Research Article

Drug utilization study in medical intensive care unit in a rural tertiary care teaching hospital in Maharashtra

Rucha Mahesh Shinde, Anand Kale, Swapnil Chube, Mahadeo Sawant

Department of Pharmacology, Swami Ramanand Teerth Rural Medical College, Ambajogai, Maharashtra, India

Correspondence to: Rucha Mahesh Shinde, E-mail: shinderucha1@gmail.com

Received: November 06, 2016; **Accepted:** November 30, 2016

ABSTRACT

Background: Drug utilization study is an important tool to study the clinical use of drugs and its impact on health-care system. There is limited data from Indian medical intensive care unit (MICUs) on prescription patterns. **Objectives:** To study the drug utilization pattern in the patients admitted to the MICU. **Materials and Methods:** A retrospective observational study was conducted in a 14 bedded MICU of rural tertiary care hospital. Indoor case papers of the patients admitted to the MICU between 1st January 2016 and 28th February 2016 were studied, and the prescribing pattern was analyzed using the World Health Organization (WHO) basic drug indicators. **Results:** A total 234 cases with the mean age group of 48 years were evaluated, 141 (60.78%) of which were males and 93 (39.74%) were females. The most common cause of admission was suicidal poisoning (45.69%). The average duration of stay was 4.24 days. The average number of drugs prescribed per patient was 6.26. Pantoprazole, atropine, pralidoxime, ondansetron, and ceftriaxone were prescribed in more than 30% of the patients. Average antibiotic prescribed per patient was 1.12 and ceftriaxone (30.42%) was the most commonly prescribed antibiotic. 47.97% of prescribed drugs were from the WHO model list of essential medicines and 60.48% were according to their brand names. **Conclusion:** The findings of this study are comparable to those of other studies. However, there is a scope of improvement in areas such as overdosing, prescribing more by generic names instead of brand names and from WHO Model List of Essential Medicines.

KEY WORDS: Drug Utilization; Defined Daily Dose; Prescribed Daily Dose; Overdosing; Generic Drugs; Essential Medicines

INTRODUCTION

Drug utilization study (DUS) has been defined by the World Health Organization (WHO) as "The marketing, distribution, prescription and use of drugs in society, with special emphasis on resulting medical, social, and economic consequences."[1] The definition suggests that such studies help in determining the rationality of the prescribed drugs and also help in formulating evidence-based guideline for making policy decisions at various levels of health care. It is a vital tool to study the clinical use of drugs in population and also its impact on the health-care system. Drug utilization patterns differ not only among different countries but also within a country in different institutions and in the same institution at different point of time probably because of variation in population and changing disease trends over a period. Therefore, it is necessary to assess the drug utilization pattern of the patients to analyze the current hospital drug prescribing practices and make improvements based on various standard guidelines of treatment, thus, improving the future drug usage. This is particularly important in a resource poor country like ours so as to ensure stringent use of available resources.[2]

Access this article online	
Website: http://www.ijmsph.com	Quick Response code
DOI: 10.5455/ijmsph.2017.1165030112016	

The medical intensive care unit (MICU) is a setting were patients who are critically ill are admitted and thus are

rigorously treated with multiple medications. The patients are also often prescribed multiple broad-spectrum antibiotics at admission as they are more sick, to be exposed to multiple invasive procedures, and vulnerable to multidrug-resistant pathogens. However, this pattern of prescription is often empiric and based on the physician's experience and choice which leads to overuse or misuse of antibiotics (Williams et al). This increases the chance of developing resistance, the cost of treatment and probability of developing side effects.[3]

The assumed average maintenance dose per day for a drug used for its main indication in adults is called defined daily dose (DDD).[4] DDD is an important tool to assess and compare utilization of drugs among different institutions in the same and different countries. DDD/100 bed-days provide a rough estimate of the pattern of drugs consumed by the hospital in-patients. It is also a fixed unit of measurement independent of formulation and price.[5,6]

There is limited data from Indian ICUs on prescription patterns.[7] Hence, we proposed to study the Drug Utilization Pattern in patients admitted to the MICU of our Rural Tertiary Care Hospital.

MATERIALS AND METHODS

A retrospective study was conducted, after permission from the Institutional Ethics Committee, Swami Ramanand Teerth Rural Government Medical College, Maharashtra, India. Indoor case papers of the patients admitted in the MICU between 1st January 2016 and 28th February 2016 were studied.

For studying the drug utilization pattern, following data were collected: (i) age, (ii) gender, (iii) average stay in the emergency department, (iv) diagnosis of the patient, and (v) comorbid conditions. Detailed information on drugs used including name of drugs, dose, frequency, and duration of treatment was recorded from the patient's medical records over a case record form.

Data were analyzed for demographic profile of the patients; cause of admission to MICU; duration of stay; prescribed medications and various parameters related to them. The treatment given was segregated for various WHO DUS indicators such as average number of drugs per encounter, percentage of drugs prescribed by generic name, percentage of various routes of drug administration, and percentage of drugs prescribed from WHO model list of essential medicines. The drugs were classified according to the anatomical therapeutic classification based on their chemical, pharmacological, and therapeutic properties. The drug utilization was measured using parameters such as DDD/100 bed-days, prescribed daily dose (PDD), and PDD/DDD ratio.

DDD/100 bed-days were calculated using the following equation:

DDD/100 bed-days = [total dose in mg during study period × 100]/[DDD of drug × study duration (days) × bed strength × Average bed occupancy rate]

The number of DDDs per 100 patients - day is utilized to analyze the consumption variation in the prescribed drugs.

And,

Average bed occupancy rate = [Total in-patients service days for a period × 100]/[total in-patient bed count × number of days in the period]

In our MICU, the bed strength was 14 and average bed occupancy was 28.

PDD is the average daily amount of a drug that is actually prescribed. It was calculated in grams by multiplying DDD with the ratio of number of DDDs to the number of treatment days.[8]

- The PDD to DDD ratio was then calculated.

RESULT

A total 234 indoor case papers of the MICU patients were scrutinized. 32 (13.68%) patients were between 18 and 32 years of age; 120 (51.28%) patients were between 36 and 55 years, and 82 (35.04%) patients were above 56 years of age group. The mean age of admitted patients over the entire study period was 48 years. The maximum patients admitted were in the age group of 36-55 years, followed by patients with age group more the 56 years. Out of total patients 141 (60.78) were males and 93 (39.74) were females (Figure 1).

Demographic Characteristics of the Study Population

The common indications for admission were suicidal poisoning (45.69%), cardiovascular emergencies (20.94%),

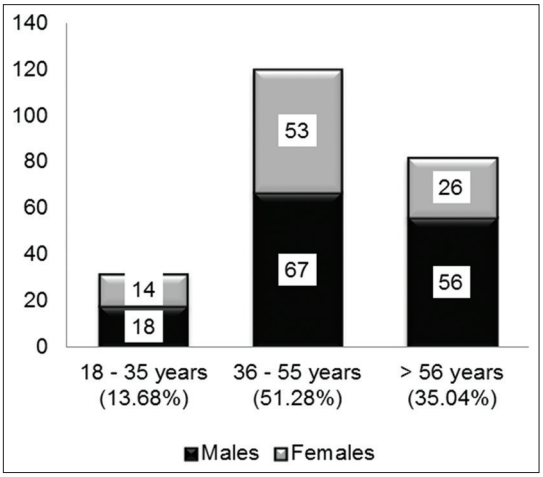

Figure 1: Age and Gender wise distribution of the study population (n = 234)

respiratory system diseases (10%) and the remaining indications included alcohol intoxication, snake bite, central nervous system disorders, etc (Figure 2).

The average duration of MICU stay was 4.24 days. A total 1468 drugs (68.83% parenteral and 31.17% oral formulations) were prescribed in all patients. A total 147 different drugs (39.52% generic and 13% fixed drug combinations [FDCs]) were used. The minimum and maximum number of drugs prescribed to a single patient was 2 and 12, respectively. The average number of drug prescribed per patient were 6.26. Pantoprazole, atropine, pralidoxime, ondansetron, and ceftriaxone were prescribed in more than 30% of the patients. Clopidogrel, cefotaxime, isosorbide dinitrate, human insulin, ranitidine, amoxicillin and clavulanic acid, atorvastatin, syrup cremaffin, paracetamol, ferrous sulfate and Folic acid, Vitamin K, and hydrocortisone were given in 10-30% of the patients.

Utilization pattern of various drugs including DDD/100 bed-days, PDD, DDD, and PDD/EDD ratio has been summarized as shown in Table 1. We did not include FDCs in our analysis because the DDD assignment for them differs from that for single ingredient products. The commonly prescribed FDCs are described as shown in Table 2. The PDD is defined as the average dose prescribed according to a representative sample of prescriptions. It gives the average daily amount of a drug that is actually prescribed. The ratio of PDD to DDD was calculated for the drugs which were prescribed in more than 10% of the study population. It is used as an indication of the adequacy of dosing. The ratio of more than one (>1) suggests overdosing, less than one (<1) suggests underdosing and equal to 1(=1) suggests adequate dosing.[8] The data corresponding to the PDD/DDD ratio is summarized as shown in Table 1 which shows values of >1 for all the drugs suggesting overdosing of the drugs in our MICU.

Among all the prescribed drugs, 24 different types of antibiotics were used of which ceftriaxone (30.42%), metronidazole (20.15%), amoxicillin and clavulanic acid (11.79%), cefotaxime (8.7%), and azithromycin (6%) were the most commonly prescribed antibiotics. An average number of antibiotic prescribed per person was 1.12.

Only 47.97% of the prescribed drugs were from the 19th WHO model list of essential medicines. About 60.48% drugs were prescribed according to their brand names (Figure 3).

DISCUSSION

Total 234 cases record forms, from a 14 bedded MICU of a rural tertiary care hospital, were evaluated for 2 months. Male preponderance 60.78% was observed and male: Female ratio was in accordance with the previous reports.[2,3,9] The mean age group of the patients admitted in our study (48 years) was similar to that in other study conducted by Kaur et al. (46 years) and more than that reported by Patel et al. (44 years).[2,3]

The most common indication for admission was suicidal consumption of poison especially that of organophosphorus compounds in contrast to the previous studies, which had reported myocardial infarction, septicemia, and cancer.[2,3,10] Myocardial infarction, chronic obstructive pulmonary disease, and snake bite were the other common indications for admission in accordance with the previous studies. Total 22.65% patients were having more than one illness, which is lesser than other published reports.[3] The most common cause of admission in our study; suicidal poisoning was

Table 1: Utilization pattern of various drugs in MICU, ATC code and DDD/100 bed-days

Drugs	DDD/100 bed-days	PDD	WHO DDD of the drug=EDD	PDD/EDD ratio	PDD/EDD ratio	ATC code
Metronidazole	6.38	3.8	1.5	2.5	>1	J01XD01
Cefotaxime	17	5.75	4	1.4	>1	J01DD01
Pantoprazole	0.17	473	40	11.8	>1	A02BC02
Atropine	0.008	86	2	43	>1	N04AC01
Ondansetron	0.07	140	16	8.8	>1	A04AA01
Ceftriaxone	8.5	13.33	2	6.7	>1	J01DD04
Clopidogrel	0.32	163	75	2.2	>1	B01AC04
Isosorbide dinitrate	0.09	28.33	20	1.4	>1	C01DA08
Insulin	0.17	46	40	1.2	>1	A10AB01
Ranitidine	1.28	0.84	0.3	2.8	>1	A02BA02
Amoxi and Clav	12.76	6.2	3	2.1	>1	J01CR02
Atorvastatin	0.09	42.67	20	2.1	>1	C10AA05
Paracetamol	12.76	3.1	3	1.0	>1	N02BE01
Vitamin K	0.09	81.67	20	4.1	>1	B02BA01
Hydrocortisone	0.13	675	30	22.5	>1	H02AB09

MICU: Medical intensive care unit, PDD: Prescribed daily dose, DDD: Defined daily dose

Table 2: Prescribed fixed dose combinations

Fixed dose combinations	Number of cases (%)
T FSFA	13.68
Inj piptaz	5.13
T clopitab A	4.7
Syp grillinctus BM	4.7
T Pan D	4.27
Multivitamin injection	5.67

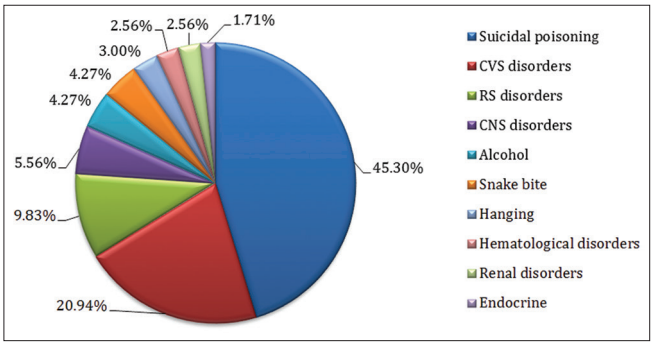

Figure 2: Indication for admission

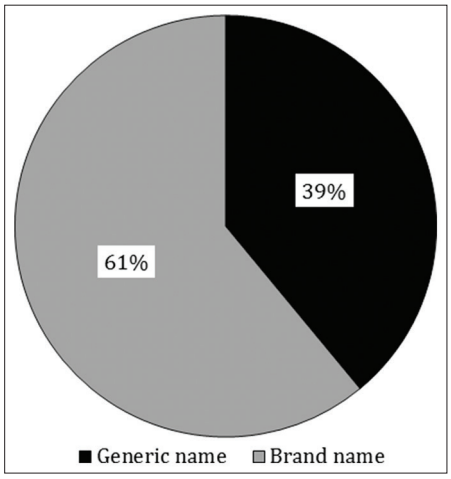

Figure 3: Percentage of antimicrobial drugs prescribed by generic and brand name

probably because of the prevailing draught in this region, as the primary occupation of the people here is agriculture.[11] The most common comorbidity associated with the primary cause of admission was diabetes mellitus which substantiates the current data of increase in the prevalence of diabetes in developing countries.[2] The average duration of MICU stay (4.24 days) was similar to that in the studies of Patel et al. (4.15 days) and Shankar et al.[3,9] and lesser than that reported by Williams et al. (5.75 days) and more than that in the study of Kaur et al. (2.23 days).[2,7] The use of brand names (60.48%) and FDCs (13%) is comparatively higher in our study.[3]

An average number of drugs per prescription were 6.26 which is more than triple the average number (i.e., 2) as per norms of WHO.[2] Different studies conducted in India yielded varied results, but mostly all of them have reported the higher values of average drugs per prescription for, e.g., 4.9 by Kaur et al., 3.36 by Singh et al. and a relatively higher 13.54 by Patel et al.[2,3] However, the use of multiple drugs in an emergency setting especially to treat acute life-threatening conditions is inevitable and thus cannot be considered as irrational polypharmacy. Similarly, number of encounters with parenteral preparations were higher (68.83%), which again seems inevitable due to the need of immediate drug action in emergency conditions. Drug prescribed from the WHO essential medical list comprised only 47.97% of drugs.[10] This proportion should have been higher since this list of drugs is prepared with regard to public health relevance, evidence on efficacy and safety of the drugs, and comparative cost-effectiveness.

Ceftriaxone (30.42%), metronidazole (20.15%), amoxicillin, and clavulanic acid (11.79%) were the most commonly prescribed antibiotics similar to the previous studies.[3,2] Drugs acting on the gastrointestinal system and nutritional agents were among the other commonly prescribed drugs. However, whether the use of these supplements was actually medically indicated needs a closer scrutiny.[2]

In our study, another area of concern was the lower proportion of drugs prescribed as generics (39.42%). In spite of various benefits like low-cost therapy, better patient compliance and similar therapeutic benefits as that of the branded alternative, generic prescribing is not common in India. The branded alternative should be opted only if generic drugs option is not feasible.[2,13,14]

A comparison of a drug's PDD with its DDD gives an insight into actual use of the drug when compared to its most common and recommended use. The value of PDD/DDD ratio >1 for almost all drugs in our study suggests overdosing for which the physicians need to be sensitized and it may improve the prescribing pattern of the drugs.

The use of latest WHO DUS indicators, for evaluating the prescribing patterns, is the strength of our study. It also has some limitations, that is, we are not certain if the sample size of 234 patients studied during a 2-month period was truly representative of the total rural population visiting emergency department but it was comparable to sample size of other studies conducted by Williams et al.[7] and Singh et al.[2] in other parts of the country.

CONCLUSION

In conclusion, this study provides an insight into the various disorders encountered in patients admitted to MICU in a rural area. The data on the pattern of drug utilization was largely comparable to other studies conducted in various parts of India.

Among the patients admitted predominance of male gender, age group between 36 years and 55 years and overdosing was observed. As per WHO norms the average number of drugs should have been restricted to two. However, considering an emergency setup such as MICU, the same could exceed and does not amount to polypharmacy. This study highlights the need for improving the prescribing pattern in the emergency setting by increasing the prescription of the drugs from the WHO model list of essential medicines and by their generic name. Thus, physicians should be sensitized regarding rational pharmacotherapy; prescribing by generic names and restricting drugs to essential bare minimal in adequate doses and judicious use of antibiotics.

REFERENCES

1. World Health Organisation. Introduction to Drug Utilization Research. Geneva.World Health Organisation;2003. Available from: http://www.apps.who.int/medicinedocs/en/d/Js4876e. [Last accessed on 2016 Nov 13].
2. Mittal N, Mittal R, Singh I, Shafiq N, Malhotra S. Drug utilisation study in a tertiary care center: Recommendations for improving hospital drug dispensing policies. Indian J Pharm Sci. 2014;76(4):308-14.
3. Patel MK, Barvaliya MJ, Patel TK, Tripathi C. Drug utilization pattern in critical care unit in a tertiary care teaching hospital in India. IInt J Crit Illn Inj Sci. 2013;3(4):250-5.
4. Available from: http://www.whocc.no/ddd/definition_and_general_considera/Last updated:29. [Last Assessed on 2016 October 28].
5. WHO Collaborating Centre for Drug Statistics Methodology. WHO Collaborating Centre for Drug Statistics Methodology. Guidelines for ATC Classification and DDD Assignment. Oslo: WHO Collaborating Centre for Drug Statistics Methodology; 2002.
6. WHO Collaborating Centre for Drug Statistics Methodology. WHO Collaborating Centre for Drug Statistics Methodology. ATC Index with DDDs. Oslo: WHO Collaborating Centre for Drug Statistics Methodology; 2002.
7. Williams A, Mathai AS, Phillips AS. Antibiotic prescription patterns at admission into a tertiary level intensive care unit in Northern India. J Pharm Bioallied Sci. 2011;3(4):531-6.
8. Lahon K, Shetty HM, Paramel A, Sharma G. A retrospective drug utilization study of antidepressants in the psychiatric unit of a tertiary care hospital. J Clin Diagn Res. 2011;5(5):1069-75.
9. Shankar PR, Upadhyay DK, Subish P, Bhandari RB, Das B. Drug utilisation among older inpatients in a teaching hospital in Western Nepal. Singapore Med J. 2010;51(1):28-34.
10. Gupta DR. Drug prescribing pattern in intensive care unit (ICU) in a tertiary care teaching hospital in Central India. Int J Pharm Bio Sci. 2015;6(3):325-9.
11. Kale S, Gond JK. Drought in Marathwada arathwadaht in Man Maht in Maeaching hosMarathwada. Int J Innov Res Sci Eng Technol. 2016;5(5):8376-84. [Last assessed 2016 October 25].
12. WHO. 19th WHO Model List of Essential Medicines. Geneva: WHO; 2015.
13. Haas JS, Phillips KA, Gerstenberger EP, Seger AC. Potential savings from substituting generic drugs for brand-name drugs: Medical expenditure panel survey, 1997–2000. Ann Internal Med. 2005;142(11):891-7.
14. Generic Bulletin NMIC. Available from: http://www.15no1 web with refs.pdf. [Last accessed on 2016 Oct 25].

How to cite this article: Shinde RM, Kale A, Chube S, Sawant M. Drug utilization study in medical intensive care unit in a rural tertiary care teaching hospital in Maharashtra. Int J Med Sci Public Health 2017;6(4):733-737.

Source of Support: Nil, **Conflict of Interest:** None declared.