Clinical Pharmacist Intervention in Abate of Drug Related Problem and Emerging Antibiotic Resistance in Intensive Care Unit

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Abstract

Problem: To assess the rate and incidence of medication error and antibiotic resistance. To develop the monitoring and minimization programme. To promote cost effective treatment. To develop strategy for reducing the risk of medication error. **Approach:** Conducted a prospective observational study over 6 months in a tertiary care hospital's ICU. The patients meeting specific criteria were included in the study. Microsoft excel was used for data compilation. Statistical analysis through SPSS software revealed significant findings. **Findings:** We have collected a total of 375 drug related problems including medication errors, adverse drug reactions and also include patients for antibiotic stewardship programme. During the study, Distribution of medication error in according to age and gender shows that medication errors repeatedly occur in the male patients (66%) compared with female patients (34%). While considering ICUs, the highest number of medication errors was found in the department of NMICU with 38%. The Department of MICU consists of 29.3% errors and Department of SICU consists of 26%. The Department CICU consists of 6% errors and In the Department of MDICU, least number of medication errors were occurred with 0.7%.Amongthe 150 subjects in the study 59.3% were occurred by the Doctors. 40% of Medication errors were made by Nurses and 0.7% of Medication error was due to the Pharmacist. 60% of the reported errors were Prescribing errors, 37.3% of the errors were Drug administration errors and 2.7% were Dispensing error. Among the 75 subjects reported with adverse drug reaction in the study 54.7% were females and 45.3% were males. Among the 75 cases, 81.3% subjects recovered from the adverse drug reaction occurred and 18.7% subjects were recovering from the adverse event. The result of antibiotic stewardship programme shows that among the 150 subjects in the study, 57.3% were males and 42.7% were females. The stewardship programme was carried out in 5 different ICUs. Out of this 38% was taken from MICU, 26% was taken from SICU, 20.7% was taken from MDICU, 10% was taken from NMICU and 5.3% was taken from CICU. **Conclusion:** Comprehensive analysis of medication charts of IP patients across five major intensive care units including MICU, MDICU, NMICU, SICU and CICU revealed spectrum of drug related problems spanning from medication errors to adverse drug reactions. Employing various interventional tools, pre and post ward rounds , and distinct inclusion criteria we categorized subtypes of these issues .The study underscored the pivotal role of clinical pharmacist in mitigating the rate of medication errors, show casing a significant reduction through direct reviews of medication charts and collaborative interaction with nurses and physicians .This emphasizes the vital contribution of clinical pharmacist in enhancing patient safety and overall quality of health care delivery in intensive care settings.

Keywords: Intensive Care Unit, drug related problems, antibiotic stewardship, medication error, adverse drug reaction

Introduction

Intensive care units (ICUs) provide care to the most severely hospitalized patients. Although ICUs increasingly rely on inter professional teams to provide critical care (1), it is a potential area for drug-related problems. As many of the patients were treated as complex patients, this could increase drug therapy problems. Resolving these drug-related problems before reaching those patients plays a major role in their lives. Since we play a key role in minimizing drug-related problems through the proper use of medicines, most of the errors occur due to the scarcity of drug information. By providing drug information, we will increase the rapport among healthcare professionals, including nurses, doctors, and pharmacists.

Drug-related problems include medication errors (ME) and adverse drug reactions (ADR). Medication error is the error involved in the process of prescribing, dispensing, or administering a drug, whether there are adverse consequences or not. An adverse drug reaction is any response to a drug that is noxious and unintended and that occurs at doses normally used in humans for prophylaxis, diagnosis or therapy of disease, or the modification of physiological function. Factors contributing to medication errors are human-related, system-related, and medication-related. The National Coordinating Committee on Medication Error Reporting and Prevention (NCCMERP) in the United States is an interdisciplinary group consisting of representatives of fourteen healthcare organizations. Their purpose is to promote support, understanding, and prevention of medication errors and focus on the way to protect patient safety through coordinated efforts of associations and agencies. The severity of medication errors can be categorized (A–I) based on the impact they have on the patient population, as constructed by the NCC MERP. The American Society of Health Pharmacists (ASHP) definition of ME includes prescribing, dispensing, medication administration, and patient compliance errors.

An adverse drug reaction is any undesirable effect of a drug beyond its anticipated therapeutic effects, occurring during clinical use. Types of adverse reactions are type A (pharmacological) or type B (idiosyncratic). Type A reactions represent an enhancement of the pharmacological actions of the drug. They are dose-dependent and are therefore readily reversible by reducing the dose or drawing the drug. In contrast, Type B-adverse reactions are bizarre and cannot be predicted from the known pharmacology of the drug. Pharmacovigilance, and more generally, the study of the benefits and risks of drugs, plays a major role in pharmacotherapeutic decision-making, be it individual, regional, national, or international. It was not until the disaster caused by thalidomide in 1961 that the first systematic international efforts to address drug safety issues begin.

The reporting of ADRs through periodic safety update reports is a regulatory requirement in many countries, including India; however, the importance of ADR reporting through a spontaneous reporting system cannot be ignored. After the initiation of the Programme for International Drug Monitoring, the WHO-Uppsala Monitoring Centre (UMC), Sweden, succeeded in establishing a worldwide pharmacovigilance (PV) network in >150 countries. As a full member of this program, India has also developed a robust PV system through the PharmavigilanceProgramme of India (PvPI), involving its various ADR-Monitoring Centers, and after due diligence of individual case safety reports (ICSRs), submits this information to UMC through a web-based tool called VigiFlow®. These Information is stored inVigiBase®, which is the repository of worldwide ICRs. Based on the drug-safety information collected, PvPI issues alerts, recommends label changes (if any), and identifies signals, thereby supporting the National Regulatory Authority. At the national level, PvPI has developed several tools for reporting ADRs by stakeholders. Tools for Adverse Drug Reactions-Reporting include Adverse Drug Reactions reporting forms, Mobile Application, Toll-free Helpline, and Voluntary Reporting by Non-Adverse Drug Reaction Monitoring Center.

Antimicrobial resistance (AMR) is defined as the ability of microorganisms to survive and be viable under the influence of antimicrobial agents.

Several types of antimicrobial agents are present, such as antibiotics, disinfectants, and food preservatives that can be used against microorganisms to reduce their capacity to grow inhibit their multiplication, or even kill them. There are natural, semi-synthetic, and synthetic agents with distinctive mechanisms able to cause major alteration on the metabolic and physiological levels. Modifications on cell wall synthesis such as β-lactams and glycopeptides, protein synthesis inhibition such as Macrolides and tetracyclines, metabolic pathway inhibition such as sulfonamides, and interference with DNA replication and translation such as fluoroquinolones. The resistance of bacteria to antibiotics hinders the efficiency of antibiotic use in healthcare, and there is significant evidence to prove that the misuse of antibiotics will eventually result in the development of resistance. Moreover, inadequate availability of efficient antibiotics attenuates the risk of prevention and management of immune-compromised health conditions like HIV, cancer, surgical procedures, and diabetes. Mechanisms of antimicrobial action include interfering with the synthesis of cell walls, inhibiting the synthesis of proteins, inhibiting the synthesis of nucleic acids, and interfering with the structure of the bacterial membrane. The Antimicrobial Stewardship Programme (AMS-Programme) is an organizational or system wide health-care strategy to promote appropriate use of antimicrobials through the implementation of evidence-based interventions. Antibiotic Stewardship Programme, to reduce antimicrobial resistance, decreases the spread of infection caused by MDRO, and thus improve patient outcomes.

Methodology

The study was a prospective observational study carried out among various ICUs, including NMICU, CICU, SICU, MDICU, and MICU, of a private tertiary care hospital, KIMS AL-SHIFA, a 550-bed super specialty hospital situated in Perinthalmanna at Malappuram district of Kerala. The study spanned a period of six months. Patients of all ages (excluding septicaemia, patients aged less than 18 years) and sexes were selected and enrolled in this study. The study was approved by the ethical committee of the institution. Investigators always considered the privacy and confidentiality of all study participants without disclosing their identities. Drug-related problems (medication error, ADR) and emerging antibiotic resistance were collected and reported using the Medication error reporting form, ADR reporting form, AMS form. The data were collected with the help of patient medication charts and direct interaction with health care professionals.

Statistical Methods

Data was collected and coded in Microsoft Excel, and data analysis was performed using SPSS version 16.0 software. The quantitative variable was expressed as the mean and standard deviation. Qualitative variables were expressed as frequency and percentage. An independent sample t test was used to compare the means of two independent random samples from two populations.

Results

A prospective observational study was carried out over a period of six months among the inpatients of various ICU's including MICU, MDICU, NMICU, SICU and CICU at a Tertiary care super specialty hospital. A total of 375 samples were collected for this study. The Drug related problems chosen were Medication errors and Adverse drug reactions. 150 subjects were selected for Medication Error and 75 subjects for Adverse Drug Reaction. For the Antibiotic Stewardship Programme, 150 subjects were selected. The subjects selected for medication errors were having a mean age of 58.6 with a range of 18- 96. Medication errors were found to be more in males. Highest numbers of errors were identified from NMICU and mostly the errors were prescribing errors. The Suspected ADR identified in patients was having a mean age of 46.1 with a range of 18- 87. Suspected ADR was found to be more in females. The subjects selected for stewardship were having a mean age of 53.5 with a range of 18- 94. In the Antibiotic

Stewardship programme, out of the 150 samples, most of the patients were not received a culture test. Commonly the antibiotics were given prophylactic rather than empirical.

Medication errors

Among the 150 subjects in the medication error, the mean age of the participants were 58.6 with a standard deviation of 18.6 and a range of 18- 96. In this study 66% (n=99) were males and 34% (n=51) were females. The medication errors were found to be more in the males.

In this Study, the highest number of medication errors were identified from the department of NMICU with 38% (n=57). The Department of MICU reported 29.3% (n=44) errors and Department of SICU reported 26% (n=39). The Department of CICU reported 6% (n=9) errors and in the Department of MDICU, least number of medication errors are occurring with 0.7% (n=1).

In this study, 54% (n=81) patients were presented with comorbidities and 46% (n=69) patients had no co-morbidities. The medication errors were found to be more in the patients with co-morbidities.

Highest number of errors was resulted from doctors that is 59.3% (n=89). Medication errors resulted from Nurses were 40% (n=60) and Medication error resulted from the Pharmacist were 0.7% (n=1).

Highest number of medication errors were reported during short staffing that is 62% (n=93). Medication errors reported due to the Change/Shift of the staff were 38% (n=57).

In this study, 99.3% (n=149) of medication errors resulted in additional patient monitoring and 0.7% (n=1) resulted in type of harm.

From the medication errors reported, 60% (n=90) of the errors were Prescribing errors, 37.3% (n=56) of the errors were Drug administration errors and 2.7% (n=4) were Dispensing errors.

In this study, 97.3% (n=146) of medication errors were identified by the medication chart review and 2.7% (n=4) were identified during ward round participation.

150 medication errors were reported and 79 drugs commonly caused medication errors. 6% (n=9) of error was caused by Syp Potassium Chloride, 3.3% (n=5) error was caused by Tab Pantoprazole, 2.67% (n=4) error was caused by Tab Atorvastatin, 2% (n=3) error was caused by Inj Tramadol and Tab Clopidogrel. 1.3% (n=2) error was caused by Tab Piracetam, Inj Ondansetron, Inj Paracetamol, Tab Levetiracetam, Tab Metformin HCL, Tab Sitagliptin, Cap Silodosine, Tab Cilacar, Tab Nifedipine and Tab Paracetamol. 0.7% (n=1) error was caused by Inj Diclofenac Sodium.

The Entire subjects (n=150) were provided with patient counselling. All the subjects (n=150) have been provided with intervention and Full subjects (n=150) received intervention.

From the 150 cases, 50.7% (n=76) medication errors were reported to the nurse and 49.3% (n=74) medication errors were reported to the physician.

Adverse drug reaction

Among the 75 subjects in the ADR, the mean age of the participants were 46.1 with a standard deviation of 18.3 and a range of 18-87.In this study 54.7% (n=41) were females and 45.3% (n=34) were males. The adverse drug reactions were found to be more in the females.

Out of 75 cases, 33.65% (n=35) of adverse event occurred was Itching over the body, 10.57% (n=11) of events was Itching at the Injection site, 9.61% (n=10) of events was Breathing difficulty, 7.96% (n=8) of events was Redness over the body and rashes over the body, 5.76% (n=6) of events was shivering, 3.84%

(n=4) of events was body pain, 2.88% (n=3) of events was Triggers and Oedema, 1.92% (n=2) of events was Eye puffiness, Chest discomfort, Vomiting, Head numbness and Fever. 0.96% (n=1) of events was Steven Johnson syndrome, Burning sensation over body and Abdominal distension.

In this study, 22.66% (n=17) of Adverse events was due to InjCefaperazone+Sulbactam, 13.33% (n=10) was due to Inj Levofloxacin, 8% (n=6) was due to Inj Ceftriaxone. 6.66% (n=5) was due to Inj Ketorolac and Inj Ciprofloxacin. 5.33% (n=4) was due to Inj Thymoglobulin and Inj Ferric carboxy maltose. 4% (n=3) was due to InjPiperacillin+Tazobactam and Inj Pantoprazole 2.66% (n=2) was due to Tab cefixime, Tab Azithromycin, InjParacetamol, InjClobazam, InjFosphenytoin, InjDiclofenac sodium, InjEdaravon and Inj Albumin 20%. 1.33% (n=1) was due to SypLevosalbutamol and InjVancomycin.

Among the 75 cases, 86.7% (n=65) drugs were given as Intravenous and 13.3% (n=10) were given orally. The causality value of adverse events occurring in both gender was similar. There was no difference in causality between male and female. The Independent sample t test was used to compare causality score according to gender. There was a difference ($p < 0.05$) in weight between males and females.

From the 75 cases of adverse events, 81.3% (n=61) subjects recovered from the adverse drug reaction occurred and 18.7% (n=14) subjects were recovering from the adverse event.

Antibiotic stewardship programme

Among the 150 subjects in the Antibiotic stewardship programme, the mean age of the participants were 53.5 with a standard deviation of 19.1 and a range of 18-94. Among the 150 subjects in the Antibiotic stewardship, 57.3% (n=86) were males and 42.7% (n=64) were females.

The stewardship programme was carried out in 5 different ICU's. Out of this 38% (n=57) was collected from MICU, 26% (n=39) were reported from SICU, 20.7% (n=31) took from MDICU, 10% (n=15) were reported from NMICU and 5.3% (n=8) was reported from CICU.

Among the 150 Subjects, 82% (n=123) were not administered with the loading dose and 18% (n=27) were administered with loading dose.

Among the cases, 79.3% (n=119) subjects were prescribed with antibiotic as prophylactic and 19.3% (n=29) subjects were prescribed with antibiotics as empirical. Infections were identified among 61.3% (n=92) subjects and were not identified among 38.7% (58) subjects.

Out of 150 cases of Antibiotic stewardship, 41.89% (n=93) of antibiotic used were InjCefaperazone+Sulbactam, 9.45% (n=21) were Inj Meropenem, 7.2% (n=16) were Inj Amikacin, 6.75% (n=15) were Tab Cefuroxime, 5.4% (n=12) were Inj Ceftriaxone, 4.05% (n=9) were Inj Clindamycin, 3.15% (n=7) were Tab Cefixime, 2.7% (n=6) were Inj Cefotaxime, 2.25% (n=5) were Inj Gentamicin and Inj Metronidazole. 1.8% (n=4) were Inj Vancomycin and Inj Colistin. 1.35% (n=3) were Piperacillin+Tazobactam, Tab Levofloxacin and Inj Levofloxacin. 0.9% (n=2) were Tab Metronidazole, Tab Amoxicillin, Inj Ampicillin, Tab Ciplofloxacin, Tab Clarithromycin and Inj Moxifloxacin. 0.45% (n=1) were Tab Azithromycin, Inj Ciprofloxacin, Tab Tinidazole and Tab Doxycycline.

Out of 150 cases, 86.1% (n=149) of antibiotic drugs were given as Intravenous and 13.9% (n=24) drugs were given as oral.

Out of 150 cases, 71.9% (n=146) antibiotic drugs were given as BD (Twice in a day), 14.8% (n=30) drugs were given as TID (Three times in a day) and 13.3% (n=27) drugs were given as OD (Once in a day).

Among the 150 cases, 22.7% (n=34) cases have obtained culture and 77.3% (n=116) cases has not obtained culture. 4% (n=6) cases were positive for MDR strains and 96% (n=144) were negative for MDR

strains. 1.3% (n=2) subjects were allergic to test dose and 98.7% (148) were non allergic. 0.7% (1) have toxin positive for clostridium difficile and 99.3% (149) were negative for clostridium difficile.

Out of 150 cases, 1.3% (n=2) cases have 5 culture reports attached, 1.3% (n=2) cases have 2 culture reports attached, 18% (n=27) have 1 culture report attached and 79.3% (n=119) cases have no culture reports.

Among the 150 cases, 2.7% (n=4) cases have step down culture correlation, 2% (n=3) have step up culture correlation, 0.7% (n=1) have non-compliance and 94.7% (n=142) have no change in culture correlation.

Discussion

Intensive care unit is a potential area for drug related problems, as many of the patients were treated as complex patients, this could increase drug therapy problems. Drug related problems (DRP) is a major term which comprises of medication errors and drug interactions. Resolving these drug related problems before reaching those patients plays a major role in their lives. Since we play key role in minimizing drug related problem through proper use of medicines, as most of the errors occurs due to scarcity of drug information. By providing drug information, will increase the rapport between the healthcare professionals including nurses, doctors and pharmacist. A Medication error can be defined as any error in the prescribing, dispensing or administration of drug irrespective of whether such errors lead to adverse consequences or not are the single most preventable cause of patient harm. It has been found that medication errors are most likely to be made by health care professional can account of several reasons. In medication error deserves serious attention, because they are most common in a clinical setting. From our clinical experience, we have found several drug related problems in ICU. So, this made us to select our topic —Intervention in abate of drug related problem and emerging antibiotic resistance pattern in Intensive Care Unit: A prospective observational study. We consider this study as a monitoring and minimization program since clinical pharmacist conducted preward and ward rounds, continuously monitored all the medication charts of the respective major intensive care units. All the drug related problems noted were recorded and reported using NCC MERP form, Adverse drug reaction reporting form etc and this gave additional attention to health care professionals to avoid preventable drug related problems. This helped in minimization of drug related problems. Adverse drug events were reported through adverse drug reaction monitoring centres and which acts as a signal generation for further adverse drug reaction.

Antibiotic stewardship measures the appropriateness of antibiotic use by using a score system. This study helped in minimization of additional cost for the patients by changing dosage forms like conversion from iv to oral therapy and prior reporting of side effects and adverse events prevents additional cost for test and scanning and also help to eliminate the root cause. This way our study proved to promote cost effective treatment. By communicating with physicians and nurses about drug related problems further chances of occurring similar drug related problems were also reduced. So, healthcare professionals were educated at the same time. The study was conducted in the ICU inpatients including MICU, MDICU, NMICU, SICU and CICU. The total study duration was six months. We have collected a total of 375 drug related problems including medication errors, adverse drug reactions and also include patients for antibiotic stewardship programme. During the study, Distribution of medication error in according to age and gender shows that medication errors repeatedly occur in the male patients (66%) compared with female patients (34%). Medication errors sometimes occur unintentionally this can be avoided through medication reconciliation performed by pharmacist trainees upon admission can reduce unintentional medication discrepancies. Similar study that supports our result was conducted by QianGuoetal. While considering ICUs, the highest number of medication errors were identified from the department of NMICU with 38%. The Department of MICU consists of 29.3% errors and Department of SICU consists of 26%. The Department CICU consists of 6% errors and In the Department of MDICU, least number of medication errors are occurring with 0.7%. Among the 150 subjects in the study 54% patients are presented with co-morbidities and 46% patients have no co- morbidities. The medication errors were found

to be more in the patients having co-morbidities. A study by Muhammad Umair Khan, Akram Ahmad support our result.

Among the 150 subjects in the study 59.3% were produced by the Doctors. 40% of Medication errors were made by Nurses and 0.7% of Medication error was due to the Pharmacist. Similar study that supports our result was conducted by MajaCvikl et al. Total of 150 errors, 38% medication errors were produced during the Change/Shift of the staff. 62% of Medication errors were due to Short Staffing and of those errors 99.3% of medication errors results in Additional patient monitoring and 0.7% results in type of harm. 60% of the reported errors were Prescribing errors, 37.3% of the errors were Drug administration errors and2.7% were Dispensing errors. A study by Denise Bueno et al supports our results. Out of the 150 medication errors obtained during the study period, 97.3% of medication errors was discovered by the medication chart review and 2.7% was discovered by ward round participation. 79 drugs commonly caused medication errors. 6% of error was caused by SypPotassium Chloride, 3.3% error was caused by Tab Pantoprazole, 2.67% error was caused by TabAtorvastatin, 2% error was caused by Inj Tramadol and Tab Clopidogrel. 1.3% error was caused by Tab Piracetam, InjOndansetron, InjParacetamol, Tab Levetiracetam, Tab Metformin HCL, Tab Sitagliptin, Cap Silodosine, Tab Cilacar, Tab Nifedipine and Tab Paracetamol. 0.7% error was caused by InjDiclofenac Sodium. 100% of the subjects are providedwith patient counselling. 100% of subjects have been provided with intervention and 100% subjects received intervention. 50.7% medication errors were communicated with the nurse and 49.3% medication errors was communicated with the physician. Similar study that supports our result was conducted by MajaCvikl et al. Among the 75 subjects reported with suspected adverse drug reaction in this study 54.7% were females and 45.3% were males. The adverse drug reactions were found to be more in the females.

A study conducted by Ganeshanetalalso come up with similar results. Out of 75 cases, 33.65% of adverse events occurred were Itching over the body, 10.57% of events were Itching at the Injection site, 9.61% of events were Breathing difficulty, 7.96% of events were redness over the body and Rashes over the body, 5.76% of events were shivering, 3.84% of events were Body pain, 2.88% of events were Triggers and Oedema, 1.92% of events were Eye puffiness, Chest discomfort, Vomiting, Head numbness and Fever. 0.96% of events were Steven Johnson syndrome, Burning sensation over body and Abdominal distension. In this study, 22.66% (n=17) of Adverse events was due to InjCefaperazone+Sulbactam, 13.33% (n=10) was due to Inj Levofloxacin, 8% (n=6) was due to Inj Ceftriaxone. 6.66% (n=5) was due to Inj Ketorolac and Inj Ciprofloxacin. 5.33% (n=4) was due to Inj Thymoglobulin and Inj Ferric carboxy maltose. 4% (n=3) was due to InjPiperacillin+Tazobactam and Inj Pantoprazole. 2.66% (n=2) was due to Tab cefixime, Tab Azithromycin, InjParacetamol, InjClobazam, InjFosphenytoin, InjDiclofenac sodium, InjEdaravon and Inj Albumin 20%. 1.33% (n=1) was due to SypLevosalbutamol and InjVancomycin.Among the 75 cases, 81.3% subjects recovered from the adverse drug reaction occurredand18.7% subjects were recovering from the adverse event. The result of antibiotic stewardship programme shows that among the 150 subjects in the study, 57.3% were males and 42.7% were females. The stewardship programme was carried out in 5 different ICU's. Out of this 38% were collected from MICU, 26% was taken from SICU,20.7% wastaken from MDICU, 10% was taken from NMICU and 5.3% was taken from CICU. Among the 150 Subjects in the study, 82% are not administered with the loading dose and18%are administered with loading dose.These shows that most of the antibiotic were administered without loading dose. 79.3% subjects were having antibiotic as prophylactic and 19.3% subjects as empirical. 61.3% subjects have identified the infection and 38.7% have not identified the infection. A study by Eric J Nelson et al showed similar results.

Out of 150 cases of Antibiotic stewardship, 41.89% (n=93) of antibiotic used were InjCefaperazone+Sulbactam, 9.45% (n=21) were InjMeropenem, 7.2% (n=16) were InjAmikacin, 6.75% (n=15) were Tab Cefuroxime, 5.4% (n=12) were InjCeftriaxone, 4.05% (n=9) were InjClindamycin, 3.15% (n=7) were Tab Cefixime, 2.7% (n=6) were InjCefotaxime,2.25% (n=5) were InjGentamicin and Inj Metronidazole. 1.8% (n=4) were InjVancomycin and InjColistin. 1.35% (n=3) were

Piperacillin+Tazobactam, Tab Levofloxacin and Inj Levofloxacin. 0.9% (n=2) were Tab Metronidazole, Tab Amoxicillin, Inj Ampicillin, Tab Ciplofloxacin, Tab Clarithromycin and InjMoxifloxacin. 0.45% (n=1) were Tab Azithromycin, Inj Ciprofloxacin, Tab Tinidazole and Tab Doxycycline. 86.1% of antibiotic drugs were given as Intravenous and 13.9% drugs were given as oral. Among the 150 cases collected during the study period, 22.7% cases have obtained culture and 77.3% cases has not obtained culture. 4% cases were positive for MDR strains and 96% were negative for MDR strains. 1.3% subjects were allergic to test dose and 98.7% were non allergic.0.7% have toxin positive for clostridium difficile and 99.3% were negative for clostridium difficile. During the study period, 2.7% cases have step down culture correlation, 2% have step up, 0.7% have non-compliance and 94.7% have no change.

The study has number of limitations which includes: Only those drug related problems witnessed by the researchers were used for the analysis. Therefore, several drug related problems have gone unnoticed. The total study period was short and also it was difficult to collect the orders during the evening and night shifts, during which most serious mistakes may occur. In this study we analysed only the IP patients belonging to five intensive care unit. The drug related problems occurred during the public holidays were not recorded.

The strength of the study was, A collaborative approach of clinical pharmacist students with other health care professionals in order for optimizing medicine management is effective in providing overall improvement in quality use of medicines and health outcomes. Major reduction of drug related problems was possible before reaching the patients through direct reviewing of medication chart by a clinical pharmacist.

The Future scope of our study was, the study had paved a new role of intervention for the clinical pharmacist, to provide a better treatment for the patients who are hospitalized. The introduction of clinical pharmacist can reduce the clinical burden on physicians and nurses. This can also assist the patients on clearing their doubts regarding the disease, drugs, life style modifications, dietary modifications and other precautions to be followed. Therefore, appointing a clinical pharmacist in major intensive care units of hospital helps to provide better treatment outcome.

Conclusion

In this study we analysed medication charts of IP patients from five major intensive care units including MICU, MDICU, NMICU, SICU and CICU. Within this many Drug related problems such as medication error and adverse drug reactions were reported. The range of drug related problems seen in this study steamed from the studies using interventional tools, pre and post ward rounds, identifying subtypes of drug related problems, implementing different inclusion criteria and using different study designs. The study examined the role of a pharmacist in the rate of medication and study shows significance reduction in the rate of drug related problem before reaching the patient through direct reviewing of the medication chart and also through the direct interaction with nurses and physicians. Clinical pharmacist contribution mainly includes checking drug history, keeping an eye on the patient medication chart so that it ensures the reduction of even very small mistakes done by the physicians and nurses due to their busy schedule that may lead to serious drug problems. The selection of our topic " Intervention in abate of drug related problem and emerging antibiotic resistance pattern in intensive care unit " is mainly based on the experience acquired from the ward rounds and previous case history during our academics. From the findings of study, we have observed that there are many Drug related problem in the hospital. We are able to reduce these types of drug related problems before reaching the patient which implies the need of clinical pharmacist in each Major departments. The study concluded that the safe usage of medication and reduction of drug related problem are mainly done through introduction of Ward based pharmacist.The increased multidrug resistance lead to AMS programs.

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Tables and figures

Table1:Age distribution of subjects in medication errors

(n =150)	Range	Mean	S.D.
Age	18 to 96	58.6	18.6

Table2:Age distribution of subjects in Adverse drug reaction

(n=75)	Range	Mean	S.D.
Age	18 to 87	46.1	18.3

Table3: Age distribution of subjects in Antibiotic Stewardship

(n=150)	Range	Mean	S.D.
Age(Years)	18 to 94	53.5	19.1

Figure1:Diagrammatic representation of gender wise distribution in Medication Errors

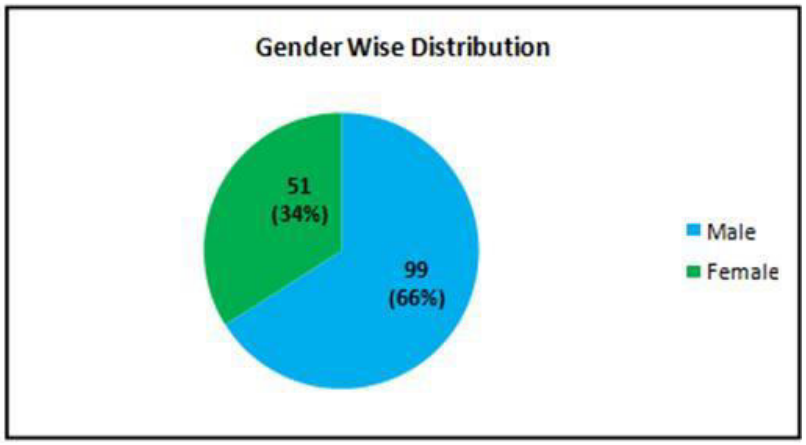

Figure 2 : Diagrammatic representation of Frequency and ICU wise percentage of medication errors

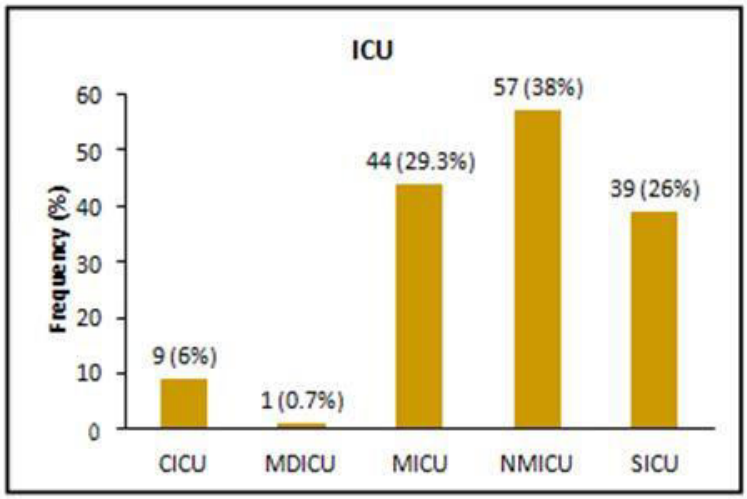

Figure 3: Diagrammatic representation of Frequency and co-morbidities wise percentage of medication errors

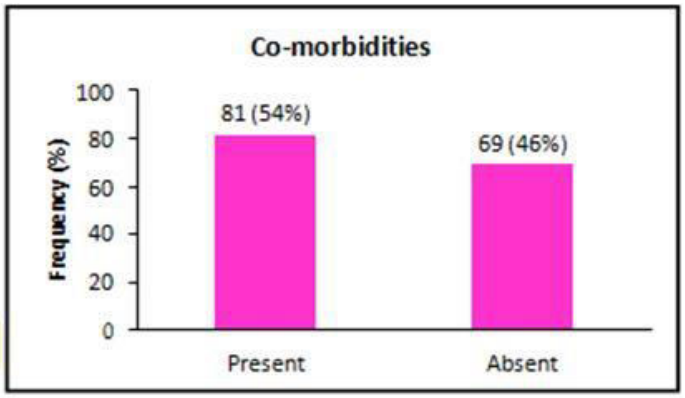

Figure 4: Diagrammatic representation of frequency and percentage of medication error based on staff involved

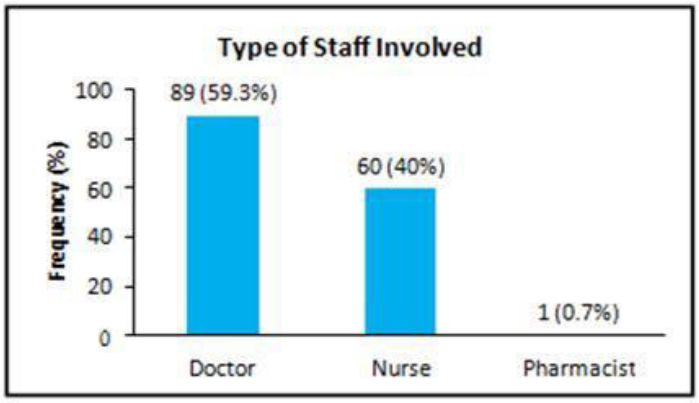

Figure 5: Diagrammatic representation of frequency and percentage of medication error based on working environment of the staff involved.

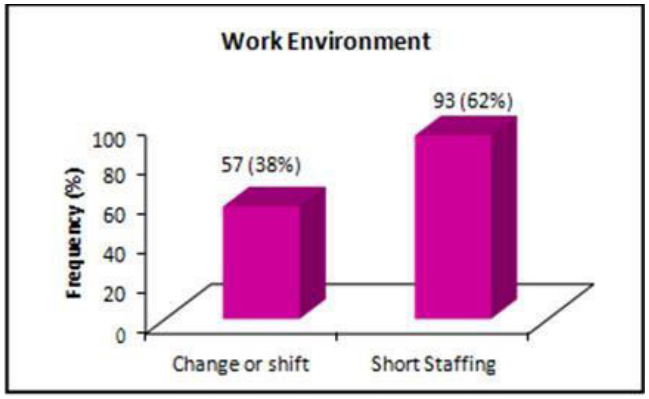

Figure 6: Diagrammatic representation of frequency and percentage of direct result of the Medication Error.

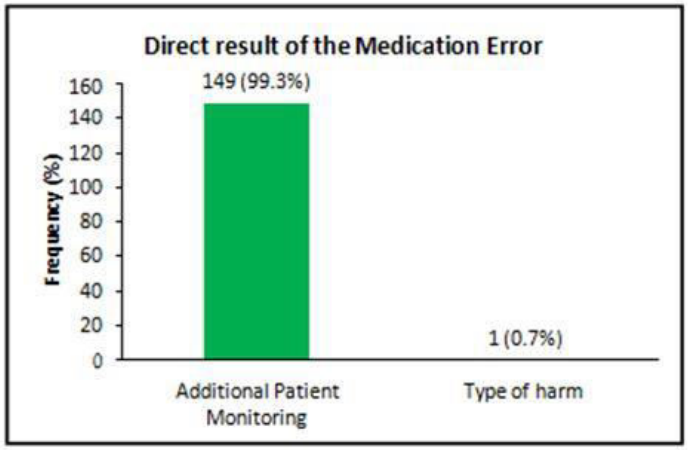

Figure 7: Diagrammatic representation of frequency and percentage of Possible medication error causes.

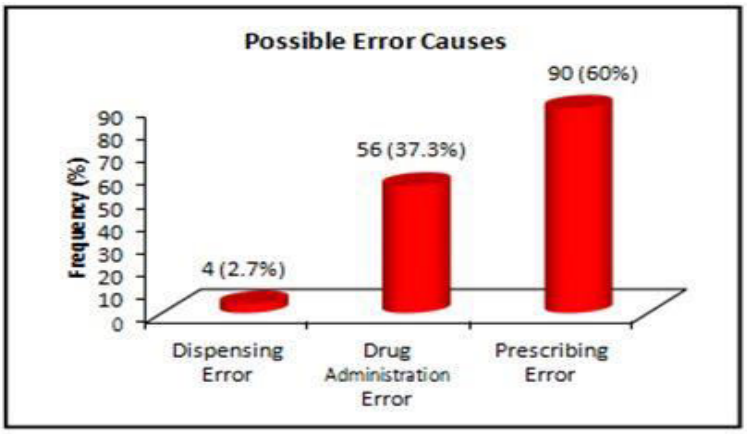

Figure 8: Diagrammatic representation of frequency and percentage of how the error was discovered

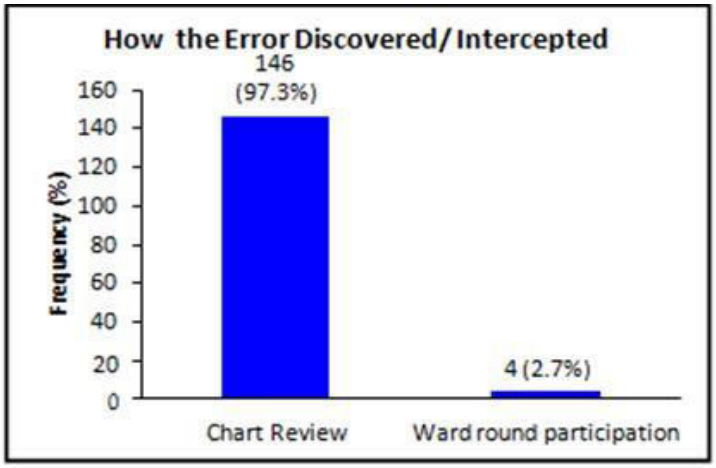

Figure 9: Diagrammatic representation of frequency and percentage distribution of common drugs involved in the error.

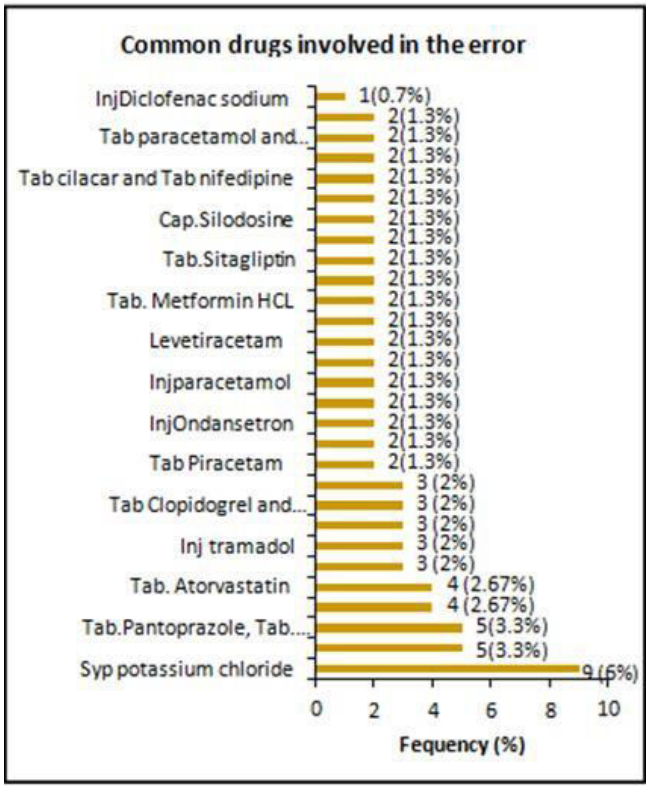

Figure 10: Diagrammatic representation of frequency and percentage distribution of the intervention provided and received. (Medication Error)

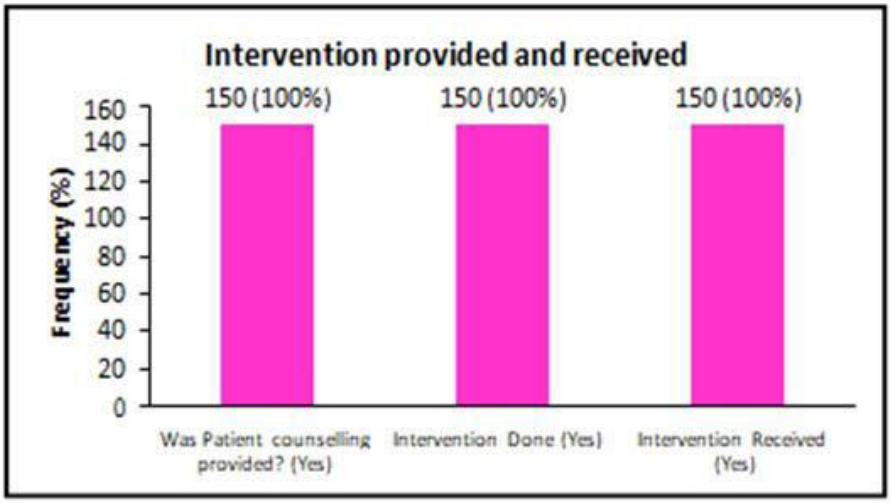

Figure 11: Diagrammatic representation of frequency and percentage of intervention of the error.

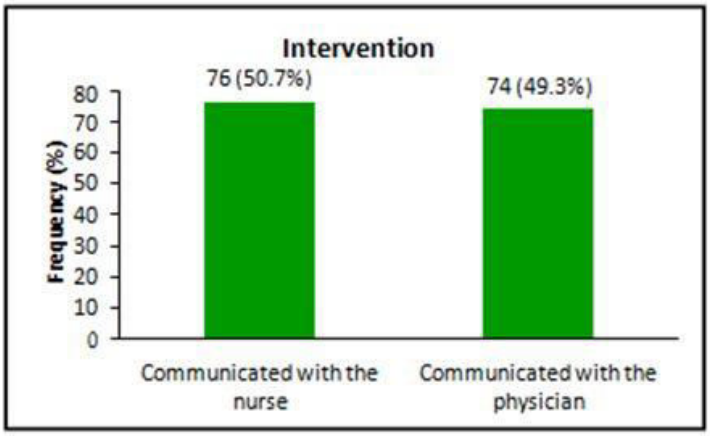

Figure12:Diagrammatic representation of gender wise distribution in ADR

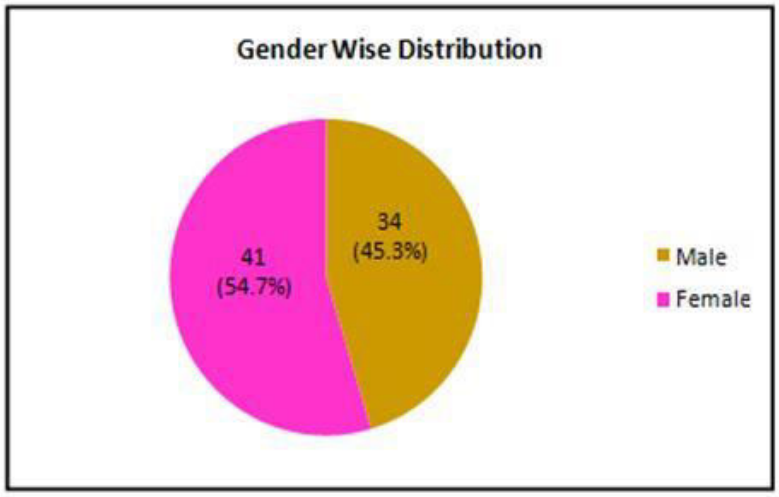

Figure 13: Diagrammatic representation of frequency and percentage distribution of various adverse events

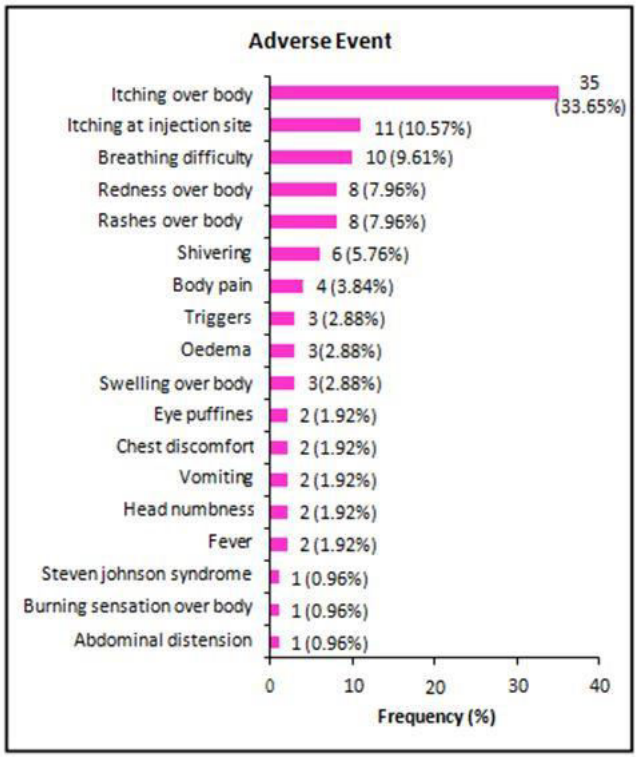

Figure 14: Diagrammatic representation of frequency and percentage distribution of suspected drugs for adverse events

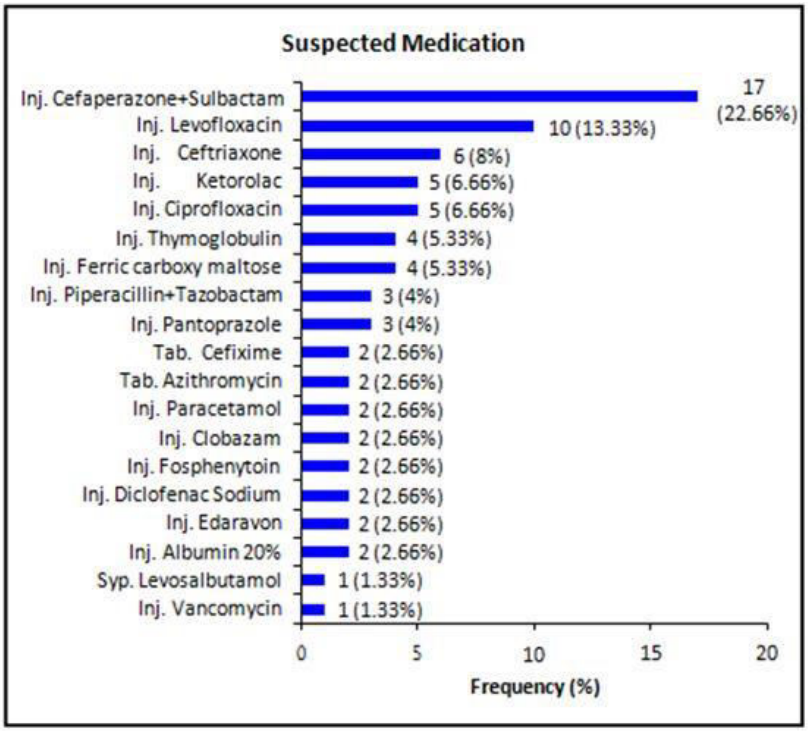

Figure 15: Diagrammatic representation of frequency and percentage distribution of route of administration of drugs in ADR

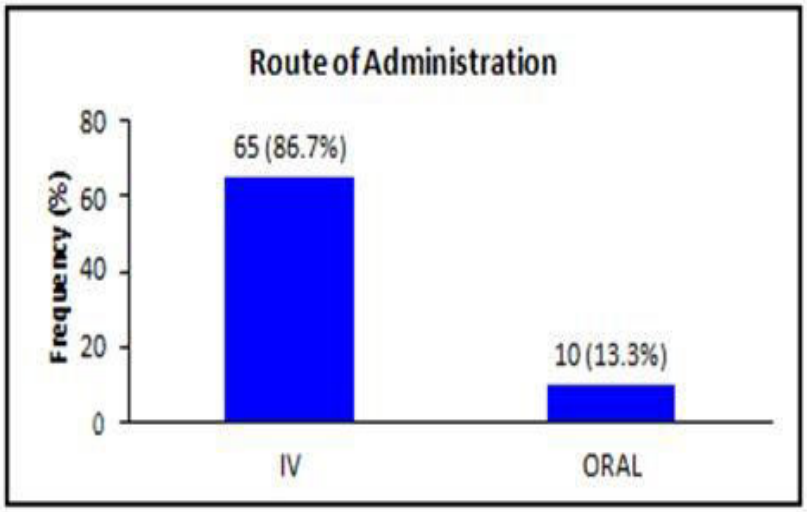

Figure 16: Diagrammatic representation of causality value of adverse events in both gender (ADR)

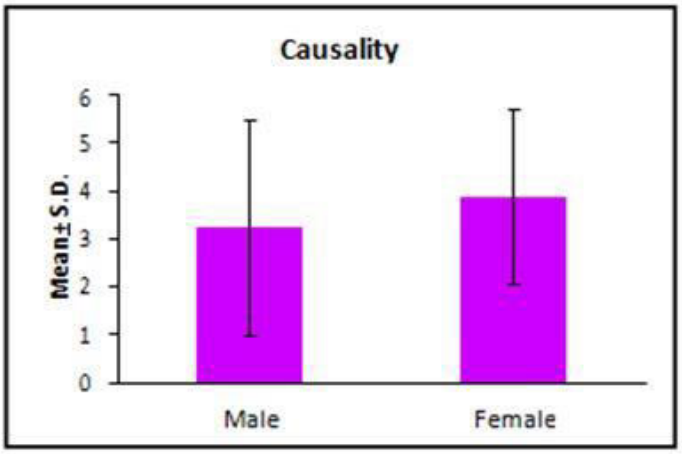

Figure17: Diagrammatic representation of outcome of the adverse drug reaction

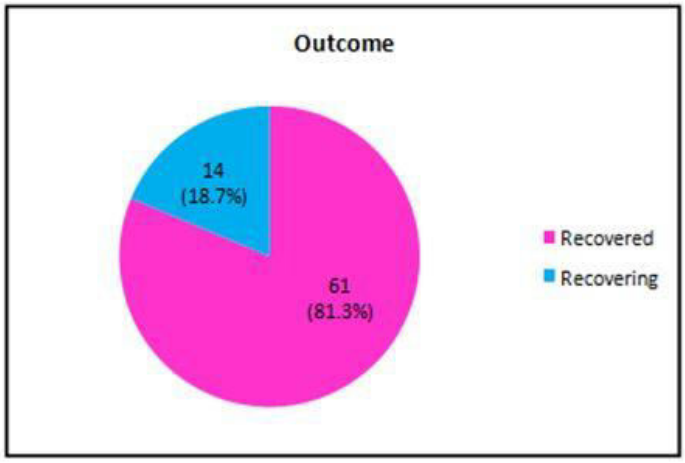

Figure18: Diagrammatic representation of gender wise distribution in Antibiotic Stewardship

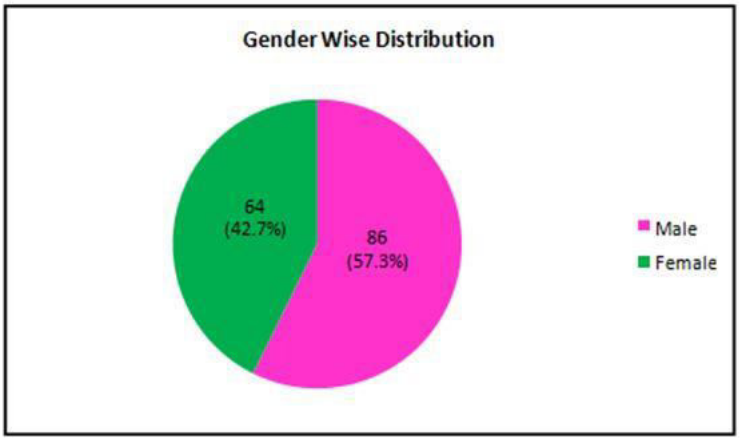

Figure19: Diagrammatic representation of frequency and ICU wise percentage of Antibiotic Stewardship.

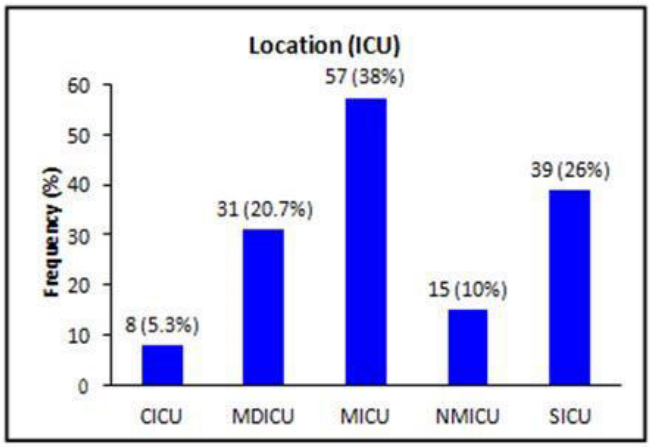

Figure 20: Diagrammatic representation of frequency and percentage distribution of administration of loading dose to subjects. (Antibiotic stewardship)

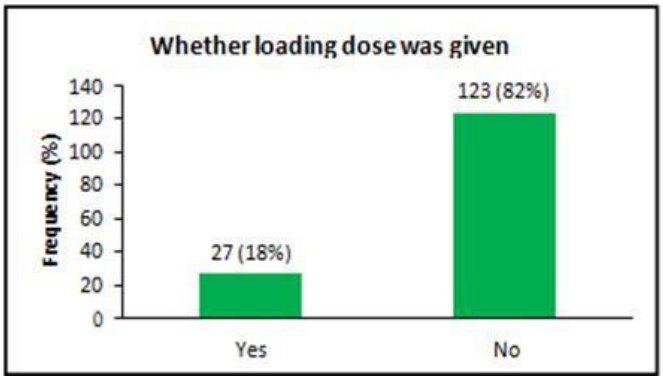

Figure 21: Diagrammatic representation of frequency and percentage of prophylactic or empirical treatment and identification of infection. (Antibiotic stewardship)

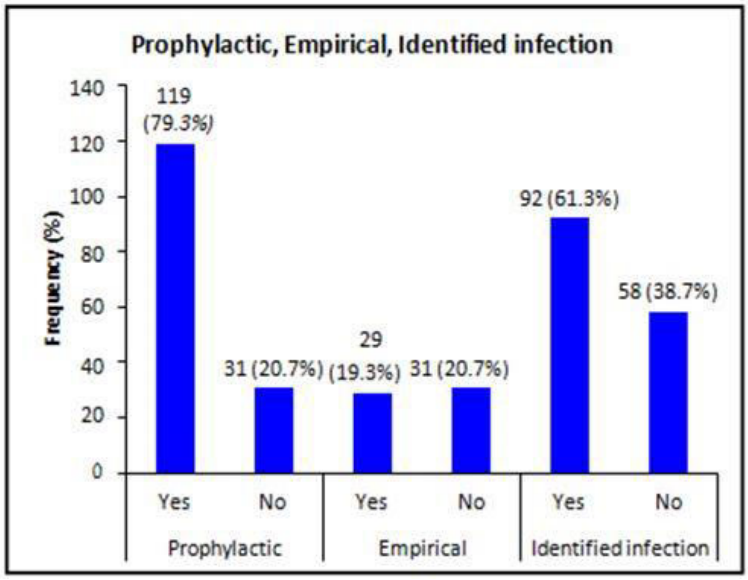

Figure 22: Diagrammatic representation of frequency and percentage distribution of antibiotic drugs used in stewardship

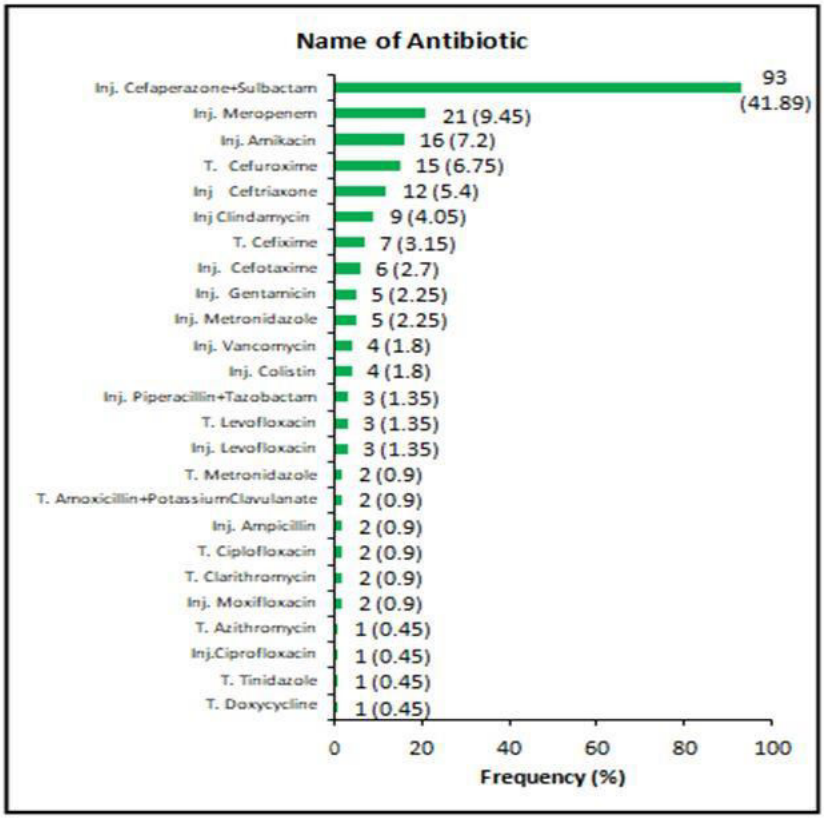

Figure 23: Diagrammatic representation of frequency and percentage distribution of route of administration of antibiotic. (Antibiotic stewardship)

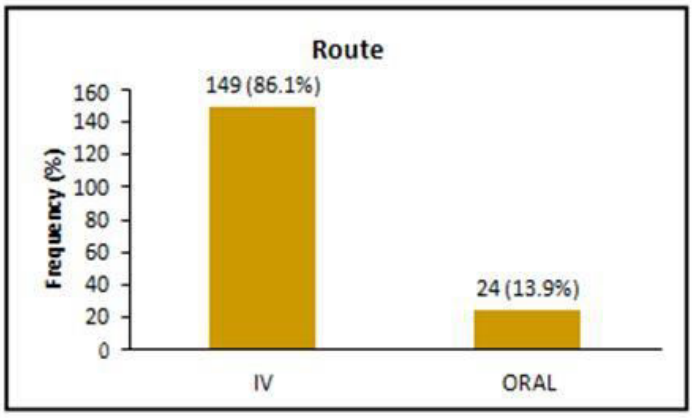

Figure 24 : Diagrammatic representation of frequency and percentage distribution of frequency of antibiotics. (Antibiotic stewardship)

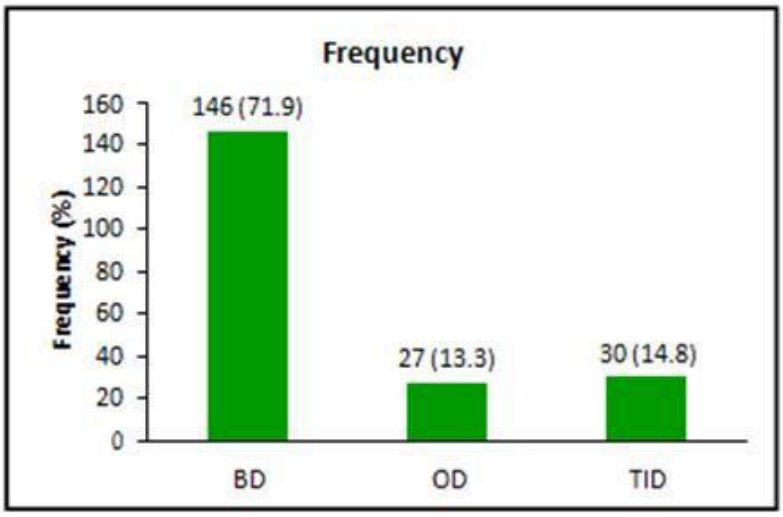

Figure 25: Diagrammatic representation of frequency and percentage of culture reports, allergic to test dose and toxin positive for Clostridium difficile. (Antibiotic stewardship)

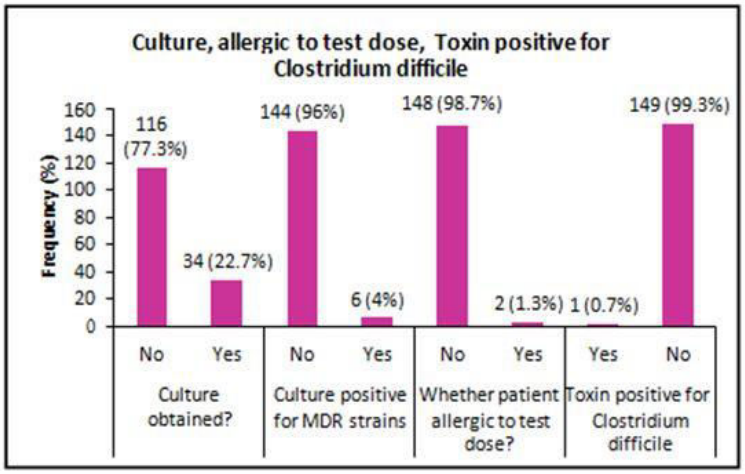

Figure 26: Diagrammatic representation of frequency and percentage of number of culture reports attached. (Antibiotic stewardship)

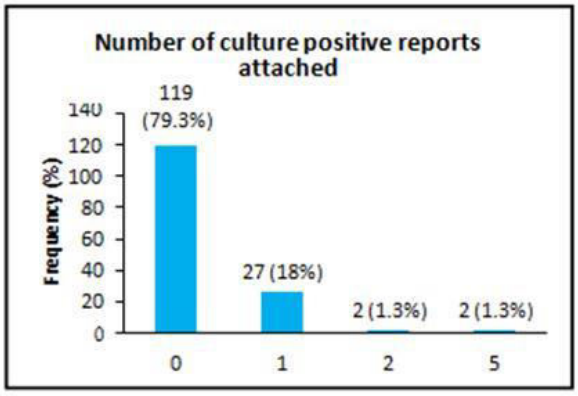

Figure 27: Diagrammatic representation of frequency and percentage distribution of culture correlation of antibiotic prescription. (Antibiotic stewardship)