



## COLISTIN, TEICoplanin AND VANCOMYCIN USE PATTERNS AMONG INTENSIVE CARE UNIT PATIENTS AT KING HUSSEIN MEDICAL HOSPITAL AND PRINCESS HAYA MILITARY HOSPITAL IN THE JORDANIAN ROYAL MEDICAL SERVICES

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### ABSTRACT

**Introduction:** In the realm of healthcare, combating infectious diseases remains a perpetual challenge, particularly in intensive care units (ICUs) where critically ill patients are highly susceptible to infections. Antibiotics play a pivotal role in managing these infections, but their indiscriminate use has led to the emergence of antimicrobial resistance (AMR), posing a global public health threat. Against this backdrop, understanding antibiotic utilization patterns is paramount. This study explores and compares the utilization trends of Colistin, Teicoplanin, and Vancomycin in the ICUs of King Hussein Medical Hospital (KHMH) and Princess Haya Military Hospital (PHMH) over 2020-2021, aiming to inform evidence-based antimicrobial stewardship strategies.

**Objective:**The primary objective of this study is to analyze and compare the utilization patterns of Colistin, Teicoplanin, and Vancomycin among ICU patients at KHMH and PHMH over a two-year period (2020-2021). Specifically, the study aims to elucidate any disparities in prescribing practices between the two hospitals and identify potential factors influencing antibiotic utilization, contributing to the growing body of evidence on antimicrobial stewardship in Jordanian healthcare facilities.

**Methodology:**This retrospective study will analyze the electronic antibiotic prescription data from the ICUs of KHMH and PHMH over 2020-2021. Ethical approval will be obtained from institutional review boards. Descriptive statistical methods, including frequencies and growth percentages, will be employed to analyze the utilization patterns of Colistin, Teicoplanin, and Vancomycin. Comparative analyses also will be conducted to discern any significant differences in prescribing practices between the two hospitals.

**KEYWORDS:** Antibiotic utilization, Intensive Care Units (ICUs), Antimicrobial stewardship, Colistin, Teicoplanin, Vancomycin, Jordanian Royal Medical Services, Antibiotic resistance.

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## 1. INTRODUCTION:

Effective treatment options are necessary for infectious diseases, which have long been a burden in healthcare. This is especially true in intensive care units (ICUs), where critically ill patients are more susceptible to infection. As essential therapeutic agents, antibiotics are essential in the management of various infections. However, the overuse and indiscriminate use of antibiotics has resulted in the development of antimicrobial resistance (AMR), which is a serious threat to public health worldwide<sup>[1]</sup>.

In light of this growing challenge, it is critical to use antibiotics responsibly, which calls for a sophisticated knowledge of the various ways that antibiotics are used in healthcare settings<sup>[2]</sup>. The Kingdom of Jordan is always working to improve its healthcare infrastructure in order to satisfy the changing requirements of its population within the dynamic landscape of healthcare services. Under this framework, the Jordanian Royal Medical Services including the King Hussein Medical Hospital (KHMH) and Princess Haya Military Hospital (PHMH), which provide critical care services to patients throughout the country.

The high intensity and complexity of the intensive care unit (ICU) create unique challenges for the management of infectious illnesses. To maximize treatment results, reduce the danger of antimicrobial resistance (AMR), and raise patient survival rates, antibiotics must be chosen and administered carefully. In light of this, it becomes crucial to comprehend the antibiotic use patterns of KHMH and PHMH ICU patients<sup>[3]</sup>.

In the ICUs of KHMH and PHMH, this study aims to investigate and analyze the trends in the use of antibiotics, specifically Colistin, Teicoplanin, and Vancomycin, during a two-year period, from 2020 to 2021. This research intends to shed light on the factors influencing antibiotic utilization, identify potential areas for improvement, and aid in the development of evidence-based antimicrobial stewardship strategies by exploring the unique characteristics of those prescribing practices for antibiotics within these healthcare institutions.

Initiatives targeted at optimizing the use of antibiotics are essential for protecting public health

in light of the changing nature of infectious illnesses and the growing threat posed by antimicrobial resistance. In order to ensure the sustainable use of these life-saving drugs while maintaining their efficacy for future generations, it is crucial to promote a culture of responsible antibiotic stewardship through cooperative initiatives involving healthcare providers, legislators, and researchers<sup>[4,5]</sup>.

This study aims to protect the health and well-being of the population served by Jordanian Royal Medical Services by exploring the patterns of antibiotic utilization among ICU patients at KHMH and PHMH. The study also intends to improve clinical practice and policy decisions.

## 2. METHOD:

**2.1 Study Design:** This study involved a retrospective observational design and involved a review of electronic prescription data for selected antibiotics, primarily Colistin, Teicoplanin, and Vancomycin, obtained from the ICUs of KHMH and PHMH between 2020 and 2021. The institutional review boards of both institutions approved the study protocol, guaranteeing that it adhered to ethical guidelines.

**2.2 Data Collection:** A comprehensive dataset comprising information on Colistin, Teicoplanin and Vancomycin prescriptions during the years of 2020 and 2021 was extracted from electronic medical records.

**2.3 Data Analysis:** Descriptive statistical methods, including frequencies and growth percentages, were employed to analyze the patterns of those antibiotics utilization. Comparative graphical analyses between the two hospitals were conducted to discern any significant differences in prescribing practices.

## 3. RESULTS:

The analysis of antibiotic utilization patterns revealed intriguing findings, elucidating variations in prescribing practices between KHMH and PHMH. Table 1 presents the antibiotic utilization trends at KHMH, while Table 2 displays the corresponding data for PHMH.

	2020	2021
Colistin	198	388
Teicoplanin	52	88
Vancomycin	253	232

	2020	2021
Colistin	34	48
Teicoplanin	5	56
Vancomycin	276	362

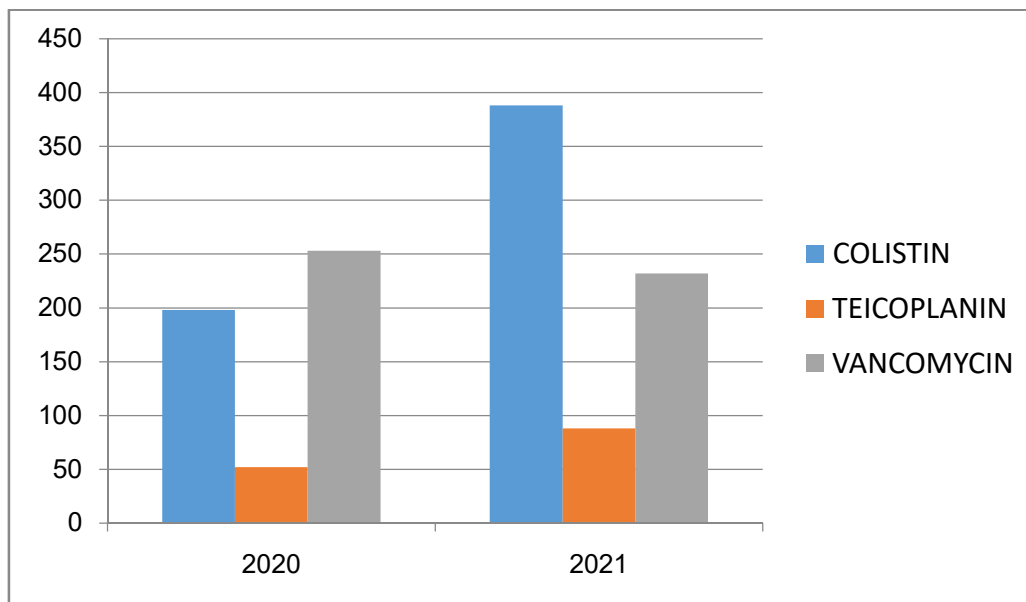


Figure1: KHHM

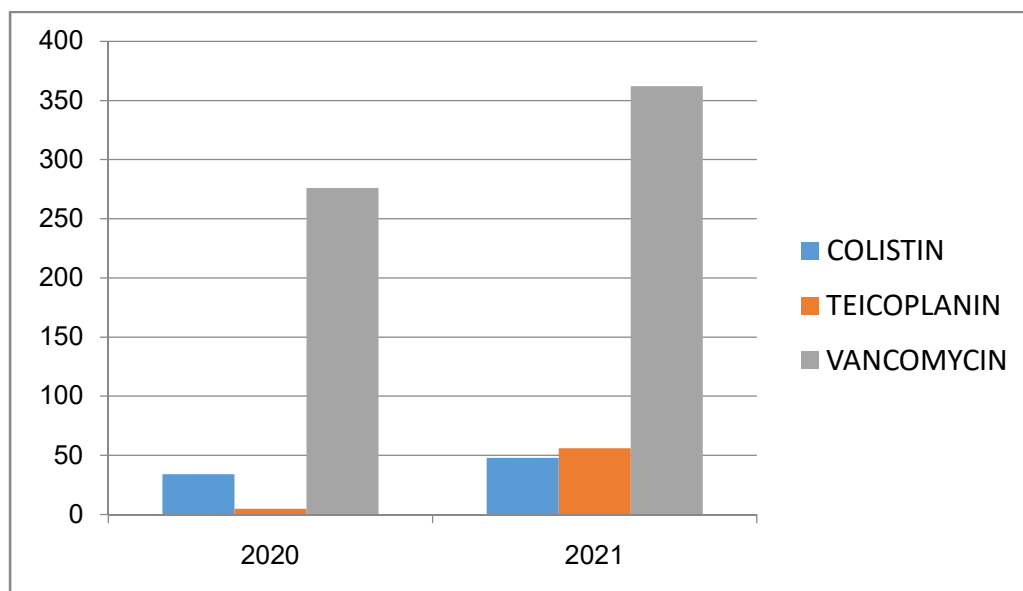


Figure2: PHMH

The changes in prescription rates and growth

percentages over the study period were also computed (Table 3 and 4)

	2020	2021	Growth percentage
Colistin	198	388	95.96%
Teicoplanin	52	88	69.23%
Vancomycin	253	232	-8.30%

	2020	2021	Growth percentage
Colistin	34	48	41.18%
Teicoplanin	5	56	1020.00%
Vancomycin	276	362	31.16%

#### 4. DISCUSSION;

**4.1 Comparative Analysis of Antibiotic Use:** A comparison of antibiotic prescribing procedures at Princess Haya Military Hospital (PHMH) and King Hussein Medical Hospital (KMH) uncovers interesting differences in patterns of consumption. Remarkably, Teicoplanin and Vancomycin usage increased at both institutions, suggesting a wider trend toward the use of glycopeptide antibiotics. The two institutions different growth rates, however, point to possible variations in therapeutic strategies and antimicrobial stewardship protocols. The significant rise in Teicoplanin use at PHMH, which increased by more than 1000% between 2020 and 2021, is of particular importance. This startling increase calls for more research into the underlying causes of the abrupt increase, as well as the consequences for antimicrobial resistance and patient care.

**4.2 Interpretation of Growth Percentages and Trends:** The growth percentages provide more detailed information about the changing antibiotic usage trends in the KMH and PHMH intensive care units. Notable in particular is the significant rise in Teicoplanin use at both hospitals. Prescriptions for Teicoplanin increased at KMH from 52 in 2020 to 88 in 2021, a growth rate of 69.23%. Similarly, Teicoplanin consumption at PHMH increased dramatically, with 56 prescriptions written in 2021 compared to just 5 in 2020—an exponential spike of 1020.00%. These striking increases in Teicoplanin use indicate a significant change in prescribing habits, which may be caused by factors such as changed clinical guidelines or patterns of antimicrobial resistance<sup>[6]</sup>.

On the other hand, although both institutions continued to prescribe Vancomycin often, KMH showed a minor decrease in the drug's use, from 253 prescriptions in 2020 to 232 prescriptions in 2021, which translates to a negative growth rate of -8.30%. This sudden fall calls for more investigation into the causes, which could include modifications to clinical practices, changes in patient demographics, or changes to the epidemiology of infectious diseases in the hospital context<sup>[7]</sup>. On the other hand, Vancomycin prescriptions at PHMH increased steadily; from 276 prescriptions in 2020 to 362 prescriptions in 2021, a growth percentage of 31.16% was seen. This increasing pattern shows how vital and relevant Vancomycin is as a primary antibiotic for treating severe Gram-positive infections in intensive care unit patients.

Additionally, the data shows that KMH and PHMH utilized Colistin at different rates. The degree of increases in Colistin prescriptions varied considerably across the two institutions. Colistin use at KMH increased by 95.96%, from 198 prescriptions in 2020 to 388 prescriptions in 2021, almost doubling. By contrast, PHMH saw a more gradual increase in the number of prescriptions for Colistin, from 34 in 2020 to 48 in 2021, or a growth rate of 41.18%. The need for specialized interventions to maximize Colistin use and reduce the risk of antimicrobial resistance is highlighted by these variances in Colistin prescribing patterns, which may be the result of changes in local epidemiology, resistance profiles, or institutional antimicrobial stewardship strategies<sup>[8]</sup>.

**4.3 Factors Influencing Antibiotic Prescribing:**

A wide range of factors, such as hospital-specific policies, antimicrobial resistance profiles, patient demographics, and therapeutic indications, may be responsible for the reported discrepancies in antibiotic utilization. Variations in prescribing practices may also be influenced by variations in healthcare delivery systems, the availability of resources, and doctor preferences. For example, differences in the frequency of multidrug-resistant organisms or various approaches to empirical treatment for severe infections could account for the disparity in Colistin utilization. Comprehending these variables is essential for customizing interventions aimed at optimizing the utilization of antibiotics and reducing the likelihood of antibiotic resistance<sup>[9,10]</sup>.

**4.4 Implications for Antimicrobial Stewardship:**

The results highlight how crucial it is to put in place efficient antimicrobial stewardship programs in order to encourage responsible antibiotic usage and enhance patient outcomes. Targeted interventions have the potential to improve antibiotic prescribing patterns in intensive care unit (ICU) settings. Examples of these interventions include antimicrobial formulary restrictions, educational initiatives, and antimicrobial susceptibility testing. Furthermore, multidisciplinary collaboration and the advancement of antimicrobial stewardship initiatives can be facilitated by the formation of antibiotic stewardship teams that include microbiologists, clinical pharmacists, and experts in infectious diseases<sup>[2,5]</sup>.

**4.5 Clinical Implications and Future Directions:**

The patterns in antibiotic use that have been noted have important therapeutic ramifications for treating infections in patients who are severely ill. The significant rise in prescriptions for Vancomycin and Teicoplanin highlights the continued significance of glycopeptide antibiotics in the targeted and empirical management of Gram-positive infections, especially in light of the growing antimicrobial resistance. To guarantee suitable prescribing practices and stewardship of this priceless antibiotic resource, however, the disproportionate development in Teicoplanin

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utilization at PHMH calls for close examination and additional research.

Likewise, the divergent trends in Colistin usage between KMH and PHMH underscore the necessity of customized antimicrobial stewardship measures to maximize the application of this last-resort antibiotic while reducing the possibility of resistance development. Subsequent investigations ought to concentrate on clarifying the factors that contribute to variances in antibiotic prescribing, such as hospital-specific practices, regional patterns of resistance, and the prescribing behaviors of physicians. Evidence-based treatments for the promotion of prudent antibiotic use in intensive care units (ICUs) require longitudinal research assessing the effects of stewardship initiatives on antibiotic prescribing practices and patient outcomes.

**5. CONCLUSIONS:**

This study adds to the expanding body of knowledge on antibiotic stewardship in Jordanian healthcare institutions by offering insightful information on the antibiotic consumption patterns among ICU patients at KMH and PHMH. The results highlight the necessity of keeping an eye on antibiotic use and placing customized interventions in place to strengthen antimicrobial stewardship initiatives. Subsequent investigations ought to concentrate on clarifying the complex factors that influence the prescription of antibiotics and assessing the effects of stewardship initiatives on patient results.

**Limitations of the Study:** A number of limitations should be taken into account, such as the study's retrospective design and any potential error in data abstraction process from electronic medical records. Furthermore, it's possible that the study's conclusions won't apply to other different healthcare environments or geographical areas. However the alleviation of these constraints may be possible via comprehensive research methodologies and cross-center cooperation is vital in order to progress our comprehension of antibiotic prescription procedures in intensive care units.

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