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Original Research Article

Influence of reserve antimicrobial indent form in antimicrobial utilization pattern in intensive care unit of tertiary care hospital in North India

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ABSTRACT

Background: Misuse and overuse of antimicrobials in intensive care units is of particular concern as it creates selective evolutionary pressure and thereby enables antimicrobial resistant bacteria to increase rapidly resulting in loss of antimicrobial effectiveness. The aim of the present study was to evaluate influence of Reserve Antimicrobial Indent form in Strengthening the antimicrobial stewardship in intensive care unit of tertiary care hospital, Rajasthan.
Methods: An observational study was conducted over a period of 18 months, and the data was obtained from MRD and from the ICU after introduction of reserve antimicrobial indent form, of a tertiary care hospital. All the data was tabulated in summery sheets and were analyzed by using computer software SPSS version 20 and Microsoft Excel 2019.
Results: A total 257 cases were reviewed during the study period, among these 46.77% were males and 53.23% were females in MRD group, out of 124 cases and 53.38% were males and 46.62% were females in MICU group, out of 133 cases. Total number of reserve drug prescribed was 444 out of which in MRD group Amoxicillin /Clavulanic acid were commonly prescribed followed by piperacillin/tazobactumand in ICU group Meropenem were commonly prescribed followed by piperacillin/tazobactum.
Conclusions: Study showed reducing trend in overall consumption of reserve antimicrobial drugs, which also gave an overview of antimicrobial consumption pattern in intensive care unit.

Keywords: Reserve drug, Antimicrobial resistance, Medical record department, Intensive care unit

INTRODUCTION

Coronavirus disease 2019 (COVID-19) has put enormous burden on health, social care and resources globally. The importance of infection prevention and control through measures such as hand hygiene, social distancing and self-isolation has now been encouraged at a societal level.[1] Antimicrobial has left its marks on the history of medicine, owing to successfully lowering the morbidity and mortality from infectious disease. Meanwhile, however upsurge in the prevalence of irrational use of antimicrobial has weakened its original effectiveness and contributed to growing drug resistance that will undermine the ability to fight infections with varying degrees or even worse.[2] With 700,000 people losing battle to antimicrobial resistance per year and another 10 million projected to die from it by 2050.[3] Consideration needs to be given to the impact of the COVID-19 pandemic on individual national action plans for antimicrobial resistance.[2] Evidence suggests that majority of hospitalized COVID-19 patients were put on antimicrobials, to treat and to prevent superadded bacterial and fungal infections, regardless of a small percentage of these co-infections. The intensive care unit (ICU) being the epicentre of infections, use of broad – spectrum

antibiotics in critically ill patients is inevitable because of little margin for error in choice of therapy. Misuse and overuse of antimicrobials in intensive care units (ICUs) is of particular concern as it creates selective evolutionary pressure and thereby enables antimicrobial resistant bacteria to increase rapidly resulting in loss of antimicrobial effectiveness.[4-5] Drug utilization study define the intensity and characterization of recent drug usage trends, optimal quality of drugs and compliance with regional or national guidelines like generic drugs, essential drug formulations. Analytical studies try to link data on drug utilization to figure on morbidity, outcome of treatment, and quality of care with the ultimate goal to assess whether drug therapy is rational or not. Antimicrobial stewardship (AMS) describes a coherent set of action that ensures optimal use of antimicrobials to improve patient outcomes, while limiting the risk of adverse events (including antimicrobial resistance).[6-8]

METHODS

An observational study was undertaken in the department of pharmacology, RUHS college of medical sciences (CMS); intensive care unit and medical record department (MRD) of Govt. RDBP Jaipuria hospital Jaipur, Rajasthan. The duration of the study was of 18 months from January 2020 to June 2021. All patients of either sex who are admitted in general intensive care unit during the study period and on treatment with antimicrobial drugs were included in the study whereas patients who were less than 18 years of age excluded.

Sample size was calculated by multiplying average patients admitted per month in ICU with duration of data collection. It was found to be approximately 420 - 540 patients to be screened and of these, all those who fulfil the inclusion criteria were enrolled in the study. The present study included 257 cases. The study was divided into MRD group and ICU group. All the treating doctors were explained clearly about the nature and purpose of the study in the language they understand, and a written informed consent was obtained from them. The study was conducted in 3 phases, in phase 1 six months data was collected from medical record department as per the study Performa. In phase 2 of 3 months, the findings from phase 1 were analyzed and feedback was given to the prescribers on their current pattern of utilization of antimicrobials. Antibiogram was constructed and an interactive awareness session was organized by Department of pharmacology and 'reserve antimicrobial indent form' was introduced. In phase 3 of 6 months, all data similar to phase1 was noted and changes in the pattern of utilization of antimicrobials was observed and analyzed.

Statistically analysis

The utilization pattern of antimicrobials was used as the outcome measure to evaluate the impact of the 'Reserve Antibiotic Indent form' on AMSP. The ATC/DDD index developed by the WHO collaborating centre will be used for drug statistics methodology.[9-11] Defined daily dose (DDD) is defined as the assumed average maintenance dose per day for a drug used for its main indication in adults. It is presented as numbers of DDDs/1000 inhabitants/day or DDDs per 100 bed days for in-hospital drug use. At the end of data collection, all data were tabulated in summery sheets and were analyzed by using computer software SPSS version 20 and Microsoft Excel 2019. The data have been expressed as mean ± standard deviation, frequency and percentage, A p value less than 0.05 was considered significant.

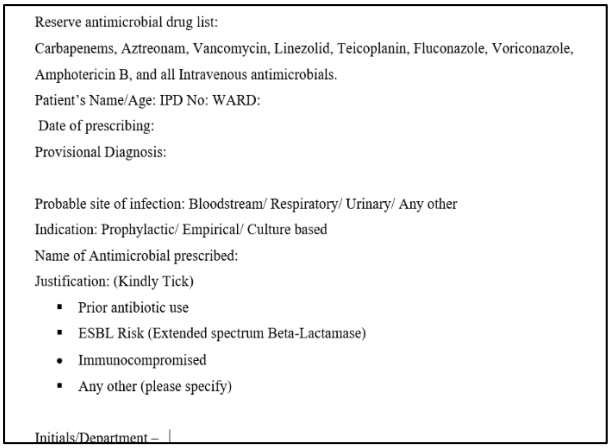
RESULTS

A total of 257 cases were reviewed during the study period. Among these 46.77% were males and 53.23% were females in MRD group, out of 124 cases and 53.38% were males and 46.62% were females in ICU group, out of 133 cases. The mean age of patients in MRD group was 56.16 and in ICU group was 56.00 years. The details of most common "reserved antimicrobial agents" used, ATC code and their DDD/100 bed-days (Table 1).

Table 1: ATC code and DDD/100 bed-days of the commonly prescribed antimicrobials in the MRD and ICU group.

Name of antimicrobial	ATC code	MRD	ICU
		DDD/100 bed-days	DDD/100 bed-days
Amikacin	S01AA21	63.49	31.75
Amoxicillin/Clavulanic acid	J01CR02	242.86	147.62
Ceftriaxone	J01DD04	120.63	82.54
Linezolid	J01XX08	15.87	152.38
Meropenem	J01DH02	61.90	177.78
Metronidazole	J01XD01	47.62	9.52
Ofloxacin	S01AE01	6.35	3.17
Piperacillin/Tazobactum	J01CR05	204.76	176.19
Ciprofloxacin	J01MA02	3.17	3.17

In MRD group Amoxicillin/Clavulanic acid was often prescribed followed by Piperacillin/Tazobactumand in ICU group Meropenem was often prescribed followed by Piperacillin/Tazobactum (Table 1). Reserve antimicrobial indent form" whereas (Table 2) shows inference of it, as in which 'Respiratory', as most common site of infection and 'Empirical' was most common indication given for prescribing antimicrobial agents with 'prior antibiotic use' was most often justification given by clinicians (Table 2, Figure 1).



Reserve antimicrobial drug list:

Carbapenems, Aztreonam, Vancomycin, Linezolid, Teicoplanin, Fluconazole, Voriconazole, Amphotericin B, and all Intravenous antimicrobials.

Patient's Name/Age: IPD No: WARD:

Date of prescribing:

Provisional Diagnosis:

Probable site of infection: Bloodstream/ Respiratory/ Urinary/ Any other

Indication: Prophylactic/ Empirical/ Culture based

Name of Antimicrobial prescribed:

Justification: (Kindly Tick)

- Prior antibiotic use
- ESBL Risk (Extended spectrum Beta-Lactamase)
- Immunocompromised
- Any other (please specify)

Initials/Department –

Figure 1: Reserve antimicrobial indent form.

Table 2: Inference from reserve antimicrobial indent form.

Row labels	N	%
Probable site of infection		
Bloodstream	12	9.02
Respiratory	121	90.98
Indication		
Empirical	125	93.98
Prophylactic	8	6.02
Justification		
Prior antibiotic use	126	94.74
ESBL risk	7	5.26

Table 3: Number of reserve drug's prescribed in MRD and ICU group.

Antimicrobial prescribed	MRD (%)	ICU (%)
Amikacin	10.52	3.93
Amoxicillin/Clavulanic acid	27.89	12.20
Ceftriaxone	20.00	10.23
Linezolid	3.68	18.89
Meropenem	6.84	22.04
Metronidazole	6.31	0.78
Piperacillin/Tazobactum	24.21	14.56
Remdesivir	0	17.18
Gentamicin	0.52	0
Total	100.00	100.00

Reserved drugs were prescribed based on their class whereas total number of reserve drugs prescribed was 444 out of which 190 drugs was prescribed in MRD group and 254 drugs prescribed in ICU group and total number patients prescribed reserve drugs was 255 out of which 122 patients was from MRD group and 133 patients was from ICU group (Table 3).

DISCUSSION

Antimicrobial agents, especially antibiotics have saved millions of lives in the 20th century alone. Apart from treating infections in vulnerable populations of children, women and geriatric population, they are critical in complex surgeries and management of chronic conditions. However, misuse and overuse of these medicines in humans and animals have facilitated the acquisition and spread of resistance among pathogens and made most of them ineffective in various cases. Empirical antimicrobial therapy is based on repeated review, testing and sound knowledge of possible microbes and antimicrobial available coupled with institutional 'sepsis protocol' or antibiotic policy developed on the basis regular microbial surveillance, culture, sensitivity testing and clinical audit.[12-13] In our study 257 cases were reviewed among which 46.77% were males and 53.23% were females in MRD group, out of 124 cases and 53.38% were males and 46.62% were females in ICU group, out of 133 cases. Similarly, a study carried out by Bimba et al showed 57.8% males and 42.2 % females inpatients whereas another study also suggests similar findings.[14-15] The mean age of patients in MRD group was 56.16 and in ICU group was 56.00 years. It has been found an earlier study conducted by Kumar S et al that mean age of patients was 66.84 years which also correlates with similar study.[16-17] The consumption of amoxicillin /clavulanic and piperacillin /tazobactum was 242.86 and 204.76 DDD/100 bed days in MRD group and, consumption of meropenem and piperacillin/tazobactum was 177.78 and 176.19 DDD/100 bed days in ICU group, However a study conducted by Suraj et al found out consumption metronidazole and piperacillin/tazobactum 35.32 and 23.82 DDD/100 bed days which is lower than compared to our study, this could be explained by the fact the empirical prescription habits in ICU with possible increase in pneumonia patients with COVID 19 positive infection. This finding is also comparable with similar study conducted in south India.[18-19] In this study amoxicillin/ clavulanic acid (27.89 %) and piperacillin/tazobactum (24.21%) most common reserved drugs prescribed in MRD group similarly Meropenem (22.04 %) and Linezolid (18.89 %) was commonly prescribed in ICU group. The trend of antimicrobial consumption before and after implementation of reserve antimicrobial indent form was evaluated. Intervention showed reducing trend in overall consumption of reserve antimicrobial drugs. Similarly, Sharma conducted a prospective study for four months following the implementation of reserve antibiotic indent form which showed reduced consumption over period of four month, whereas study done by Shridhar et al concluded that meropenem, imipenem, vancomycin and colistin showed significant difference in consumption before and after implementation of reserve drug indent form.[5]

Limitations

The major limitation of our study was ongoing pandemic of COVID-19 caused by severe acute respiratory corona virus (SARS-Co V2) which had significant effect on prescribing pattern in ICU, also our data analysis is limited only to the information available in the records. The study

was done with small sample size that may affect the validity of the conclusion.

CONCLUSION

The study indicates that reserve antimicrobial indent form had no significant impact on the consumption pattern of antimicrobial drugs. This data gave an overview of antimicrobial consumption pattern in intensive care unit which would spread awareness among prescribers and help in reducing unnecessary utilization of antimicrobial drugs.

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