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POINT PREVALENCE OF EMPIRICAL ANTIBIOTICS USAGE IN ADULT MEDICAL INTENSIVE CARE: A STUDY OF ANTIBIOTIC COMPLIANCE.

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Abstract: Antibiotics are an indispensable part of modern medicine. However, as with all drugs, antibiotics may have adverse effects and medication errors can occur in prescribing. Another untoward effect of antibiotics is the selection of antibiotic-resistant bacteria. A clear relationship has been found between the percentage of resistant strains and antimicrobial use. In addition, only around 60 % of empirically started antibiotics are considered appropriate. Finding a balance between adequate antibiotic use for the individual patient, avoidance of selection of antibiotic resistance, and medication errors is the key role of antibiotic stewardship teams. ASTs have been shown to increase appropriate empirical antibiotic therapy and reduce medical errors and costs. In this study, a total of 124 cases were studied, On the first day of survey, a total of 29 patients were prescribed with antimicrobials, out of which 37.93% patients were prescribed with empiric antimicrobial therapy whereas on the second day of survey, a total of 31 patients were prescribed with antimicrobials among which 67.74% patients were given empiric antimicrobial therapy. On the third day of survey, 29 patients were given antimicrobials, in which a percentage of 86.21% patients were on empirical antimicrobials. By the time of fourth day of survey, the number of patients being prescribed with antimicrobials was 35, out of which 80.00% patients were given empirical therapy of antimicrobials. The empirical antimicrobial usage in adult intensive unit areas was high on an average (67.97%); whilst the use of definitive therapy was low and antimicrobials were prescribed majorly for prophylaxis (53.22%). Also, majority of the antimicrobials being prescribed in the intensive care areas were in compliance with the local antimicrobial policy of the hospital (average compliance rate was 80.20%).

Keywords: AST, Antimicrobial stewardship, Antibiotic, Compliance

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INTRODUCTION

Inappropriate antimicrobial use has been associated with increased morbidity, mortality and hospital costs [1]. As antimicrobial use is considered a major determinant in the evolution of resistance [2], hospital antibiotic stewardship has been widely implemented in an attempt to improve patient outcome whilst reducing adverse effects associated with antimicrobial use [3]. The control of antibiotics within the Northern Health and Social Care Trust in Northern Ireland has been scrutinized over a long period of time [4]. Robust guidance on the use of antibiotics has been in place since 1995 and was revised in 1999 specifically to restrict the use of second and third generation cephalosporins in response to an outbreak of *Clostridium difficile* infection (CDI). The use of cefotaxime was restricted to specific infections such as meningitis and facial cellulitis whilst intravenous cefuroxime was restricted to surgical prophylaxis. Following this, the use of second and third generation cephalosporins was very low within the hospital. In January 2008, the use of fluoroquinolones (mostly ciprofloxacin) was restricted (by its removal from the empirical antibiotic guidelines and from all wards) in response to controlling a major CDI outbreak, and subsequently the use of fluoroquinolones was remarkably decreased.

Antibiotics are an indispensable part of modern medicine. However, as with all drugs, antibiotics may have adverse effects and medication errors can occur in prescribing. Another untoward effect of antibiotics is the selection of antibiotic-resistant bacteria. In 2007, more than 8,000 excess deaths in Europe were associated with bloodstream infections caused by methicillin-resistant *Staphylococcus aureus* (MRSA) and third-generation cephalosporin-resistant *Escherichia coli* [6]. This mortality is only a fraction of the total burden of disease associated with antibiotic resistance [6]. The U.S. Centers for Disease Control and Prevention (CDC) estimated that each year at least 2 million people in the USA acquire infections with antibiotic-resistant bacteria, with at least 23.000 deaths as a direct result of these infections [7]. Although in the Netherlands antimicrobial resistance is low compared to other countries [8], antimicrobial resistance here is also increasing [9].

A clear relationship has been found between the percentage of resistant strains and antimicrobial use [10]. In addition, only around 60 % of empirically started antibiotics are considered appropriate [11-12]. Finding a balance between adequate antibiotic use for the individual patient, avoidance of selection of antibiotic resistance, and medication errors is the key role of antibiotic stewardship teams (ASTs) [13]. ASTs have been shown to increase appropriate empirical antibiotic therapy and reduce medical errors and costs [10, 14, 15]. Moreover, by narrowing down earlier broad-spectrum treatment, the development of antimicrobial resistance will decrease [10, 15]. In a hospital-wide rollout of antimicrobial stewardship, AST intervention was associated with a large reduction in targeted antimicrobial

utilization among patients receiving at least 3 days of antimicrobial therapy, but no significant change was observed hospital-wide [16].

Point prevalence surveys may be considered a simple method of monitoring the effectiveness of antibiotic policies and of providing useful data on patterns of antibiotic use, thus informing and guiding local and national antibiotic stewardship. Empiric therapy-Drug selection based solely on experience and relevant clinical observational information including knowledge of current resistance patterns in suspected pathogens.

MATERIAL AND METHODS:

Objectives:

- To estimate the Point prevalence of empirical antimicrobials usage in hospital.
- To assess the impact of hospital antibiotic policy on antimicrobial usage.
- To demonstrate the value of point prevalence surveys in informing antibiotic stewardship and identifying targets for quality improvements.

Plan of Work:

Patients prescribed with Antimicrobials

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Screening → Exclusion Criteria

- Pediatric patients

↓

Inclusion Criteria

- Patients who are admitted in selected Hospital, Delhi
- Patients of both gender (Except pregnant or lactating females)
- Patients admitted in critical care areas
- Patients prescribed with antimicrobials

↓

Point prevalence survey (AMS) Performa (Annexure 1)

Assessment of Outcome

- Empiric antimicrobial usage
- Point Prevalence
- Antimicrobial resistance and susceptibility

Point Prevalence Survey:

In January 2017, four point prevalence surveys were conducted in Tertiary care corporate hospital inpatient setting. This involved collecting specific information, utilizing the AMS audit tool, regarding patients who were in the hospital at 08.00 h on the days of survey. The study population consisted of all patients in all critical care areas including ICU (1&2), Heart Command Center (1&2), and Gastro-Liver ICU, with the exception of the other ICUs, and wards. Then, all patients using at least one antimicrobials for systemic use (ATC code starting with J01) on January 10th , January 17th, January 24th and January 31st 2017 were marked, with the exception of those patients that didn't receive any antimicrobial or received antimicrobial for surgical prophylaxis. The required data were determined through reviewing patients' case notes. The following data were collected: number of admitted patients in the selected locations, patients' age and gender, antimicrobial agents used, dose per administration, number of doses per day, route of administration, anatomical site of infection, indication for therapy (community acquired infection, hospital acquired infection or prophylaxis), and compliance with the local hospital antibiotic policy. Prophylactic antibiotics for surgical patients were not assessed during this study.

Review of the antibiotic policy:

Antibiotic drugs were considered to be prophylactic if they were recorded as such in patient progress notes. Relevant data elements, such as age, sex, ward, and prescribed antimicrobial(s) were documented in the data collection form. Relevant parameters associated with antimicrobial use were evaluated and the following observations were made: Empirical Therapy or Definitive Therapy, Community Acquired Infection, Hospital acquired Infection or Prophylactic Therapy.

A community-acquired infection was defined as documented or suspected infection within 48 h after admission with fever (>38 °C) and/or elevated infection parameters (C-reactive protein >10 mg/l, white cell count >11 × 10^9/l, or erythrocyte sedimentation rate >20 mm/h) A

hospital acquired infection was defined as infection meeting the CDC criteria and occurring at least 48 h after admission.

The definition of appropriateness of antimicrobial therapy was based on the current local antimicrobial treatment guidelines, which is in line with the guidelines and available microbiological results. The antibiotic prescription was defined as empirical when the antimicrobial was used without knowing the causative agent of the infection.

1. **RESULT:** The study was carried out to determine the point prevalence of empirical antimicrobial usage in adult medical intensive care unit and the antimicrobials in compliance to the local antimicrobial policy of the hospital. In our observational study, a total of 124 patients were marked.

2. **TABLE No 1: PERCENTAGE OF EMPIRIC ANTIMICROBIALS PRESCRIBED AT THE TIME OF EACH POINT PREVALENCE SURVEY.**

Week / Parameter	1 (n=29)	2 (n=31)	3 (n=29)	4 (n=35)
Point prevalence (empiric therapy)	37.93%	67.74%	86.21%	80.00%

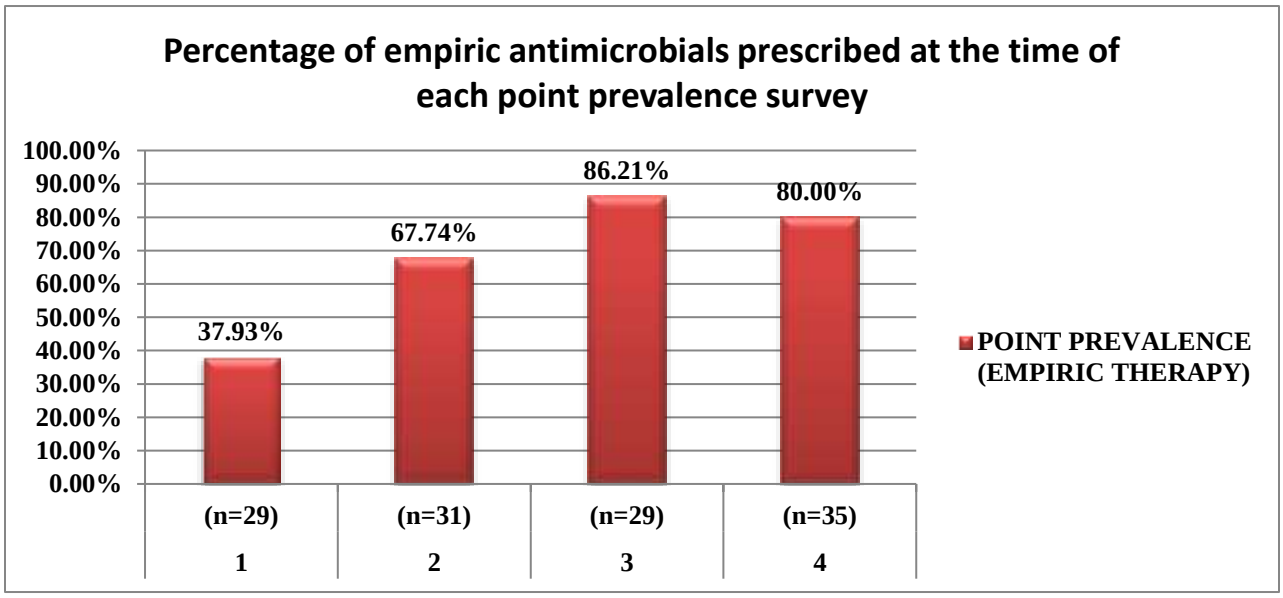

Figure no.1: Percentage of empiric antimicrobials prescribed (at the time of each point prevalence survey).

TABLE No. 2: PERCENTAGE OF ANTIMICROBIALS IN COMPLIANCE WITH THE LOCAL ANTIMICROBIAL POLICY (AT THE TIME OF EACH POINT PREVALENCE SURVEY)

Parameter \ Week	1 (n=29)	2 (n=31)	3 (n=29)	4 (n=35)
Compliance	93.10%	83.87%	72.41%	71.43%

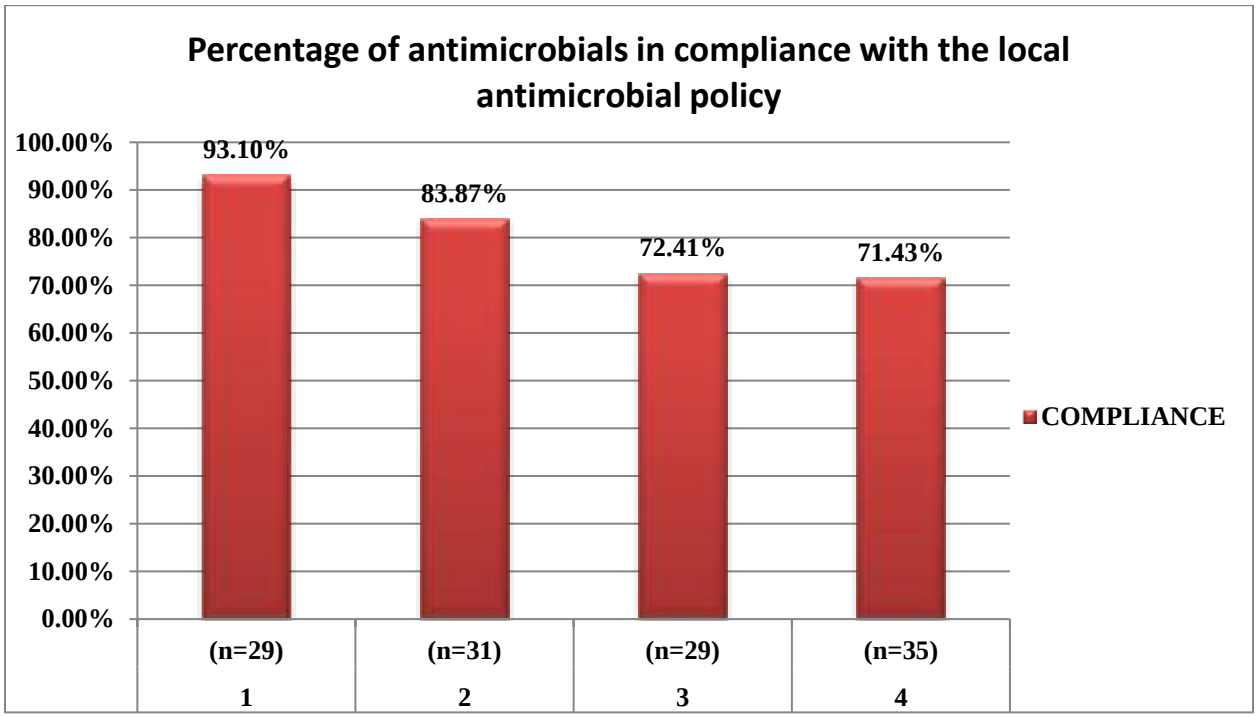

Figure No.2: Percentage of antimicrobials in compliance with the local antimicrobial policy (at the time of each point prevalence survey).

TABLE NO.3: PERCENTAGE OF EMPIRICAL ANTIMICROBIAL THERAPIES PRESCRIBED BY VARIOUS DEPARTMENTS (DURING THE WHOLE DURATION OF SURVEY)

Department Parameter	Cardiology (n=59)	Nephrology (n=11)	Critical Care Team (n=33)	Gastroenterology (n=15)	Pulmonology (n=04)	Urology (n=02)
Point prevalence (Empiric therapy)	71.18%	36.34%	78.78%	46.67%	100%	100%

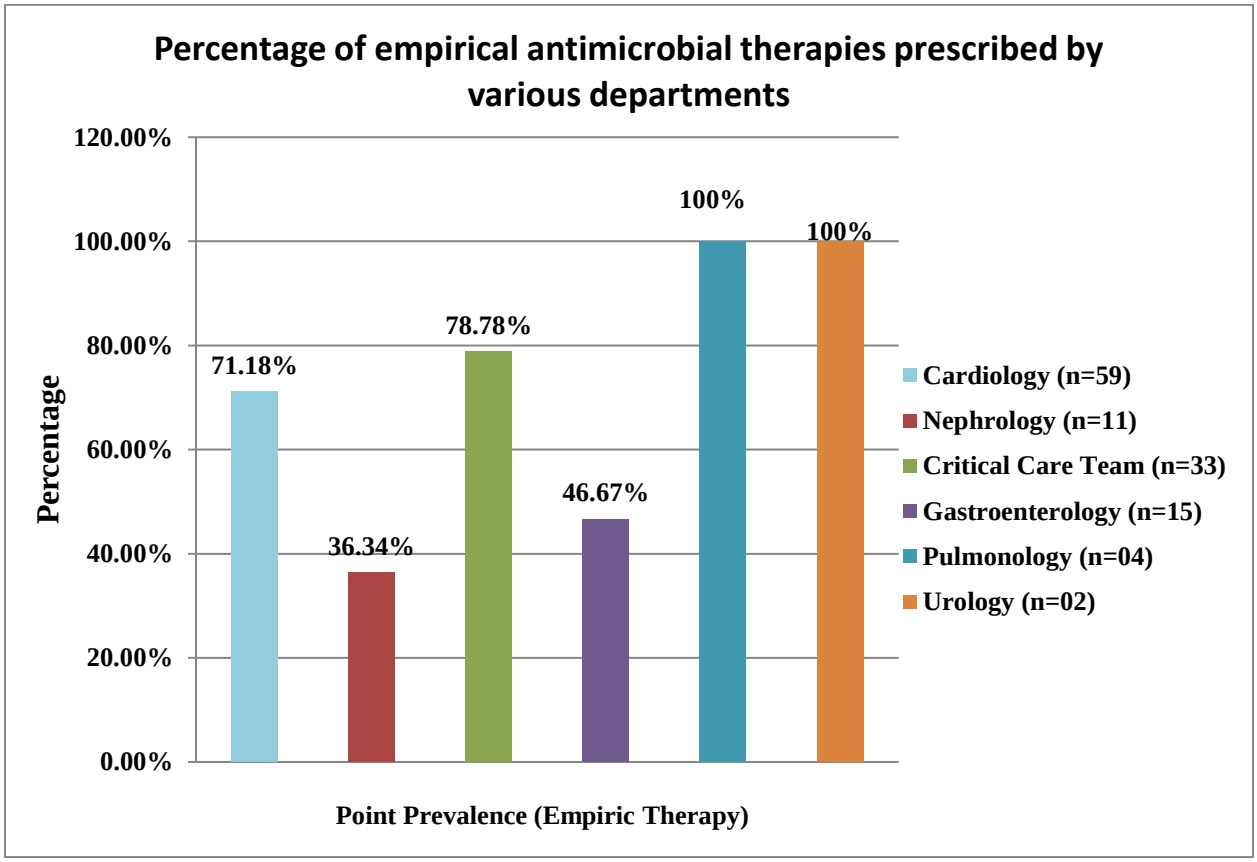

Figure no. 3: Percentage of empirical antimicrobial therapies prescribed by various departments (during the whole duration of survey)

TABLE NO. 4: PERCENTAGE OF ANTIMICROBIALS PRESCRIBED BY VARIOUS DEPARTMENTS IN COMPLIANCE WITH THE LOCAL ANTIMICROBIAL POLICY (DURING THE WHOLE DURATION OF SURVEY)

Department / Parameter	Cardiology (n=59)	Nephrology (n=11)	Critical Care Team (n=33)	Gastroenterology (n=15)	Pulmonology (n=04)	Urology (n=02)
Compliance	79.66%	90.90%	81.81%	80.00%	25%	100%

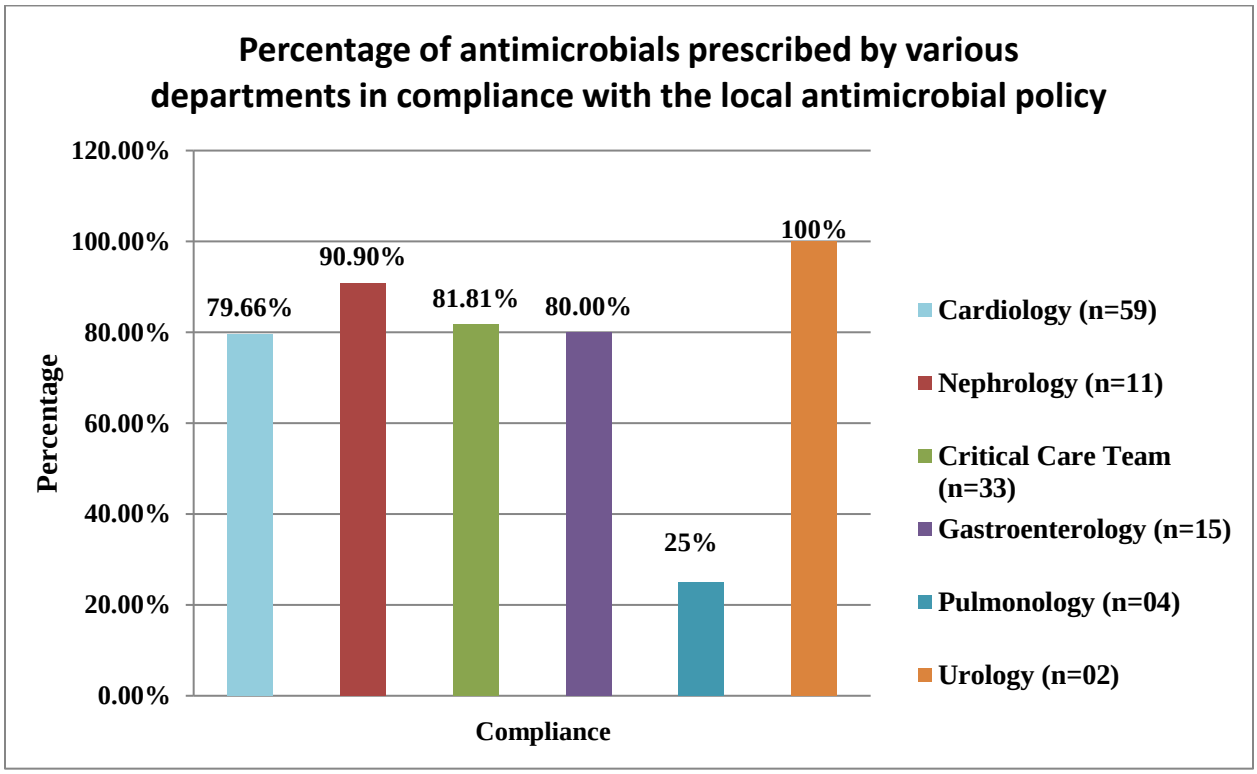

Figure no. 4: Percentage of antimicrobials prescribed by various departments in compliance with the local antimicrobial policy (during the whole duration of survey)

TABLE NO. 5: CATEGORIZATION OF ANTIMICROBIAL THERAPY ON THE BASIS OF INDICATION FOR THEIR USE

S.No	Indication for Prescribing of Antimicrobials	Number of cases	Percentage
1	Community acquired infections	48	38.71%
2	Hospital acquired infections	10	8.07%
3	Prophylaxis	66	53.22%

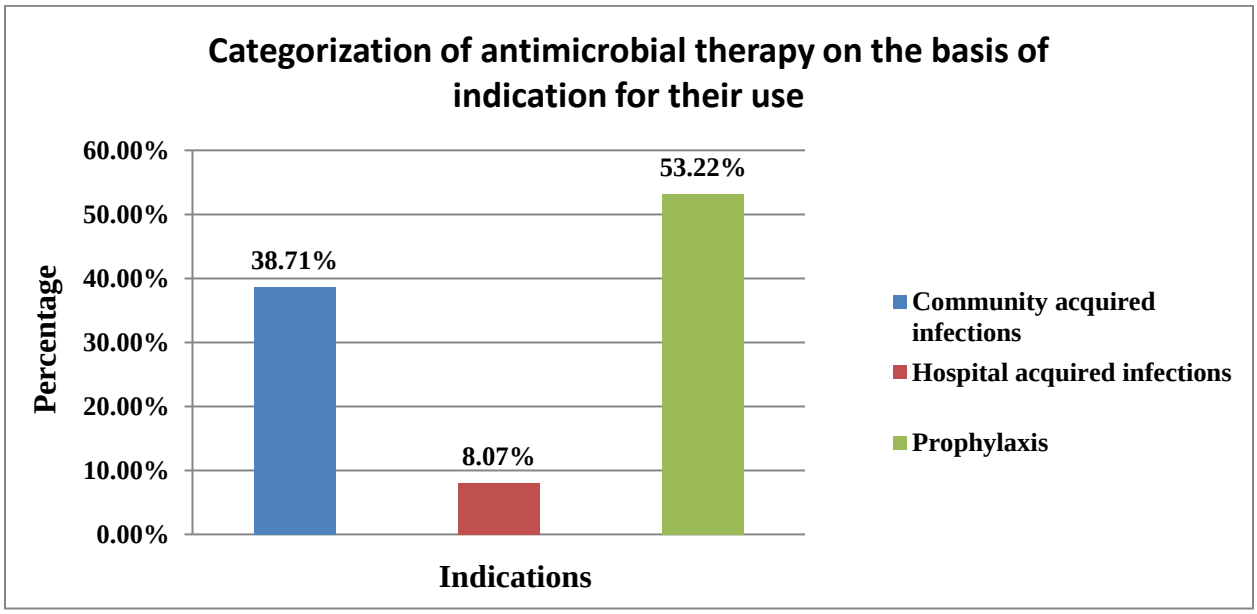

Figure no. 5: Categorization of antimicrobial therapy on the basis of indication for their use

ETHICAL CONSIDERATIONS: As it is retrospective study of prescribing pattern for Antibiotics and their Compliance, it doesn't need ethical approval.

DISCUSSION:

In this study, a total of 124 cases were studied. On the first day of survey, a total of 29 patients were prescribed with antimicrobials, out of which 37.93% patients were prescribed with empiric antimicrobial therapy whereas on the second day of survey, a total of 31 patients were prescribed with antimicrobials among which 67.74% patients were given empiric antimicrobial therapy. On the third day of survey, 29 patients were given antimicrobials, in which a percentage of 86.21% patients were on empirical antimicrobials. By the time of fourth day of survey, the number of patients being prescribed with antimicrobials was 35, out of which 80.00% patients were given empirical therapy of antimicrobials (table no.1). In table no. 2, the

percentage of antimicrobials in compliance with the local antimicrobial policy as per the hospital is calculated, according to which, the percentage compliance for the first day of survey was 93.10% whereas for the second day of survey the percentage of antimicrobials in compliance decreased to 83.87%, during the time of third day of survey, the percentage compliance was 72.41% and on the fourth day of survey, it was 71.43%.

As per the survey, the empirical antimicrobials were prescribed by various departments, out of those departments; cardiology department prescribed antimicrobials to 59 patients, out of which 71.18% therapies were empirical and 79.66% of prescribed antimicrobials were in compliance with the local antimicrobial policy. Similarly, nephrology department prescribed a total of 11 patients with antimicrobials out of which 36.34% were given empirical therapy and 90.90% of total antimicrobials prescribed were in compliance. Critical care team prescribed antimicrobials to 33 patients of which 787.78% were empirical antimicrobial therapies and 81.81% were in compliance with the local antimicrobial policy. A total of 15 patients were treated with antimicrobials by the gastroenterology department out of which, 46.67% patients were being given empirical therapies and 80.80% were compliant to the policy. Similarly, pulmonology and urology departments prescribed 100% (n=4) and 100% (n=2) of their patients with empirical antimicrobials respectively, whereas only 25% of antimicrobials by pulmonology and 100% by urology were in compliance with the policy (table no 3 and 4).

Now, out of the indications for which the antimicrobials were used, 38.71% were community acquired infections, 8.07% were hospital acquired infections and 53.22% were given for prophylaxis (table no. 5).

CONCLUSION:

In this study site hospital, the empirical antimicrobial usage in adult intensive unit areas was high on an average (67.97%); whilst the use of definitive therapy was low and antimicrobials were prescribed majorly for prophylaxis (53.22%). Also, majority of the antimicrobials being prescribed in the intensive care areas were in compliance with the local antimicrobial policy of the hospital (average compliance rate was 80.20%).

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