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Prescribing Practices of Broad-Spectrum Antibiotics in Tertiary Care Hospital

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Abstract: *Antibiotics are chemical substances produced by microorganisms. This study aims to find the prescribing practices of broad-spectrum antibiotics in tertiary care hospitals. It is a descriptive observational chart review of patients who have been prescribed broad-spectrum antibiotics in Lady Reading Hospital, Peshawar and data is collected using a standardized chart obtained from the World Health Organization and then analyzed using software such as Microsoft Excel and Statistical software. The results suggested that the frequency and percentage of the broad spectrum antibiotics are high and most broad-spectrum antibiotics prescribed are empirical. Furthermore, the study suggests that educational programs such as antibiotics stewardship programs should be utilized to educate the prescriber in the hospital, which aims to reduce the risks and various complications associated with the use of broad-spectrum antibiotics. Culture samples are required before administration of antimicrobials. Frequent reassessment of the patient's condition and antimicrobial therapy may be indicated.*

Key Words: Antibiotics , Broad-spectrum ,Prescribing practices ,Tertiary care hospitals, Descriptive observational , Chart review , Empirical prescription , Antibiotics stewardship , Culture samples , Antimicrobial therapy

Introduction

Chemicals known as antibiotics are created by living things, usually microbes, and they are harmful to other microorganisms. The production of antibiotics is frequently attributed to soil microorganisms, and these organisms likely use antibiotics to regulate the growth of rival bacteria in a complicated environment like soil. Both bacteria and fungi are microorganisms that can produce antibiotics that help prevent or treat disease (2014). A mold called Penicillium notatum had contaminated the culture, and Scottish bacteriologist Alexander Flemming discovered in 1928 that this had adversely affected bacterial colonies growing on a culture plate. In order to create semisynthetic forms of penicillin, scientists experimented with adding different chemical groups to the molecule's core towards the end of the 1950s. The Centers for Disease Control and Prevention (CDC) report that over half of hospital

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antibiotic prescriptions for specific events did not follow approved prescribing guidelines. 79% of patients with community-acquired pneumonia, 77% of patients with urinary tract infections, 47% of patients prescribed fluoroquinolone therapy, and 27% of patients prescribed intravenous vancomycin antibiotics did not support the prescription of antibiotics (Cochise, 2020). A class of antibiotics known as broad-spectrum antibiotics targets both gram-positive and gram-negative bacterial species to combat a wide variety of disease-causing germs. Their propensity to affect the various bacterial groupings is frequently used to group them. For medication to be used rationally, people must receive it at the lowest possible cost to them and the community, for a sufficient amount of time, in doses suitable for their unique needs, and according to their clinical demands. Up to 70% of patients in Pakistan are prescribed antibiotics, and the country has a large supply of antibiotics as well as a significant rate of self-medication. In Pakistan, Over 50,000 products have been registered, which is excessive; only 15% of promotional brochures meet WHO guidelines; over 50% of people, according to various studies and surveys, self-medicate; a high number of quacks in the nation; and unjustified or misleading advertisements. More than three medications are recommended for each patient, and 70% of patients receive antibiotic prescriptions. General Practitioners (GPs) and public sector hospitals are more likely to use these drugs irrationally and indiscriminately, with a preference for expensive broad-spectrum antibiotics (Fatima, 2018). Most Pakistani public and private hospitals lack an antibiotic policy or antibiotic stewardship program (ASP). Basic hygiene and inappropriate antibiotic usage are two factors that undermine infection prevention and control, or IPC. Regulations like the national AMR surveillance system are absent, and microbiology lab standards are nonexistent. Professionals in healthcare do not work together very well. The quality of vaccines and antibiotics, the absence of data on antibiotic consumption, financial mismanagement, and the lack of ongoing implementation of IPC programs in healthcare settings are further challenges (Usluer, 2005). This study is to look into the percentages of broad-spectrum antibiotics prescribed in various medical units at Lady Reading Hospital in Peshawar as well as the processes surrounding their prescribing.

Objectives

- To find the proportion of broad-spectrum antibiotics prescribed in hospitals.
- To find out how often broad-spectrum antibiotics are prescribed in hospitals.
- Assessment of empirical and non-empirical use of antibiotics within the hospital.
- Indication mentioned in notes.

Methodology

This study is a descriptive observational chart review of patients who have been prescribed broad-spectrum antibiotics in Lady Reading Hospital. The study utilizes standardized data collection form to collect patient chart data, including Patient demographic information, antibiotic prescriptions, their percentage and frequency, and whether the prescription was based on CST.

The data collection form was taken from the official website of the World Health Organization.

Study Type

Descriptive Observational Study, performed on patients who were admitted to the hospital.

Study Setting

- The study was conducted in Lady Reading Hospital, Peshawar, a tertiary care hospital that receives patients from across the province.
- Data was collected from various medical units including the Medical B Female and Medical C female units, Cardiology, and Intensive care units.

Technique for Sampling

Convenient sampling without probability.

Size of Sample

35 cases were collected from different medical units including Medical C female, Medical B female, Cardiology, and intensive care unit (ICU).

Inclusion Criteria

- Patients who have been prescribed broad-spectrum antibiotics during their stay in hospital.
- Patients of all ages and genders, who have been admitted to the hospital patients who have confirmed or suspected infection require antibiotic treatment.

Exclusion Criteria

- Patients who are not prescribed broad-spectrum antibiotics during hospital stay.
- Patients who receive broad-spectrum antibiotics for less than 24 hours.
- Patients with incomplete medical records, including missing documentation.

Collection of Data

Medical records were reviewed, with the help of a questionnaire designed by the World Health Organization for broad-spectrum antibiotic consumption. The questionnaire consists of the following;

- Patient s demographics.
- Clinical profile.
- Treatment is targeted or is empiric.

Data Analysis

Data was put into Excel Sheet which was then imported to SPSS, a statistical software for analysis.

- Frequency of prescription of antibiotics.
- Ward-wise percentage of broad-spectrum antibiotics.
- To assess whether the Antibiotic prescription is based on a Culture sensitivity test.

Results

The frequency & percentage of prescribed antimicrobials in medical units

Table 3.1

Shows the Frequency & Percentage of Prescribed Antimicrobials

Antimicrobial name	Frequency	Percent
Amoxicillin/clavulanic acid	1	2.9
Azithromycin 500mg, Ceftriaxone 1g	1	2.9
Cefazolin 1g	1	2.9
Cefoparazone Sulbactam 1g	2	5.7
Cefotaxime	1	2.9
Ceftazidime 1g	1	2.9
Ceftriaxone 1g	6	17.1
Ceftriaxone 2g	1	2.9
Ceftriaxone 2g Vancomycin 1g	1	2.9
Clindamycin	1	2.9
Colistimethate	1	2.9
Gentamycin 40mg	1	2.9
Linezolid 600mg	1	2.9
Meropenem 1g	11	31.4

	Frequency	Percent
Piperacillin Tazobactam 4.5g	2	5.7
Tigecycline 50 mg	2	5.7
Vancomycin 1g	1	2.9
Total	35	100.0

Table 3.1 shows the frequency and percentage of various antibiotics that are prescribed in the hospital, in which Meropenem and ceftriaxone have the highest frequency and percentage. Antibiotics prescribed in each medical unit:

Figure 3.1

Antibiotics Prescription in each Medical Unit.

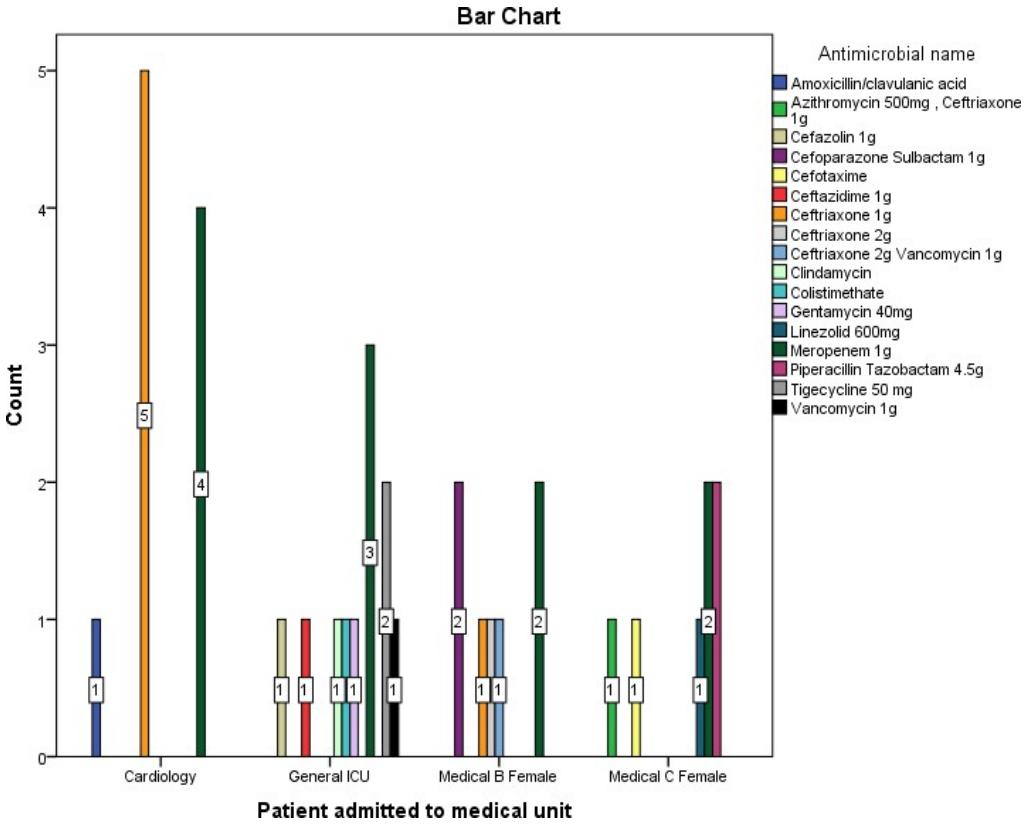
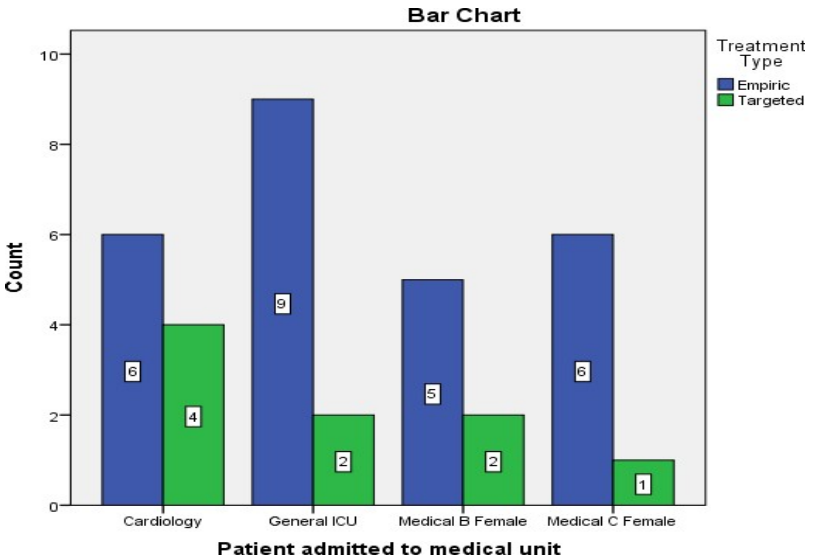


Figure 3.2

Figures 3.1 and 3.2 show the prescription of broad-spectrum antibiotics in each medical unit in the hospital. Treatment is targeted or empirical



Treatment is Targeted or Empirical (Graphical Representation) Table 3.2: Treatment is Targeted or Empirical (Table form)

Table 3.2

Patients admitted to medical unit Treatment Type Crosstabulation

Count			
	Treatment Type		Total
	Empiric	Targeted	
Patients admitted to Cardiology	6	4	10
Medical unit General ICU	9	2	11
Medical B Female	5	2	7
Medical C Female	6	1	7
Total	26	9	35

Tables 3.2 and 3.3 represent whether the antibiotics given were based on the Culture sensitivity test (CST) or were given empirically.

Specimen Collected for Culture Sensitivity Test (CST)

Table 3.3

The Specimen Collected for Culture Sensitivity Test

	The culture sent to a lab					Total
	Blood	Not Done	Sputum	Urine	Wound	
Cardiology	1	4	1	1	3	10
General ICU	4	5	2	0	0	11

Patient admitted to medical unit		1	5	0	1	0	7
	Medical B Female	0	3	1	2	1	7
Medical C FemaleTotal		6	17	4	4	4	35

Table 4.3 shows the different types of samples collected from the patient.

Indication Mentioned in Notes

Table 3.3

Shows Whether Indication is mentioned in Notes

	Frequency	Percent
No	20	57.1
Valid Yes	15	42.9
Total	35	100.0

According to Table 3.4 in 57% of prescriptions, the indication was not mentioned.

Comparison with a Study Conducted in Karachi, Pakistan

A similar study was conducted in a tertiary care hospital in Karachi, Pakistan. Following are the results of that study. Comparison of Culture sensitivity test data:

In their study in Karachi, a total of 685 cases were collected in CST was performed for 173 patients which is 25.3% of the data (Fatima, 2018).

In Lady Reading Hospital, a total of 35 cases were collected in which CST was performed for only 9 patients which is 25.7% of the data.

Comparison of Antibiotics Prescribed

According to the overall prescribing trend in Karachi, cephalosporins (37%) were the most commonly prescribed antibiotics, followed by quinolones (11%), either alone or in combination (Fatima, 2018).

In Lady Reading Hospital the most commonly prescribed antibiotics were Meropenem 31%, and the second most prescribed antibiotic was ceftriaxone 17%.

Discussion

Irrational prescribing practices of broad-spectrum antibiotics have led to a lot of complications in the form of antibiotic resistance, increased hospital stays, and thus increased cost of therapy. An observational descriptive study was conducted to determine the prescribing practices of broad-spectrum antibiotics in a tertiary care hospital setting based on data collected from patient medical records. This utilization of antibiotics was analyzed in patients of various medical units concerning the percentage and frequency of broad-spectrum antibiotics prescribed as well as the availability of culture sensitivity tests. In this study, the data of a total of 35 patients was collected from medical units namely medical b female, medical c female, cardiology unit, and intensive care unit. It was observed that different medical units had varying prescribing practices. Some medical units performed culture sensitivity tests (CST) for targeted therapy, such as

Cardiology, with an 11% CST performance rate, while other medical units did not perform CST. For example, the ICU had a 25.7% rate of empiric treatment.

The current study findings suggest that most of the broad-spectrum antibiotics prescribed are empiric which can lead to a lot of complications as

mentioned above, one of the factors for this empiric prescription is the limited resources in our country and the low use of diagnostic tests, as these tests are expensive. A Previous report from Karachi suggested that 75% of broad-spectrum antibiotics are empiric (Detail, 2022). Another study from Turkey suggested that 78.4% of antibiotics were prescribed as empiric treatment (Usluer, 2005).

There can be multiple reasons for an empiric prescription of antibiotics, either the prescriber is a specialist and the antibiotics prescribed empirically are based on local resistance patterns or there are very obvious signs of a particular disease. One of the reasons for this empiric prescribing is the hospitals themselves, to prevent any hospital-acquired infection, an empiric antibiotic is given to a patient as soon as he is admitted. The use of broad-spectrum antibiotics shall be limited instead use extended-spectrum antibiotics or use these antibiotics only after appropriate Microbiological screening.

Conclusions

The findings of this study suggest that educational programs such as antibiotics stewardship programs should be utilized to educate the prescriber in hospitals the aim of which is to reduce the risks and various complications associated with the use of broad-spectrum antibiotics. Culture samples are required before administration of antimicrobials. Frequent reassessment of the patient s condition and a short course of antimicrobial therapy may be indicated.

Limitations of the Study

The following are some of the limitations of my study;

i. Limited data was obtained from a few medical units.

ii. Limited time i.e. 1 month.

iii. Multiple parameters were not analysed instead the study was univariate. Supplementary material to this study:

The Annex Would Include the Following Data

1. Full Questionnaire
2. Raw Excel sheet data
3. Raw SPSS data

Full Questionnaire Patient Demographics

Name	Age	Gender	MR no.	Ward:

Clinical Profile

Treatment based on	C S T C R P P C

Culture Sent to Lab

Blood, Urine, Sputum, CSF, Wound, Not done.

Antimicrobial Name

Culture sensitivity Test (CST) done → Yes/No

Indication mentioned→ Yes/No Treatment→ Empheric or Targeted Microorganism Detected:

Surgical procedure during current admission → Yes/No

Previous hospitalization→ Yes/No, Unknown

Previous antibiotic treatment in less than a month → Yes/No, Unknown

Link to Raw Google Sheets

Patient data is in the form of an Excel sheet.

Raw SPSS Data

Figure 3.3

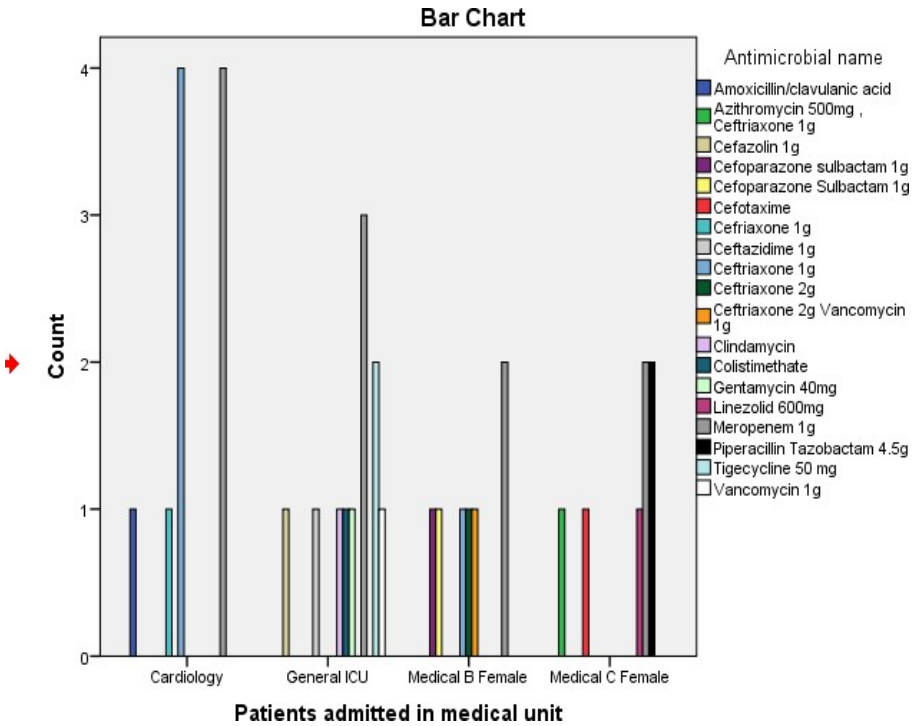


Table 3.4

*Patients admitted in medical unit * Treatment type crosstabulation count*

		Treatment Type		Total
		Empiric	Targeted	
Patients admitted in medical unit	Cardiology	6	4	40
	General ICU	9	2	11
	Medical B Female	5	2	7
	Medical C Female	6	1	7
Total		26	9	35

Figure 3.4

Antimicrobial name * Patient admitted to medical unit Crosstabulation

Statistics Count

		Patient admitted to medical unit				
		Cardiology	General ICU	Medical B Female	Medical C Female	Total
Antimicrobial name	Amoxicillin/clavulanic acid	1	0	0	0	1
	Azithromycin 500mg , Ceftriaxone 1g	0	0	0	1	1
	Cefazolin 1g	0	1	0	0	1
	Cefoparazone sulbactam 1g	0	0	1	0	1
	Cefoparazone Sulbactam 1g	0	0	1	0	1
	Cefotaxime	0	0	0	1	1
	Cefriaxone 1g	1	0	0	0	1
	Ceftazidime 1g	0	1	0	0	1
	Ceftriaxone 1g	4	0	1	0	5
	Ceftriaxone 2g	0	0	1	0	1
	Ceftriaxone 2g Vancomycin 1g	0	0	1	0	1
	Clindamycin	0	1	0	0	1
	Colistimethate	0	1	0	0	1
	Gentamycin 40mg	0	1	0	0	1
	Linezolid 600mg	0	0	0	1	1
	Meropenem 1g	4	3	2	2	11
	Piperacillin Tazobactam 4.5g	0	0	0	2	2
	Tigecycline 50 mg	0	2	0	0	2
	Vancomycin 1g	0	1	0	0	1
Total		10	11	7	7	35

Figure 3.5

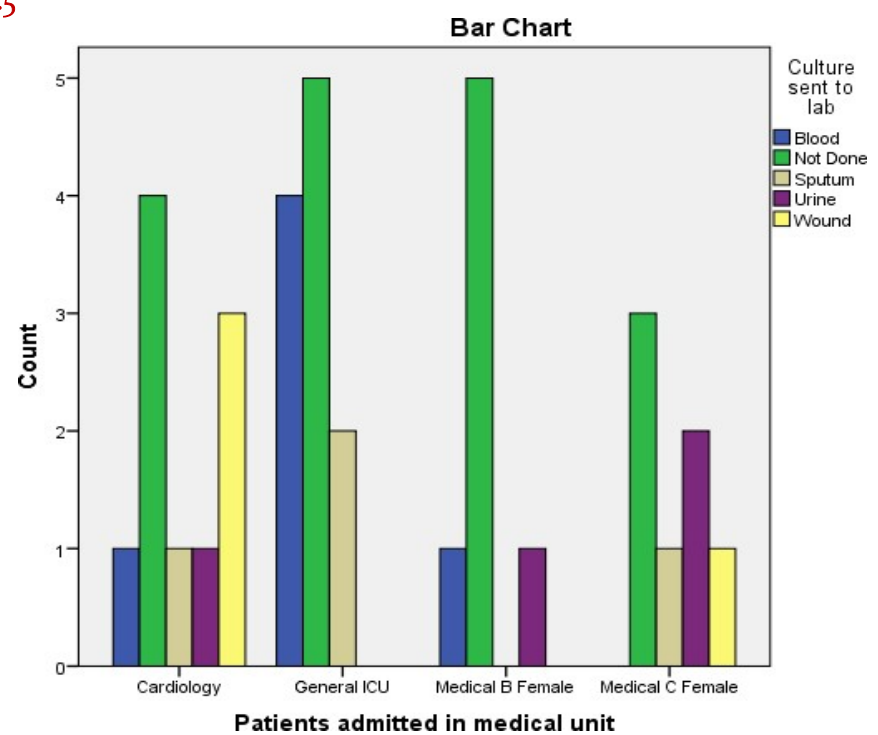


Table 3.5

*Patients admitted in medical unit * culture to lab crosstabulation Count*

		Culture sent to lab					
		Blood	Not done	Sputum	Urine	Wound	Total
Patients admitted in medical unit	Cardiology	1	4	1	1	3	10
	General ICU	4	5	2	0	0	11
	Medical B female	1	5	0	1	0	7
	Medical C Female	0	3	1	2	1	7
Total		6	17	4	4	4	35

Table 3.6

Frequency Table
culture sent to lab

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Blood	6	17.1	17.1	17.1
	Not Done	17	48.6	48.6	65.7
	Sputum	4	11.4	11.4	77.1
	Urine	4	11.4	11.4	88.6
	Wound	4	11.4	11.4	100.0
	Total	35	100.0	100.0	

Figure 3.6

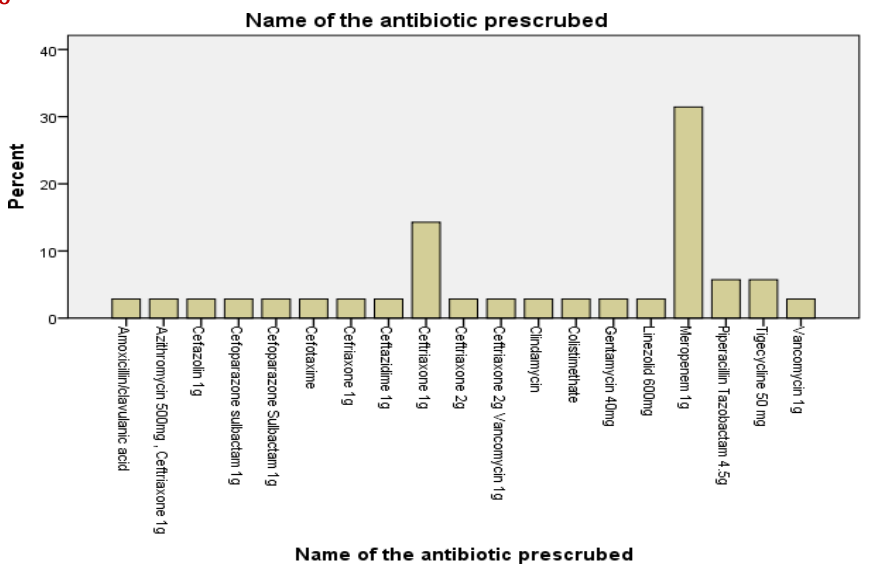


Figure 3.7

Antimicrobial name

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Amoxicillin/clavulanic acid	1	2.9	2.9	2.9
	Azithromycin 500mg , Ceftriaxone 1 g	1	2.9	2.9	5.7
	Cefazolin 1 g	1	2.9	2.9	8.6
	Cefoparazone sulbactam 1 g	1	2.9	2.9	11.4
	Cefoparazone Sulbactam 1 g	1	2.9	2.9	14.3
	Cefotaxime	1	2.9	2.9	17.1
	Cefriaxone 1 g	1	2.9	2.9	20.0
	Ceftazidime 1 g	1	2.9	2.9	22.9
	Ceftriaxone 1 g	5	14.3	14.3	37.1
	Ceftriaxone 2g	1	2.9	2.9	40.0
	Ceftriaxone 2g Vancomycin 1 g	1	2.9	2.9	42.9
	Clindamycin	1	2.9	2.9	45.7
	Colistimethate	1	2.9	2.9	48.6
	Gentamycin 40mg	1	2.9	2.9	51.4
	Linezolid 600mg	1	2.9	2.9	54.3
	Meropenem 1 g	11	31.4	31.4	85.7
	Piperacillin Tazobactam 4.5g	2	5.7	5.7	91.4
	Tigecycline 50 mg	2	5.7	5.7	97.1
	Vancomycin 1 g	1	2.9	2.9	100.0
	Total	35	100.0	100.0	

Table 3.7

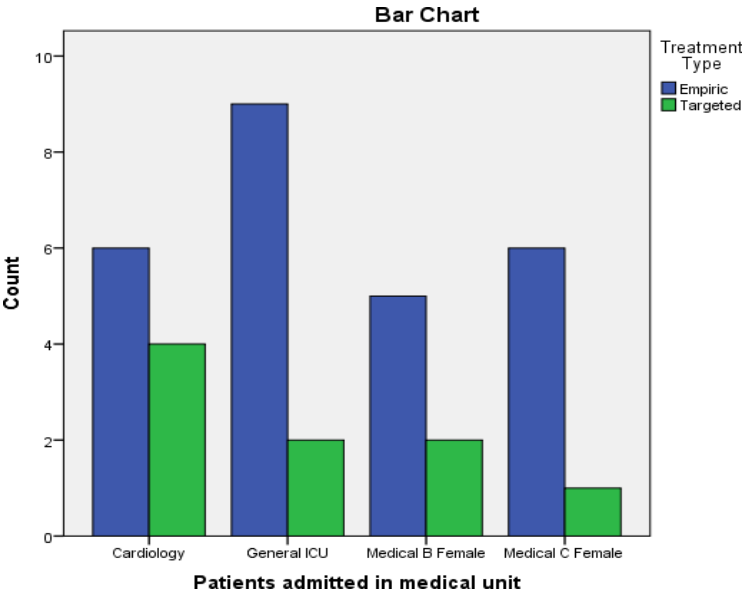
		Ward in which patient is admitted	Antimicrobial name
N	Valid	35	35
	Missing		0

Frequency Table

Ward in which patient is admitted

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cardiology	10	28.6	28.6	28.6
	General ICU	11	31.4	31.4	60.0
	Medical B Female	7	20.0	20.0	80.0
	Medical C Female	7	20.0	20.0	100.0
	Total	35	100.0	100.0	

Figure 3.8


Bar Chart
Treatment Type
Empiric
Targeted
Count
10
8
6
4
2
0
Cardiology
General ICU
Medical B Female
Medical C Female
Patients admitted in medical unit

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