DISSERTATION
ON

MONITORING THE CONSUMPTION OF ANTIBIOTICS IN A MULTI-SUPER SPECIALTY HOSPITAL

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INTRODUCTION

- Owing to the increased disease burden in India pertaining to bacterial origin, there has been a tremendous rise in antibiotic usage.
- In India, antibiotics constitute 51% of treatment plan & dependency in prognosis of health and 15.7% of the drug market (the largest therapy group) on consumption basis.
- An array of possible reasons for this overuse can be:
  - Lack of microbiological facilities.
  - Doctors prescribing antibiotics to any patients with a fever, taking it as a sign of bacterial infection
  - Patient expectations
  - Desire of pharmacists and some doctors to make a profit from drug sales
  - The public's lack of knowledge about the (in)appropriate use of antibiotics.

CONTD...

- Antimicrobial resistance (AMR) is resistance of a microorganism to an antimicrobial drug that was originally effective for treatment of infections caused by it.
- Hospitals were the birthplace of antimicrobial resistance (AMR) and continue to be a source of evolution and propagation.
- Impact
  - Increased morbidity & mortality
  - Increased cost of health care
  - Prolonged hospital stays
  - Limited treatment options (treatable infections → untreatable)

EARLY WORK

1960s

Drug utilisation studies in Northern Europe & UK

1966

Arthur Engel in Sweden and Pieter Siderius in Holland demonstrated the difference in sales of antibiotics in 6 European countries

1969

WHO organised its first meeting on ‘Drug Consumption’ in Oslo

Mid 1970s

Introduction of the uniform Anatomical Therapeutic Chemical (ATC) classification system

1975

First comprehensive national list of DDDs published in Norway

Northern European countries developed a new unit- DDD

1976

Establishment of Drug Utilization Research Group (DURG)

1982

Establishment of WHO Collaborating Centre for Drug Statistics Methodology

1996

Independent EuroDURG formally established

ATC/DDD System

- **The Anatomical Therapeutic Chemical Classification System with Defined Daily Doses (ATC/DDD)**
  - Prerequisite for national and international comparisons of drug utilization data
  - Drugs are divided into 14 main groups according to the organ or system on which they act and their chemical, pharmacological and therapeutic properties.
  - Basic principle: only one ATC code for each route of administration.

Drugs are classified at 5 levels:

ATC CODE		LEVELS
J	Anti-infective for systemic use	1st Anatomical main group
J01	Antibacterial for systemic use	2nd Therapeutic subgroup
J01M	Quinolone antibacterials	3rd Pharmacological subgroup
J01MA	Fluoroquinolone	4th Pharmacological/Chemical subgroup
J01MA12	Levofloxacin	5th Chemical substance

DDD: Defined Daily Dose

- Statistical measure of drug consumption defined by the WHO.
- *The DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults.*

$$Drug\ usage(DDDs) = \frac{Items\ issued \times Amount\ of\ drug\ per\ item}{DDD}$$

- Not to be confused with the therapeutic dose or with the dose actually prescribed by a physician for an individual patient.
- Assigned to each drug at the 5th level.
- To measure consumption along with international comparisons, a denominator i.e. bed days has been recommended.

KEY WORDS

- **Restricted antibiotics**: Prescribed and supplied only after approval from a Consultant Microbiologist. Pharmacists are required to confirm Microbiology approval or formulary indication before dispensing restricted antimicrobials. These are often broad-spectrum antibiotics those are effective against a wide variety of organisms
- **Unrestricted antibiotics**: Physicians do not need prior approval to prescribe these.

OBJECTIVES

- To monitor the consumption of antibiotics in a multi-super specialty, quaternary care hospital.
- To perform a comparative study between usage of restricted and unrestricted antibiotics.
- To perform a comparative study between the utilization of antibiotics in ICUs and wards.
- To compare with international standards
- To device a standardised tool for point prevalence evaluation of antibiotic use.

METHODOLOGY

STUDY DESIGN

Retrospective

STUDY DURATION

Period 1: July-August'13

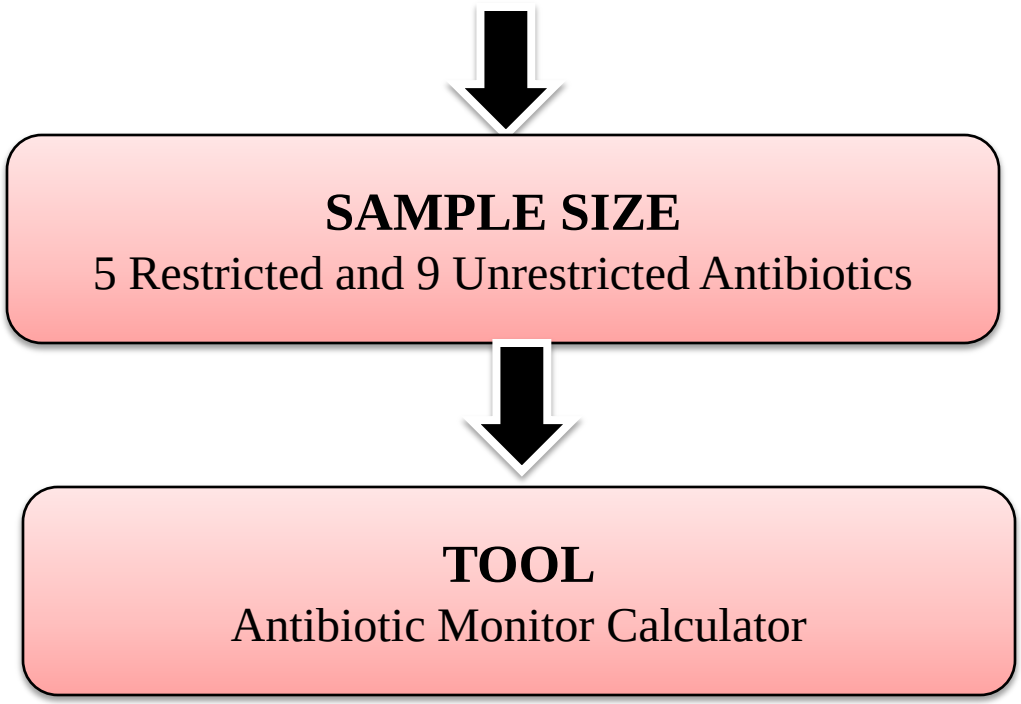
Period 2: February-March'14

SOURCE OF DATA

TrakCare and Oracle Software

SAMPLING TECHNIQUE

Purposive Sampling


SAMPLE SIZE
5 Restricted and 9 Unrestricted Antibiotics
TOOL
Antibiotic Monitor Calculator

APPROACH TO STUDY

	Main Antibiotic	Extra Salt	Total Quantity (oral)	Total Antibiotic (mg)
Amoxycillin	Amoxicillin (mg)	Clavnic Acid (mg)		
ADVENT 1G TABLET 125MG/875MG 1X4 CIPLA	875	125	5x4	17500
ADVENT 625MG TABLET 125MG/500MG 1X6 CIPLA	500	125	7x6	21000
AUGMENTIN 375 TABLET 250/125MG 1X6 GLAXO	250	125	1x6	1500
AUGMENTIN DUO SYRUP 30ML GLAXO	200	28.5	2x6	2400
				42400

Thus, total amoxicillin use by oral route= **42.4 g** which is to be entered in the Antibiotic Monitoring Calculator DDD- ICU Feb March.xls

ANALYSIS
&
INTERPRETATION

TOTAL USAGE OF RESTRICTED ANTIBIOTICS

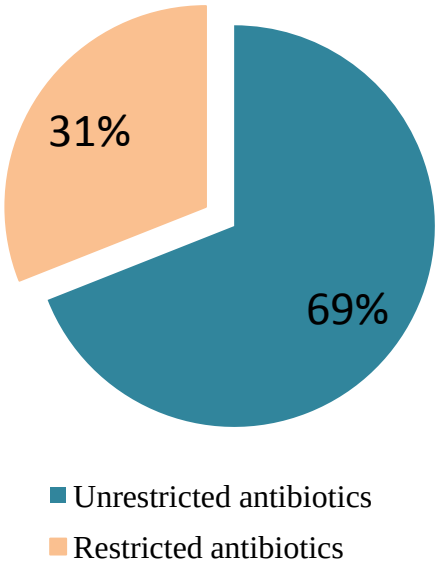
Name of A/B	DDD's (Period 1)	DDD per 100 bed days (Period 1)	DDD's (Period 2)	DDD per 100 bed days (Period2)	DDD (WHO)
Imipenem	131.5	**1.746**	138.1	↓ **1.57**	2
Colistin	977.3	**12.98**	414.7	↓ **4.715**	3
Linezolid	110.5	**1.467**	136	↑ **1.546**	1.2
Meropenem	619.3	**8.225**	761.5	↑ **8.658**	2
Teicoplanin	236	**3.134**	363.5	↑ **4.133**	0.4

TOTAL USAGE OF UNRESTRICTED ANTIBIOTICS

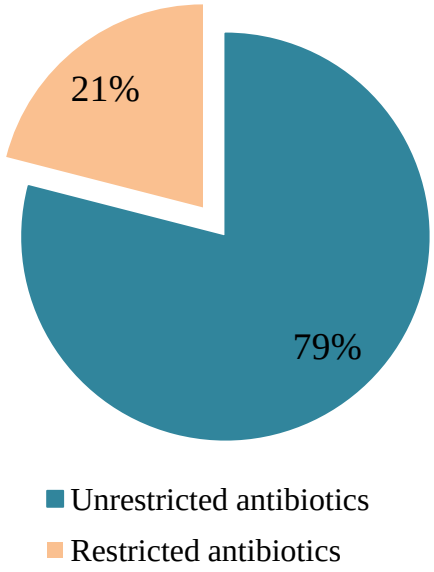
Name of A/B	DDD's (Period 1)	DDD per 100 bed days (Period 1)	DDD's (Period 2)	DDD per 100 bed days (Period2)	DDD (WHO)
Amoxicillin (oral)	317.3	**4.214**	495.9	↑ **5.638**	**1**
Amoxicillin (P/E)	810.3	**10.760**	1418	↑ **16.123**	**1**
Cefuroxime (oral)	678	**9.004**	638	↑ **11.757**	**0.5**
Cefuroxime (P/E)	714.5	**9.489**	998.3	↑ **13.286**	**3**
Ceftriaxone	1254.9	**16.665**	1851	↑ **21.561**	**2**
Cefotaxime	194.7	**2.586**	275.7	↑ **3.134**	**4**

Name of A/B	DDD's (Period 1)	DDD per 100 bed days (Period 1)	DDD's (Period 2)	DDD per 100 bed days (Period2)	DDD (WHO)
Cefazolin	76.2	**1.012**	67.5	↓ **0.767**	**3**
Clarithromycin (oral)	678	**1.567**	290	↑ **3.297**	**0.5**
Clarithromycin (P/E)	111.5	**1.481**	189	↑ **2.149**	**1**
Azithromycin	145.3	**1.930**	270.3	↑ **3.073**	**0.5**
Clindamycin	102	**1.355**	181.4	↑ **2.063**	**1.2**
Gentamycin	127	**1.687**	176.3	↑ **2.005**	**0.24**

DDDs/100 bed days in July-Aug



DDDs/100 bed days in Feb-March



Proportionate usage of restricted antibiotics has shown a downward trend

Overall usage of antibiotics has shown an upward trend (Increased by **10.32%**)

- But…..

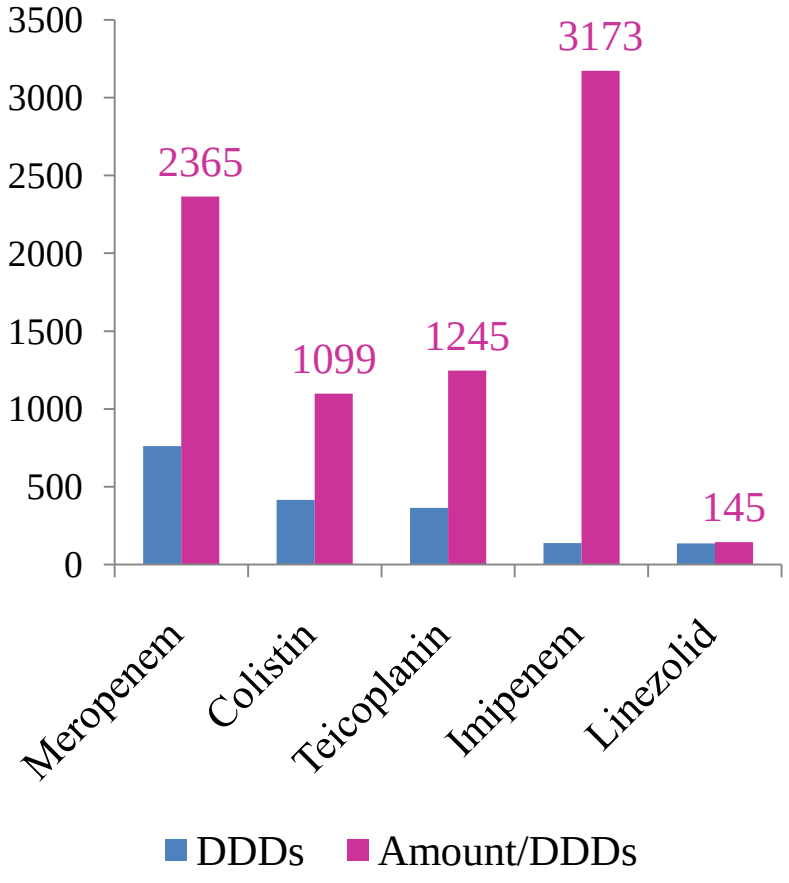
  Our Expenditure on antibiotics were :

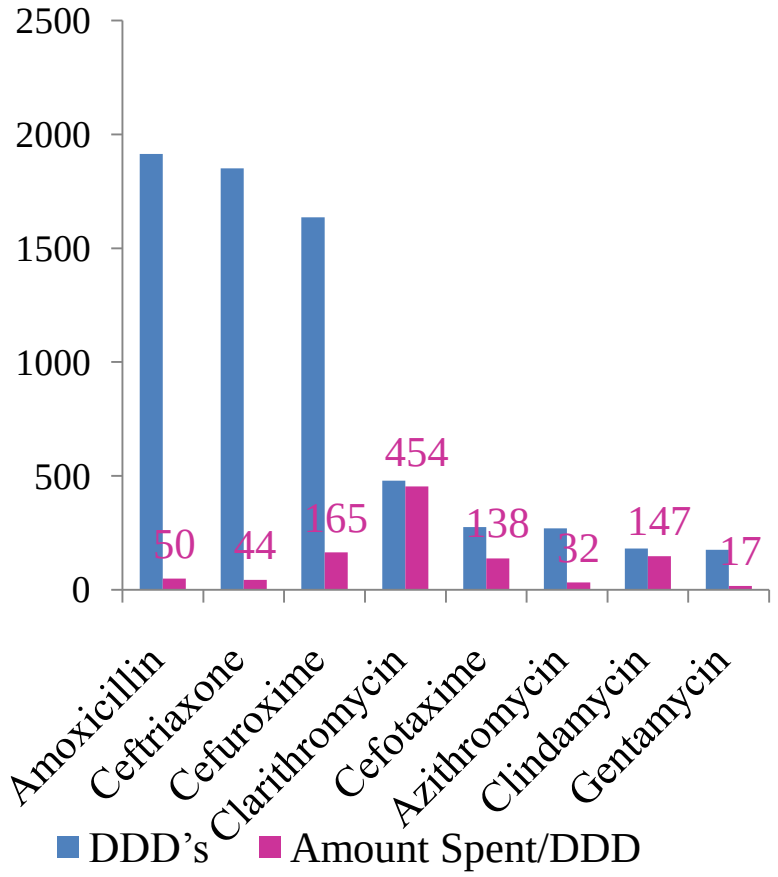
July-Aug’13: Rs. 39,93,558.61

Feb-March’14: Rs. 46,31,461.23

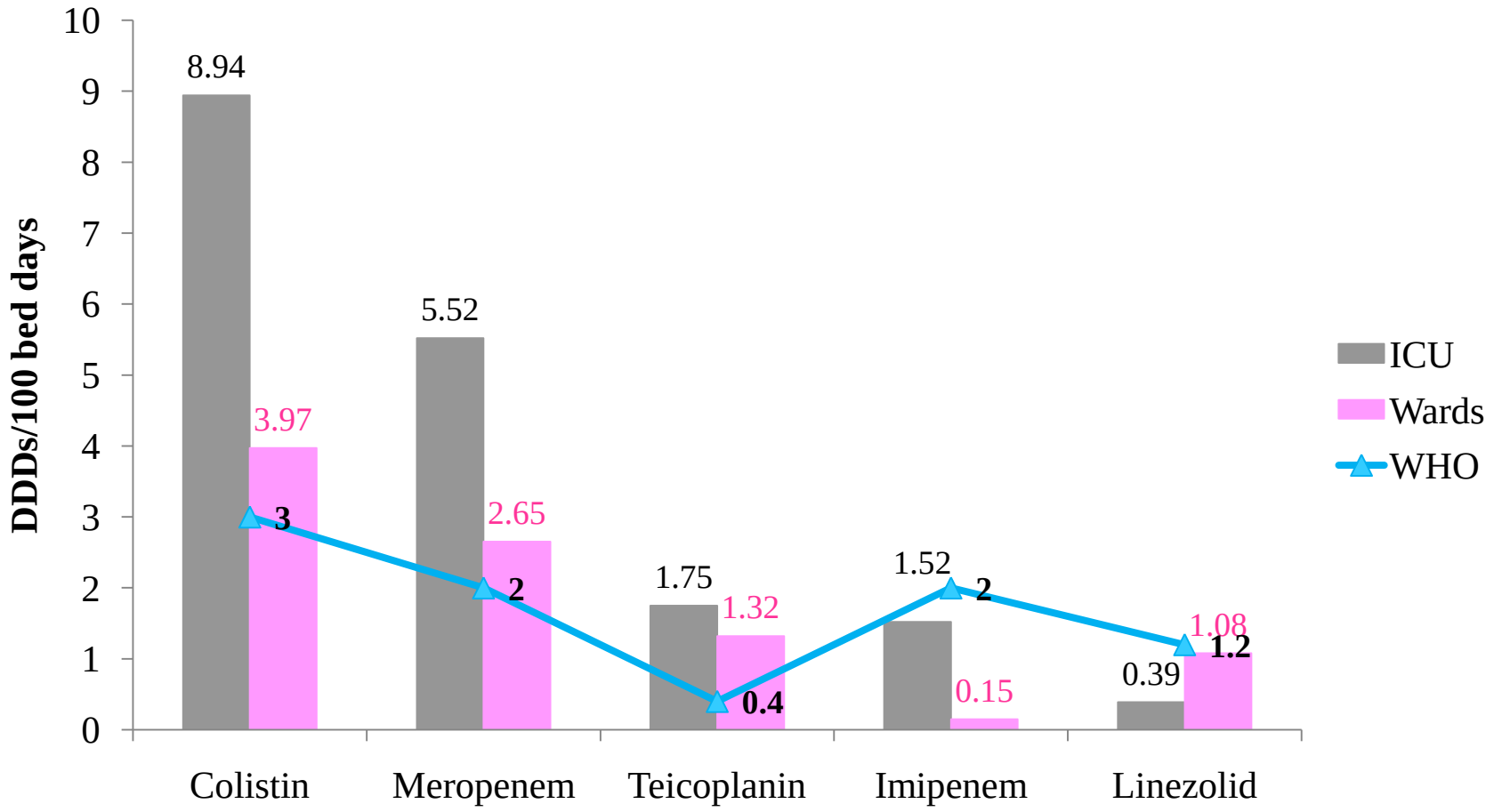
So we had an **increase in 16 % of our expenditure**

Amount Spend on Restricted Antibiotics > **Amount Spend on Un- Restricted Antibiotics**

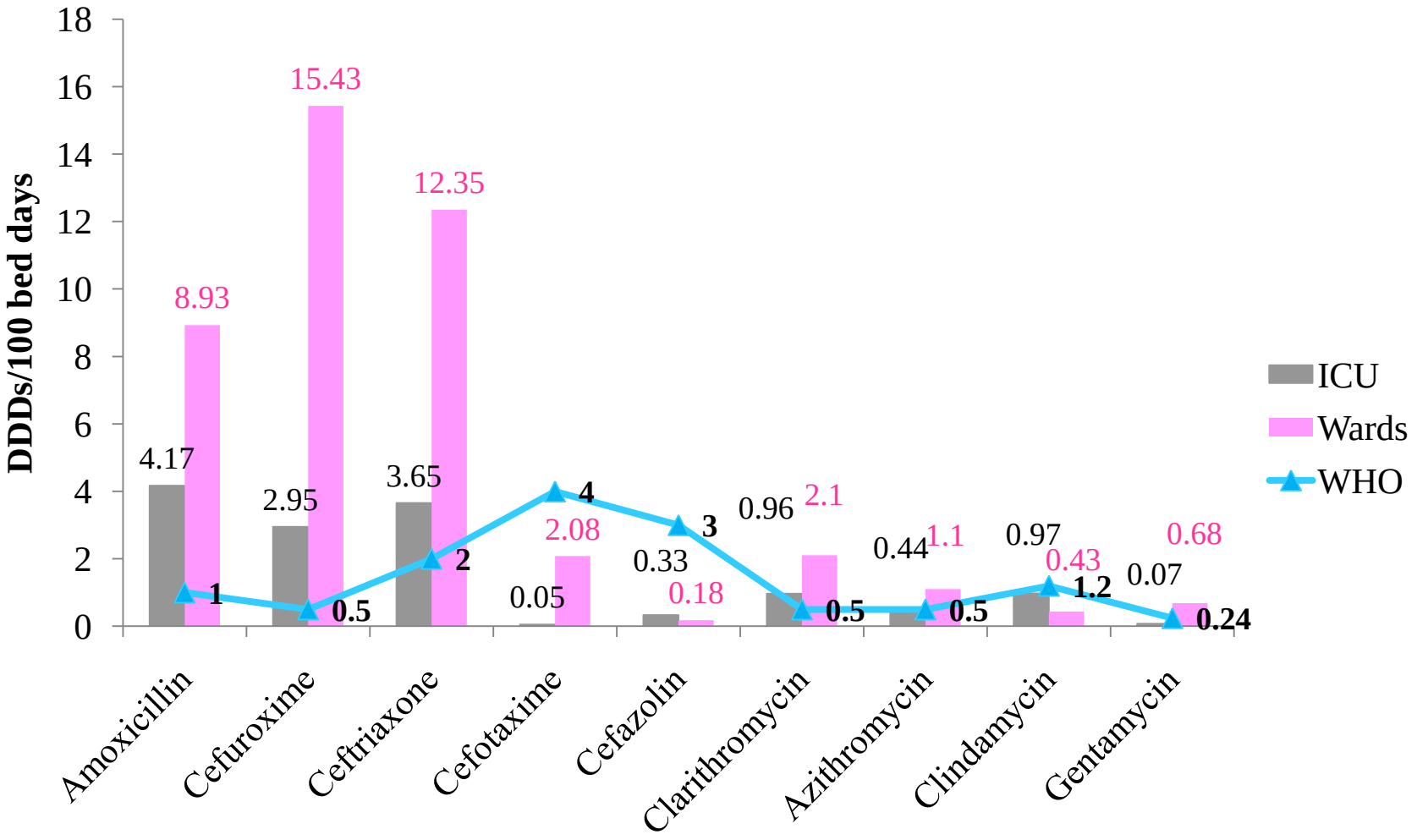




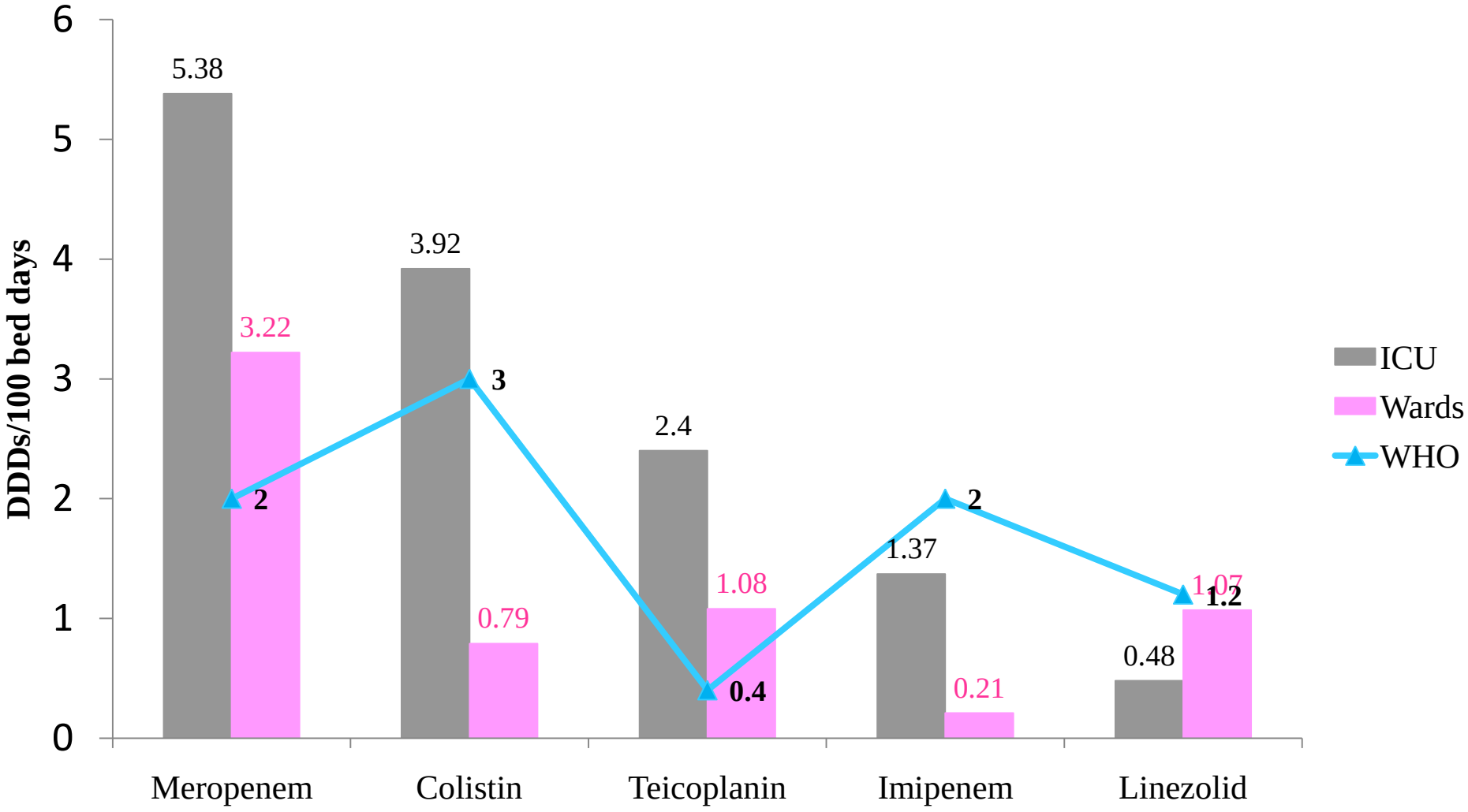
RESTRICTED ANTIBIOTIC USAGE (JULY-AUG)



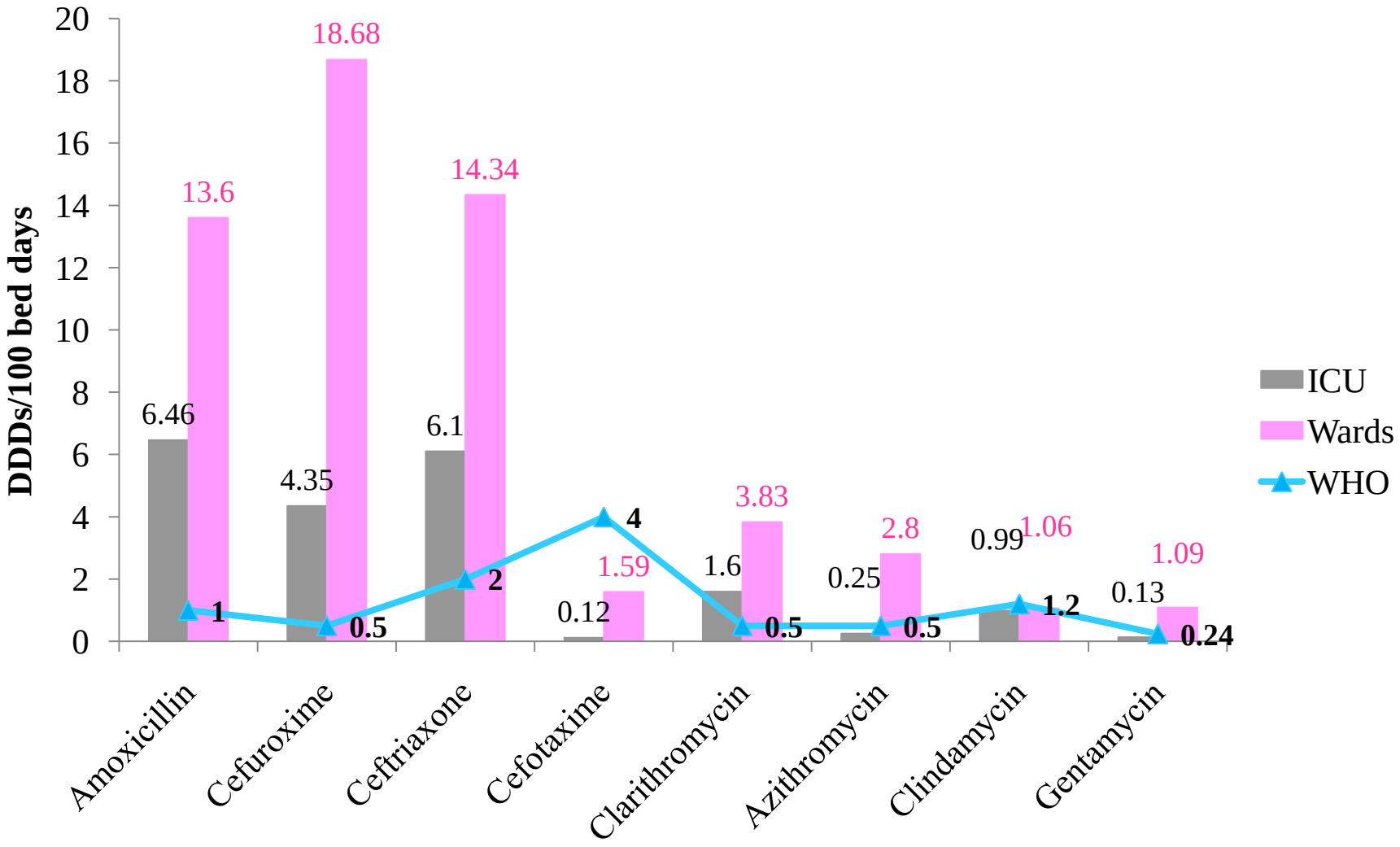
UNRESTRICTED ANTIBIOTIC USAGE (JULY-AUG)



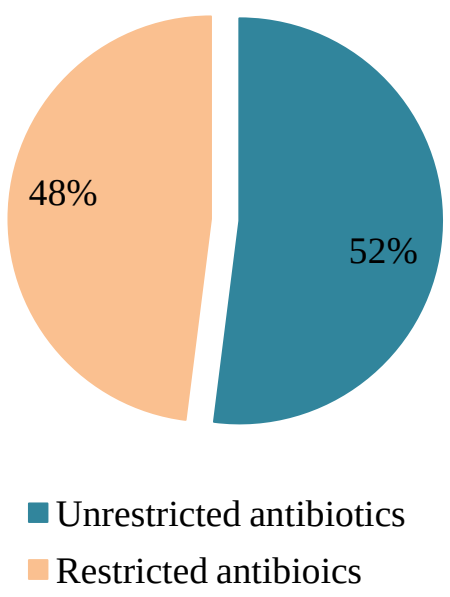
RESTRICTED ANTIBIOTIC USAGE (FEB-MARCH)



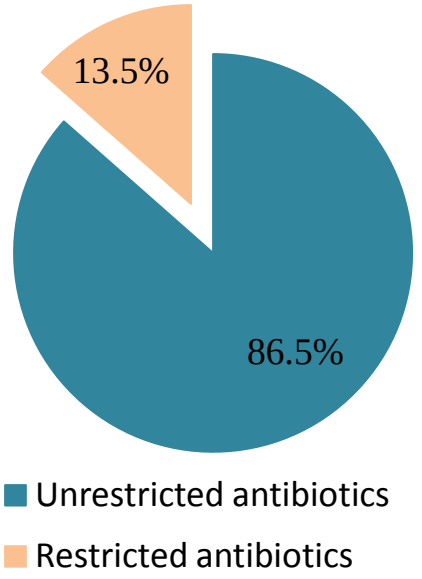
UNRESTRICTED ANTIBIOTIC USAGE (FEB-MARCH)



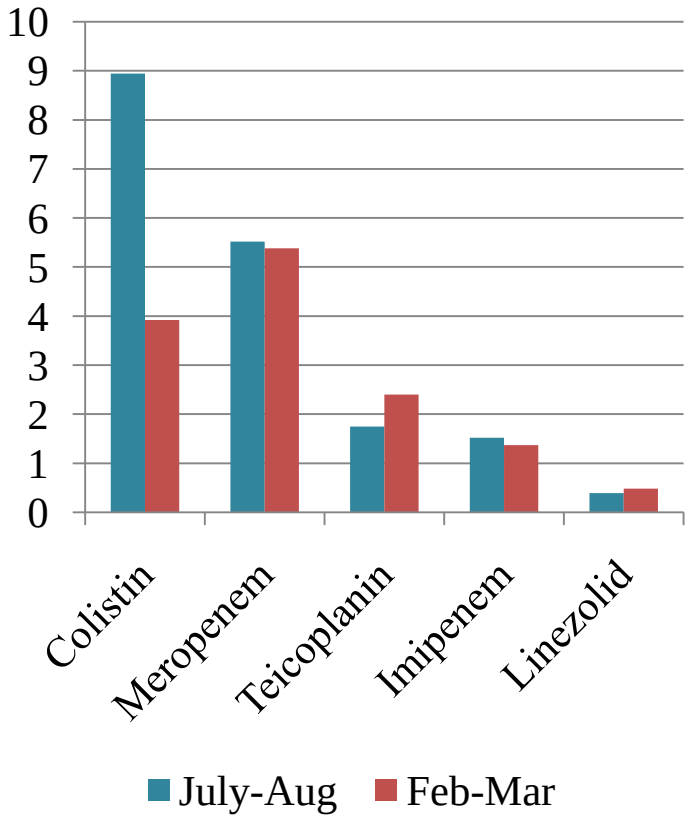
DDDs/100 bed days in ICUs (Combined 4 months)



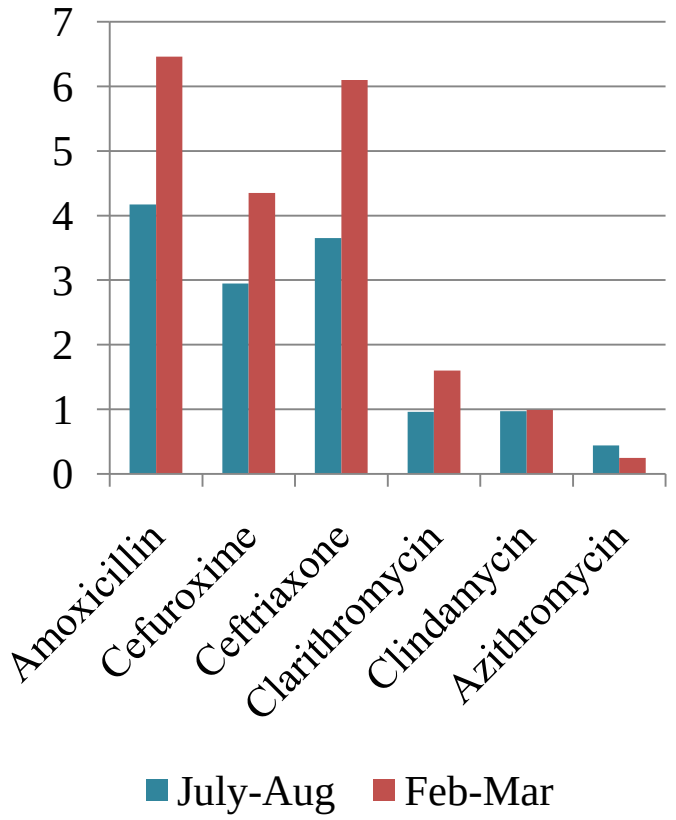
DDDs/100 bed days in Wards (Combined 4 months)



Comparison of the ICU usage between both periods

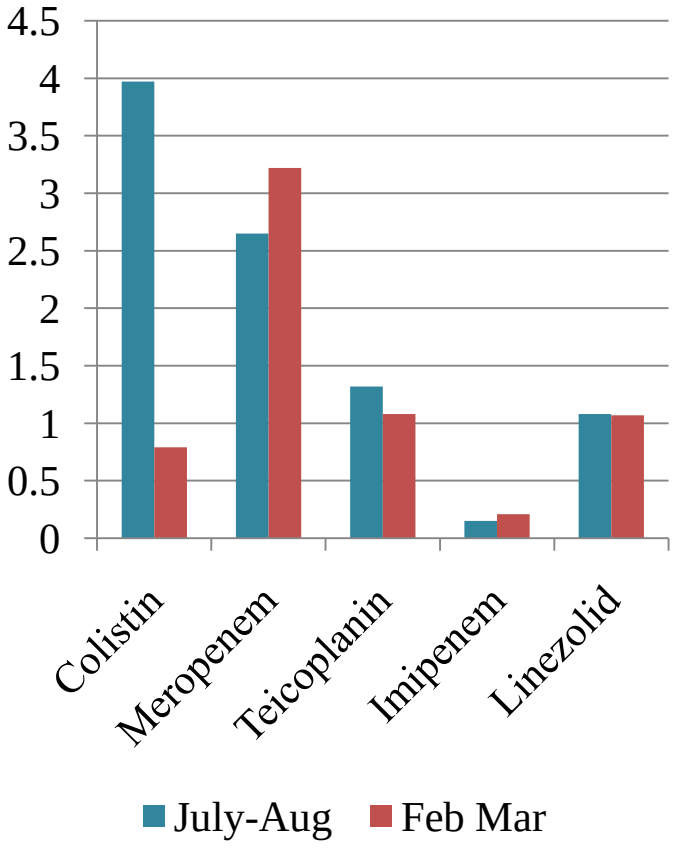


Restricted antibiotics

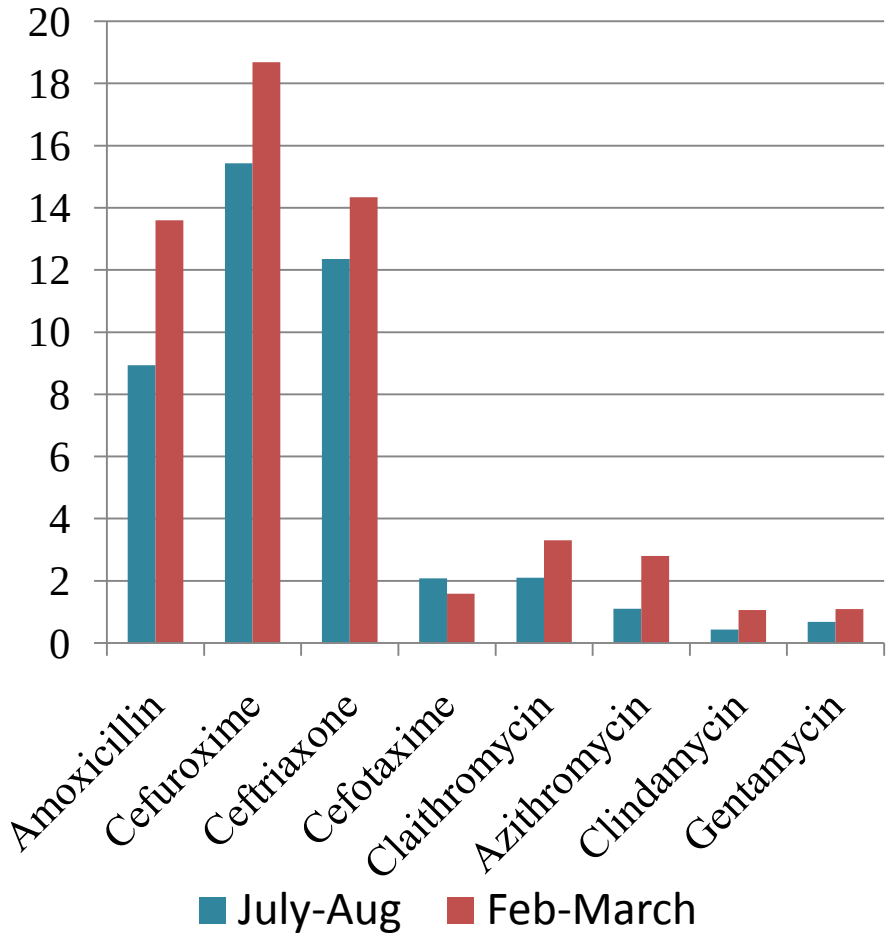


Unrestricted antibiotics

Comparison of the usage in wards between both periods



Restricted antibiotics



Unrestricted antibiotics

RECOMMENDATIONS

- Initiative has been taken to develop **Antibiotic Utilization Monitor** with the help of IT department with Antibiotic Monitoring Calculator incorporated in it with the **vision** of providing insights into:
  - Pattern of usage: extent and profile of drug use
  - Determinants of usage: Drug utilization data can be fed back to prescribers
  - Quality of usage
  - Outcomes of use
- Revised Hospital Formulary to be adopted and presented at every desktop: Reviewed yearly by consensus between clinicians, microbiologists and pharmacists.

OTHER SUGGESTIONS

- Surveillance for *antibiotic resistance* and surveillance for *antibiotic use*.
- Increasing use of diagnostic tests.
- Strengthening infection control committees
- In-service training for Physicians

LIMITATIONS

- The study does not consider geographic transactions like Age, Sex, etc while collecting and analysis of the data.
- Due to time constraints, complete implementation of the Antibiotic Monitoring Tool could not be done.
- 2 periods taken in the study could not be the same time of the year as its an upcoming hospital.

CONCLUSION

- Appropriate use of antibiotics in the hospital leads to:
  - Decreased antibiotic resistance
  - Decreased cost of treatment
  - Decreased hospital stays
  - Patient satisfaction


Thank you!