<u>Original Research Article</u>

Retrospective Assessment of the Antimicrobial Drugs Utilization in Medical ICU in Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar, India.

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Abstract

Aim: The objective of this study was to study the antimicrobial drugs utilization pattern in medical ICU in Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar, India.

Methodology: It was a retrospective and observational study, conducted during the period of 1 year (May, 2021 to April, 2022). Data of 120 patients was collected from the Central Record Section (CRS) of the hospital. The data was analyzed for demographic distribution, disease pattern and antimicrobial drugs use. The data was entered in MS Excel sheet and results were presented as tables and figures. Drug utilization data was presented as percentage.

Results: Total 120 patients were enrolled in the study. Out of 120 patients, males were 76 (63.3%) and females were 44 (36.7%). The mean age of males was 59.54 ± 21.73 years and females were 63.82 ± 19.24 years. 50 (41.7%) patients were more than 60 years of age. Most of the patients were >40 years of age. CVS system was affected in 94 (78.3%), followed by respiratory system in 8 (6.7%), excretory system in 5 (4.2%), GIT in 4 (3.3%), CNS in 3 (2.5%) and others in 6 (5%) patients. Duration of Hospital Stay was 1-3 days in 93 patients, 4-7 days in 22 patients and more than 7 days in 5 patients. At the end 69 (57.5%) patients were referred, 41 (34.2%) patients were discharged, and 10 (8.3%) patients left against medical advice (LAMA). A total of 84 antibiotics **i**n 120 patients were used. Most commonly 3rd generation cephalosporin was prescribed in 44 patients, macrolides in 25 patients, quinolones in 7 patients, anti-anaerobics in 5 patients, tetracycline in 3 patients, oxazolidinones in 3 patients, aminoglycosides and antifungals in 2 patients each and others in 1 patient.

Conclusion: Antimicrobial prescription pattern was found to be appropriate in terms of hospital and supplemental indicators. But there is a need for improvement in the area of prescribing and patient care indicators and the use of guidelines, educational initiatives, surveillance, and antibiotic restriction policies at all levels of health care. Results of this study may help the primary healthcare providers to rationalize the antibiotic utilization for better patient care.

Keywords: Antibacterial, antimicrobial, cephalosporins, resistance, macrolides, quinolones.

Introduction

Antimicrobial drugs are one of the most widely utilized drug classes globally. Evidence shows that approximately one-third of the hospital admissions are being managed with antibiotic prescription during the course of treatment in the hospitals [1,2]. Infectious diseases are one of the entities causing significant morbidity and mortality worldwide. Resistant microorganisms are becoming more prevalent in the recent past and standing out to be a major threat in health care settings. Poverty, increasing infectious disease burden, accessibility to antibiotics with ease and injudicious use of antimicrobials are a few of the contributing factors for the increasing incidence of resistant microorganisms in India [3]. With negligible amount of newer antibiotics being developed, appropriate use of already available antibiotics has become the most crucial aspect to prevent the emergence of drug-resistant organisms [4].

Large-scale benchmarking and point prevalence surveys of US and European hospitals have reported that 19%–59% of adult inpatients receive antibiotic therapy [5,6], chiefly for respiratory infections, with broad-spectrum beta-lactam, vancomycin, and fluoroquinolone antibiotics constituting the majority of use [7-9]. Approximately 22% to 49% of broad-spectrum antibiotic use has been found to be redundant and inappropriate [10, 11], with more than half of treatments usually lacking microbiological documentation of infection [9,12,13].

Evidence has shown that resistant microorganisms have significant impact on health care system in terms of patient burden by increasing both mortality and morbidity and causing economic burden to a significant level [14]. Over usage of AMs and emergence of resistant organisms had shown proportionate relationship with each other and the regions with higher rate of antibiotic usage have shown the higher rate of antibiotic resistance compared to the regions with the lower rate of antibiotic usage [15]. There is a need for improving the antimicrobial prescription practice by giving feedback on the antimicrobial usage to the prescribers to improve the patient care, to reduce the financial burden on the hospitals and to combat the spread of resistant microorganisms through multidisciplinary approach. The objective of this study was to study the antimicrobial drugs utilization pattern in medical ICU in a tertiary care teaching hospital.

Methodology:

It was a retrospective and observational study, conducted during the period of 1 year (May, 2021 to April, 2022). Data of 120 patients was collected from the Central Record Section (CRS) of the hospital. The data was analyzed for demographic distribution, disease pattern and antimicrobial drugs use. The data was entered in MS Excel sheet and results were presented as tables and figures. Drug utilization data was presented as percentage.

Results:

Total 120 patients were enrolled in the study. Out of 120 patients, males were 76 (63.3%) and females were 44 (36.7%). The mean age of males was 59.54 ± 21.73 years and females were 63.82 ± 19.24 years. 50 (41.7%) patients were more than 60 years of age. Most of the patients were >40 years of age.

CVS system was affected in 94 (78.3%), followed by respiratory system in 8 (6.7%), excretory system in 5 (4.2%), GIT in 4 (3.3%), CNS in 3 (2.5%) and others in 6 (5%) patients. Duration of Hospital Stay was 1-3 days in 93 patients, 4-7 days in 22 patients and more than 7 days in 5 patients. At the end 69 (57.5%) patients were referred, 41 (34.2%) patients were discharged, and 10 (8.3%) patients left against medical advice (LAMA).

Table 1: Demographic details, system involved, hospital stay duration and outcome of patients.

Variables		No.	%
Gender	Males	76	63.3
	Females	44	36.7
Age (in years)	18-30	5	4.2
	31-40	6	5.0
	41-50	27	22.5
	51-60	32	26.7
	>60	50	41.7
System involved	CVS	94	78.3
	Respiratory	8	6.7
	Genito-urinary	5	4.2
	GIT	4	3.3
	CNS	3	2.5
	Others	6	5.0
Duration of hospital stay (in days)	1-3	93	77.5
	4-7	22	18.3
	>7	5	4.2
Outcome	Referred	69	57.5
	Discharged	41	34.2
	LAMA	10	8.3

A total of 84 antibiotics **i**n 120 patients were used. Most commonly 3rd generation cephalosporins were prescribed in 44 patients, macrolides in 25 patients, quinolones in 7 patients, anti-anaerobics in 5 patients, tetracycline in 3 patients, oxazolidinones in 3 patients, aminoglycosides and antifungals in 2 patients each and others in 1 patient.

Table 2: Antimicrobial prescription pattern

Class	Drugs Name	Number of Patients
3rd Generation Cephalosporins	Ceftriaxone (38)	(44)
	Cefixime (4)	
	Cefotaxime (2)	
Macrolides	Azithromycin	(25)
Quinolones	Ciprofloxacin (4)	(7)
	Levofloxacin (2)	
	Ofloxacin (1)	
Antianaerobes	Metronidazole	(5)
Tetracyclines	Doxycycline	(3)
Oxazolidinones	Mupirocin Linezolid	(3)
Aminoglycosides	Gentamicin	(2)
Antifungals	Fluconazole	(2)
Others	Rifaximin	(1)

Discussion:

Appropriate monitoring of antibiotic usage pattern in clinical scenarios is essential for

a developing health care facility. This could be achieved by active surveillance of antimicrobial use or by conducting antimicrobial utilization studies at regular intervals. This will provide important inputs in forming or reforming the hospital antimicrobial use policies. Information on antimicrobial utilization pattern will give a snapshot on their usage and is important for the health care setting to understand the magnitude of use and time trends of usage patterns [16].

A recent study by Fridkin et al [17], which used an administrative database of 323 hospitals, found that approximately 56% of patients received antibiotics during their hospitalization. 16% of inpatients treated with antibiotics for urinary tract infections had no urine culture ordered and about 9% of patients receiving intravenous vancomycin had no diagnostic culture obtained. Magill et al [18] observed that respiratory tract infection was the most common indication for antibiotic use, and use of broad-spectrum antimicrobial drugs such as piperacillin-tazobactam and vancomycin was common among randomly selected patients in 183 acute care hospitals.

Antibiotics are commonly administered to patients cared and are among the most frequent causes of adverse drug events among hospitalized patients, and complications, such as increasing antibiotic resistance and Clostridium difficile infection, can be severe and even deadly [18]. However, studies have shown that antibiotics are prescribed incorrectly in up to 50% of cases [19]. One study reported that 30% of antibiotics received by hospitalized adult patients outside of critical care were unnecessary [20].

Evidence is accumulating that interventions to optimize inpatient antibiotic prescribing can improve patient outcomes [21]. The importance of ASPs is being increasingly recognized [22,23]. Determining whether an antibiotic prescription is prophylactic, pathogen directed, or empirical requires detailed information that is obtained only through medical chart reviews. Our study provides an updated and expanded understanding of microbiological documentation of antibiotic use, which is critical to ongoing efforts to improve ASPs and the quality of inpatient antibiotic use. [24]

Conclusion:

Antimicrobial prescription pattern was found to be appropriate in terms of hospital and supplemental indicators. But there is a need for improvement in the area of prescribing and patient care indicators and the use of guidelines, educational initiatives, surveillance, and antibiotic restriction policies at all levels of health care. Results of this study may help the primary healthcare providers to rationalize the antibiotic utilization for better patient care.

References:

1. Hogerzeil HV. Promoting rational prescribing: An international perspective Br J Clin Pharmacol. 1995; 39:1–6
2. Kunin CM, Tupasi T, Craig WA. Use of antibiotics.A brief exposition of the problem and some tentative solutions Ann Intern Med. 1973;79:555–60
3. Kaur A, Bhagat R, Kaur N, Shafiq N, Gautam V, Malhotra S, et al A study of antibiotic prescription pattern in patients referred to tertiary care center in Northern India Ther Adv Infect Dis. 2018;5:63–8
4. Bell BG, Schellevis F, Stobberingh E, Goossens H, Pringle M. A systematic review and meta-analysis of the effects of antibiotic consumption on antibiotic resistance BMC Infect Dis. 2014; 14:13
5. Ansari F, Erntell M, Goossens H, Davey P. The European surveillance of antimicrobial consumption (ESAC) point-prevalence survey of antibacterial use in 20 European

hospitals in 2006. Clin Infect Dis 2009; 49:1496–1504.

6. MacDougall C, Polk RE. Variability in rates of use of antibacterials among 130 US hospitals and risk-adjustment models for interhospital comparison. Infect Control Hosp Epidemiol 2008; 29:203–211.

7. Malacarne P, Rossi C, Bertolini G. Antibiotic usage in intensive care units: a pharmaco-epidemiological multicentre study. J Antimicrob Chemother 2004; 54:221–224.

8. Mettler J, Simcock M, Sendi P, et al. Empirical use of antibiotics and adjustment of empirical antibiotic therapies in a university hospital: a prospective observational study. BMC Infect Dis 2007; 7:21.

9. Montravers P, Dupont H, Gauzit R, Veber B, Bedos JP, Lepape A. Strategies of initiation and streamlining of antibiotic therapy in 41 French intensive care units. Crit Care 2011;15: R17.

10. Glowacki RC, Schwartz DN, Itokazu GS, Wisniewski MF, Kieszkowski P, Weinstein RA. Antibiotic combinations with redundant antimicrobial spectra: clinical epidemiology and pilot intervention of computer-assisted surveillance. Clin Infect Dis 2003; 37:59–64.

11. Hecker MT, Aron DC, Patel NP, Lehmann MK, Donskey CJ. Unnecessary use of antimicrobials in hospitalized patients: current patterns of misuse with an emphasis on the antianaerobic spectrum of activity. Arch Intern Med 2003; 163:972–978.

12. Kollef MH, Morrow LE, Niederman MS, et al. Clinical characteristics and treatment patterns among patients with ventilator-associated pneumonia. Chest 2006; 129:1210–1218.

13. Robert J, Pean Y, Varon E, et al. Point prevalence survey of antibiotic use in French hospitals in 2009. J Antimicrob Chemother 2012; 67:1020–1026.

14. Naylor NR, Atun R, Zhu N, Kulasabanathan K, Silva S, Chatterjee A, et al Estimating the burden of antimicrobial resistance: A systematic literature review Antimicrob Resist Infect Control. 2018

15. Goossens H. Antibiotic consumption and link to resistance Clin Microbiol Infect. 2009; 15:12–5.

16. Mali NB, Deshpande SP, Tullu MS, Deshmukh CT, Gogtay NJ, Thatte UM. A prospective antibacterial utilization study in pediatric intensive care unit of a tertiary referral center Indian J Crit Care Med. 2018; 22:422–6.

17. Fridkin S, Baggs J, Fagan R, et al. Vital signs: improving antibiotic use among hospitalized patients. MMWR Morb Mortal Wkly Rep 2014; 63:194–200.

18. Magill SS, Edwards JR, Beldavs ZG, et al. Prevalence of antimicrobial use in US acute care hospitals, May-September 2011. JAMA 2014; 312:1438–1446.

19. Weiss AJ, Elixhauser A. Characteristics of adverse drug events originating during the hospital stay, 2011: statistical brief #164. Healthcare Cost and Utilization Project (HCUP) Statistical Briefs. Rockville (MD): Agency for Health Care Policy and Research, 2006.

20. Alexander C. A., Wang L., & Shah V. Vaccine Hesitancy, Vaccine Acceptance, and Recommendations about the COVID-19 Vaccines. Journal of Medical Research and Health Sciences, 2021:4(12), 1599–1609.

21. Dellit TH, Owens RC, McGowan JE Jr, et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. Clin Infect Dis 2007; 44:159–177.

22. Hecker MT, Aron DC, Patel NP, Lehmann MK, Donskey CJ.

Unnecessary use of antimicrobials in hospitalized patients: current patterns of misuse with an emphasis on the antianaerobic spectrum of activity. Arch Intern Med 2003; 163:972–978.

23. Weiss AJ, Elixhauser A. Characteristics of adverse drug events originating during the hospital stay, 2011: statistical brief #164. Healthcare Cost and Utilization Project (HCUP) Statistical Briefs. Rockville (MD): Agency for Health Care Policy and Research, 2006.

24. Davey P, Brown E, Charani E, et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. Cochrane Database Syst Rev 2013;4:CD003543.