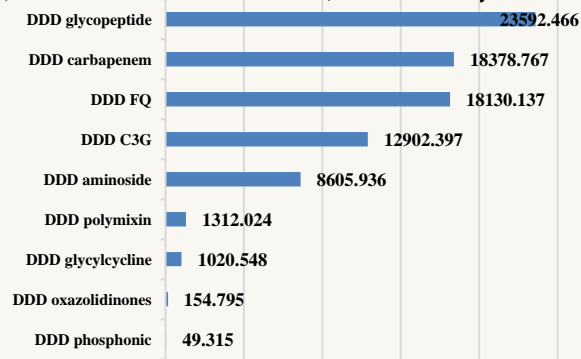


Figure 4: DDD of ATB classes in DDD/1000HD

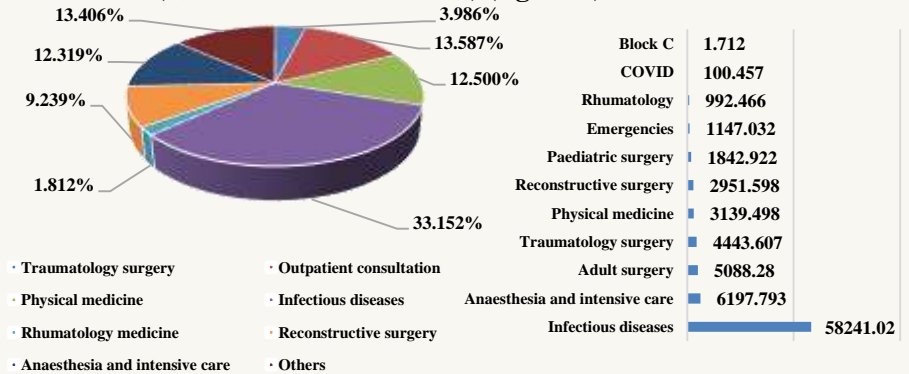


Figure 5: Distribution of MDRBs by service and their ATB consumption in DDD/1000HD

Significant correlations were found between MDRB rates and fluoroquinolone use ( $p < 0.01$ ) as well as oxazolidinone use ( $p = 0.014$ ). Moreover, carbapenemase-producing *Klebsiella pneumoniae* correlated significantly with carbapenem consumption ( $p < 0.01$ ), and methicillin-resistant *Staphylococcus aureus* (MRSA) rates were associated with glycycline use ( $p = 0.041$ ) (figure 6)

	DDD aminoside	DDD C3G	DDD carbapenem	DDD FQ	DDD glycopeptide	DDD glycycline	DDD phosphonic	DDD polymixin	DDD oxazolidinones
MDRAB rate	0,52	0,5	0,18	0,64	0,94	0,083	0,98	0,51	0,25
MDRB rate	0,91	0,74	0,88	<0,01	0,57	0,15	0,61	0,17	0,014
Hyperproducing	0,16	0,65	0,67	0,89	0,86	0,78	0,6	0,16	0,78
ESBL-E rate	0,17	0,51	0,45	0,32	0,38	0,58	0,5	0,11	0,36
VRE rate	0,98	0,79	0,071	0,72	0,19	0,6	0,57	0,9	0,12
KPC rate	0,97	0,87	<0,01	0,13	0,25	0,64	0,3	0,42	0,84
MRPA rate	0,69	0,63	0,62	0,15	0,17	0,065	0,33	0,31	0,026
MRSA rate	0,34	0,36	0,27	0,37	0,69	0,041	0,61	0,32	0,55
% reserve	0,62	0,33	0,17	0,64	0,52	0,081	0,29	<0,001	0,99
% access	0,029	<0,01	0,24	0,44	0,02	0,74	0,62	0,59	0,63
% watch	0,079	0,029	0,52	0,36	0,016	0,37	0,82	0,18	0,69

Figure 6: Statistical study

### Conclusion

This study highlights a concerning increase in MDRB rates in parallel with rising antibiotic consumption. These findings underscore the urgent need for implementing robust antimicrobial stewardship programs, reinforced by systematic pharmaceutical validation of prescriptions.