AMERICAN JOURNAL OF PHARMTECH RESEARCH

Journal home page: http://www.ajptr.com/

A Drug utilization study in Critically Ill Patients in a Tertiary care Teaching Hospital in North India.

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ABSTRACT

The objective of this study was to assess the drug utilization pattern and cost analysis among the inpatients of medical intensive care unit (ICU) of NIMS hospital, Jaipur. After taking Ethics permission , records of 356 patients admitted in the medical ICU of a NIMS hospital were noted. Demographic profile, commonly prescribed drugs as per Anatomical Therapeutic Chemical Classification (ATC) and WHO core indicators were assessed from the records. Out of 356 inpatients, 224(62.9%) were males . Most of the patients were in the age group of 61-70 for males 51-60 for females. Most commonly prescribed drugs were antibiotics followed by i.v. fluids. The average number of drugs per prescription was 11.99. Out of 4271 drugs prescribed, 1152(26.97%) were prescribed by generic names. Drugs on WHO EML were only 41% while that of NLEM 2011 were 68% . Drugs used as fixed dose combination were 19.26%. Average cost per prescription was INR 1975. Median length of stay was 6 days. Inspite of the fact that respiratory complications are one of the leading cause of death in critically ill patients and rational drug use plays a pivotal role in reverting the condition , there is a lack of pioneer drug utilization studies in this field. This study gives a message to adopt a cost effective and rational use of drug.

Keywords: Drug utilization studies, rational use of drugs, ATC code.

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Received 06 January 2014, Accepted 15 January 2014

Please cite this article in press as: Sharma N. *et al.*, A Drug utilization study in Critically Ill Patients in a Tertiary care Teaching Hospital in North India. American Journal of PharmTech Research 2014.

INTRODUCTION

Critically ill patients who are admitted in the intensive care unit usually receive a large number of drugs of different pharmacological classes due to life threatening illnesses which may be fatal. [1, 2]Prolonged length of stay, certain admitting diagnoses, and death are associated with increased medication administration[3] This lead to polypharmacy and drug-drug interactions. Thus a thorough knowledge of 'Rational use of drugs' which actually means that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, and the lowest cost to them and their community" (WHO, 1985), plays a pivotal role in prevention of incidences of polypharmacy and major health hazards.[4] Biswal S et al2006 stated that "there is a tremendous impact of antibiotic use on the cost of therapy in the intensive care unit."[5] Hence drug utilization studies are of utmost important in the ICU set up. WHO in 1977 defined drug utilization research as the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences.

Widespread use of broad spectrum antibiotics may lead to emergence of resistant bacterial strains [6] which is a matter of great concern. Thus therapeutic evidence is important for determining physicians' prescription[7] and so all interventional programs should ideally focus on promoting infectious control with rational antibiotic prescription to minimize the future emergence of bacterial resistance and futile expenses.[8]

According to a study done by Pichala PT 2013 ,drug interactions are one of the highest occurring drug-related problems in the ICUs still less priority is given to them. [9]

All these important parameters were kept in mind before conducting this study. As critically ill patients are at a higher risk of having altered respiratory functions, prescribing drugs is an art in these patients to prevent complications. [10]

The main objective of our study was to assess the utilization of drugs and cost analysis of the drugs which were given mainly in treating respiratory complications occurring in critically ill patients admitted in the medical ICU .

MATERIALS AND METHOD:

A prospective, observational , cross sectional study was done including critically ill patients admitted in the medical ICU of NIMS medical college and hospital, Jaipur. The study was conducted after getting approval from the institutional ethical committee. Total 356 records were noted from the patients admitted in the medical ICU after taking written informed consent from

the patients. Demographic profile, commonly prescribed drugs to treat the respiratory complications were recorded as per Anatomical Therapeutic Chemical Classification (ATC) and WHO core indicators were assessed .

Inclusion criteria:

Critically ill patients of all age groups with respiratory complications admitted in the medical ICU of NIMS medical college were included.

Exclusion criteria:

Medical ICU patients with complications other than respiratory system were excluded from the study.

Statistical analysis:

The data was subjected to descriptive analysis using Microsoft Excel. Drugs were classified according to the WHO ATC classification and verified by WHO EML (Essential Medicine List) as well as NLEM (National List of Essential Medicines) 2011. Different parameters were given as percentage.

RESULTS AND DISCUSSION:

The objective of our study was to assess the pitfalls in the pattern of prescribing drugs by the ICU physicians of NIMS hospital specially to revert respiratory complications. There is paucity of intensive research work in this field and we have tried our best to fill this lacunae.

Records of 356 patients were analyzed. Out of 356 inpatients, 224(62.9%) were males and 132(37 %) were females. We found male preponderance in our study which corresponds to similar studies in which male preponderance was noticed. [1, 5, 6, 10, 15]. But in a study conducted by Smythe MA et al 1993 , number of male and female was same.[3] Lisha Jenny John explained this discrepancy of male preponderance as females of low socioeconomic strata specially in Indian scenario are reluctant to utilize health care facilities even if they are critically ill.[1]Most of the patients were in the age group of 61-70 for males 51-60 for females as depicted in figure-1.

The order of prescribing drugs was antibiotics followed by i.v. fluids, multivitamins, bronchodilators, analgesics, cough and cold preparations, DOTS regimen and others. This has been shown in percentages in figure 2. Surprisingly antibiotics were prescribed in almost 98% (351) of patients in our study which resembles the results as documented by other studies done in ICU. [5, 9,11,22].We could compare this result with a study done in post-operative ward in which 100% of patients were given antibiotics. [23]

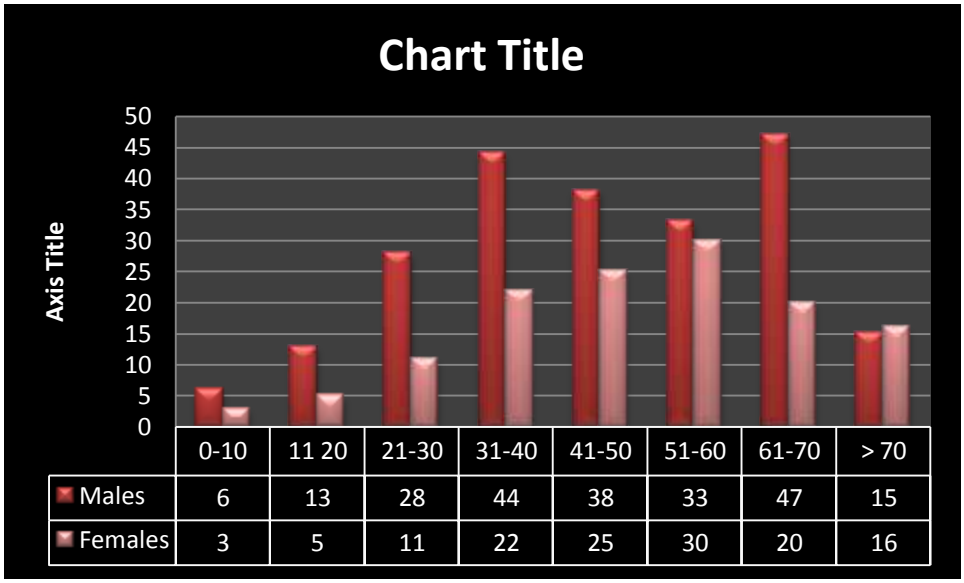

Figure-1: Showing age distribution of patients.

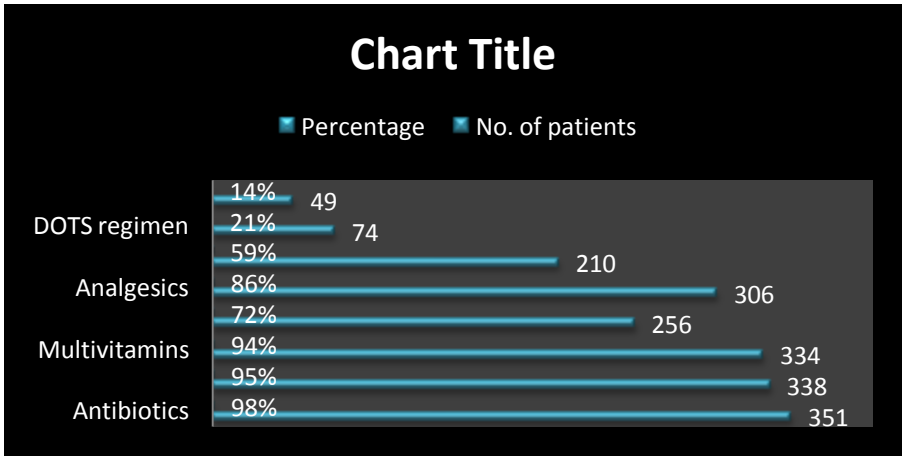

Figure 2 Showing percentage of drugs prescribed

Among antibiotics ceftriaxone (n= 105) was the most commonly prescribed antibiotic followed by cefoperazone and sulbactum(n= 74) , cefuroxime and tazobactum(n= 52) , amoxicillin and clavulanic acid(n= 43) , metronidazole(n= 39) , levofloxacin(n= 15) , moxifloxacin(n= 11) , clindamycin(n= 8) and amikacin(n= 4) as given in figure-3.

Ceftriaxone was most frequently used in our study which is consistent with a study done in Qatar medical ICU by Hanssens Y et al 2005. [22] Vandana Badar et al 2012 reported cefotaxime (32%) as the most commonly prescribed drug in medical ICU [11] in central India while PT Pichala 2013 and Lisha Jenny John 2011 observed cephalosporins as the most commonly prescribed pharmacological drug class in a rural ICU set up. [9] This is in contradiction with a study done by Shankar PR et al 2005 , who found ampicillin as the most commonly prescribed antibiotic. [6]

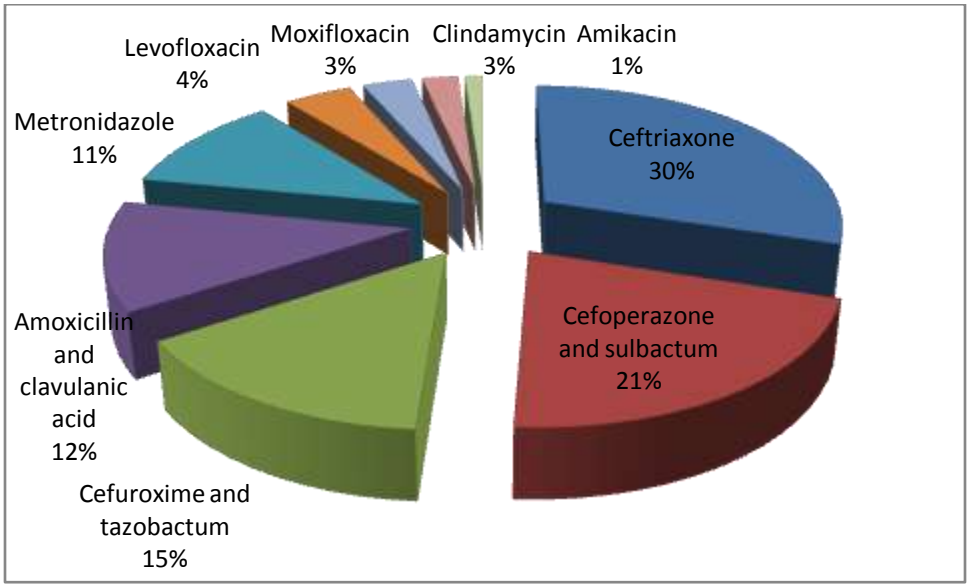

Figure 3: Showing percentage of antibiotics used in patients.

Overall drugs used with their ATC code [14] and dosage recommended dosage form is shown in table -1.

Table-1 : Shows all drugs used in patients.

S. No.	Drug class	Drug- name	ATC –code	Dosage form
1	Antibiotics	Ceftriaxone	J01DA13	Parenteral
		Cefoperazone and sulbactum	J01DD62	Parenteral
		Cefuroxime and tazobactum	J01RA03	Parenteral
		Amoxicillin and enzyme inhibitor	J01CRO2	Oral
		Metronidazole	J01XD01	Parenteral
		Levofloxacin	J01MA12	Oral, parenteral
		Moxifloxacin	J01MA14	Oral, parenteral
		Clindamycin	J01FF01	Parenteral
		Amikacin	J01GB06	Parenteral
2	i. V. fluids	Ringers lactate	B05BB	Parenteral
		Dextrose 5%	B05BB	Parenteral
3	Multivitamin	Multivitamins and other minerals including combinations	A11AA03	Oral
4	Bronchodilators	Adrenergic and anti cholinergic	R03AL	Inhal. Solution
		Salmeterol and other anti-asthmatics	R03AK06	Inhal. Aerosol powder
		Salbutamol	R03AC02	Inhal. Solution
		Formeterol	R03AC13	Inhal. Aerosol powder
		Theophylline	R03DA04	Oral, parenteral, rectal
4	Analgesics	Paracetamol combinations	N02DE51	Oral

		Paracetamol	N02DE01	Oral
		Diclofenac	M01AB05	Oral, parenteral, rectal
		Diclofenac combinations	M01AB55	Oral
5	Cough and cold preparations (R05)	Codeine combinations	N02AA59	Oral
		Bromehexine	R05CB02	Oral
		Dextrometharphan	R05DA09	Oral
6	DOTS	Rifampicin	J04AB02	Oral
		Pyrazinamide	J04AK01	Oral
		Isoniazide	JO4AC01	Oral, Parenteral
		Ethambutol	J04AK02	Oral, Parenteral
		Streptomycin	J01GA01	Parenteral
7	Others			
	Opioids	Tramadol	N02AX02	Oral, parenteral, rectal
	Antacid			
	Proton pump inhibitor	Pantoprazole	A02BC02	Oral
		Rabeprazole	A02BC04	Oral
	H_2 antagonists	Ranitidine	A02BA02	Oral, parenteral
		Sucralfate	AO2BX02	Oral
		Aluminium hydroxide	A02AB01	Oral

WHO core indicators are featured in table 2.

Table 2: Showing WHO core indicators.

S. no.	Core indicators	Percentage
1	Average no. of drugs per prescription	11.99% (4271/356)
2.	Drugs prescribed as fixed dose combinations	19.2%(822/4271)
3	Total encounters having injectable formulation	98.9%(4226/4271)
4	Drugs mentioned in NLEM 2011	68%
5	Drugs mentioned in WHO EML	41%
6	Drugs prescribed by generic name	26.97%(1152/4271)
7	Drugs prescribed by brand name	73.02% (3119/4271)

Average number of drugs per prescription is an important index and should be kept as low as possible [15] but in our study it was 11.99 which is highly suggestive of polypharmacy. Polypharmacy was also resulted in similar studies done previously in ICU set up. [1, 3] Surprisingly in some studies number of drugs prescribed was less than our study. [11, 15, 20, 23] But Tavallaee M 2010 [12] and Biswas S 2006[5] reported variations in drugs received by the ICU patients on first day of admission and on day of discharge.

We found that, drugs prescribed by generic names were 1152(26.97%) which is less than that prescribed by their brand names 3119(73.02%) . This trend of promoting drugs by their brand names may be because of different type of gifts offered by drug companies to the physicians. All

physicians should think about the socioeconomic background of poor patient before writing prescription. Generic drugs should be promoted in the prescription by all doctors in present Indian scenario. This trend of writing more brand names of drugs was seen in studies done in other outpatient department also. [16, 17]

Drugs on WHO EML were only 41% while that of NLEM 2011 were 68% which is in accordance to previous other studies. [16, 18] This result shows that more emphasis should be given on incorporation of knowledge of EML by each and every physician.

Drugs used as fixed dose combination were 19.26%. 98.96% of drugs were given as injections as most of the patients were critically ill and bioavailability of i.v. route is 100%. Average cost per prescription was INR 1975 which is almost similar to the cost reported by Aparna Williams et al in 2011 while studying antibiotic prescription patterns at admission into a tertiary level intensive care unit in Northern India [20] and Shankar PR in population of Nepal [6] . Bhansali NB who studied drug utilization in post –operative patients in a surgical ward of a tertiary care hospital also reported almost equal cost. [23]

Median length of stay in MICU was 6 days. 56% of patients were discharged after completion of treatment while 30% patients were referred to other departments. 8% patient died mainly due to respiratory complications whereas 6% took discharge after taking DAMA (discharge against medical advice). Patient's outcome has been depicted in figure:4.

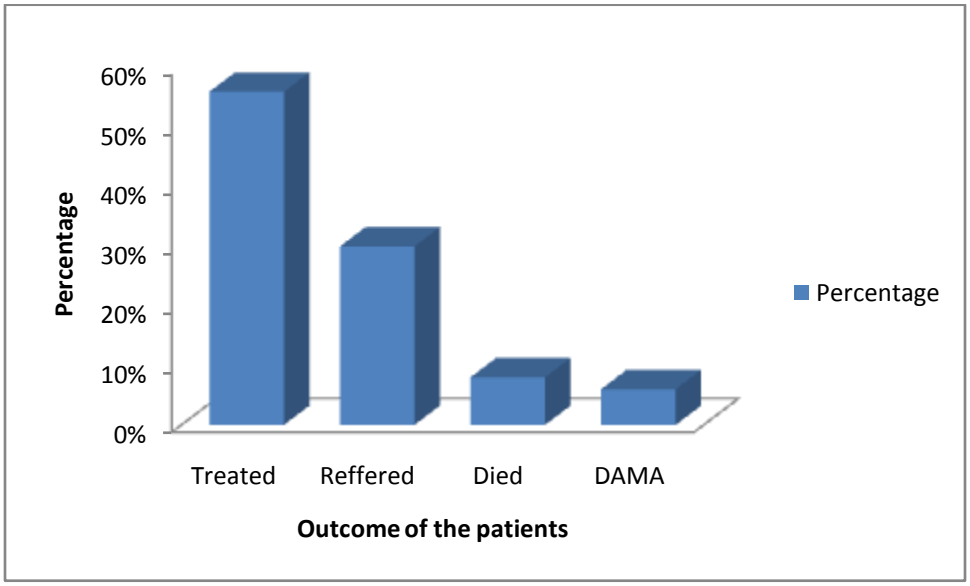

Figure 4: Shows patients outcome in percentage.

CONCLUSION:

Though our study gives an overall idea about the drug utilization pattern in ICU but there are some shortcoming of our study and the plausible reason for that may be short duration and small

sample size of the study. Various drug utilization studies have been done in this field , still there is a dire need of improvement in prescribing pattern. Number of drugs prescribed to a patient should be at the lowest possible limit to prevent drug –drug interactions. Protocols should be framed for proper antibiotic usage and they should be followed strictly to . Though drug combinations are known to reduce emergence of bacterial resistance still physicians should not stick to it. Clinical pharmacologists should be appointed not only in corporate set up but in government hospitals also. Knowledge of 'Rational prescribing' should be promoted and this should be inculcated in each medical student as soon as he starts attending clinical posting .

List of abbreviations:

- ATC- Anatomical Therapeutic Chemical classification of drugs
- DOTS- Directly Observed Treatment Short course
- DAMA- Discharge Against Medical Advice.
- EML- Essential Medicine List
- I.M- Intra Muscular
- I.V- Intravenous
- NLEM- National List of Essential Medicines
- OPD- Outpatient Department
- WHO- World Health Organization

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