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Assessment of antimicrobial use in a private and government hospitals, a comparative study in central kerala, using WHO indicators

Chinnu Roy<sup>1</sup>, Shaji George<sup>2</sup>, Aleena Issac<sup>1</sup>, Arya Ponnappan<sup>1</sup>, Dhanya Paul<sup>1</sup>

- <sup>1</sup> Pharm. D Interns. Nirmala College of Pharmacy, Muvattupuzha, Kerala-686661
- <sup>2</sup> Professor & Head, Department of Pharmacy Practice, Nirmala College of Pharmacy, Muvattupuzha, Kerala-686661

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#### Abstract

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Background: Irrational use of antimicrobial can cause various unwanted and untoward events. It may diminish the quality of patient care, increase the cost of therapy, and involvement in various side effects. Thus, the appropriateness of antimicrobial use in hospitals plays a pivotal role in patient safety. Objective: To analyze and assess the prescribing pattern of antimicrobials in private and government hospitals as per the WHO indicators. Methodology: A prospective comparative observational study was carried out for 6 months, with the patient diagnosed with an infectious disease admitted to the medical ward of both the hospitals during the study period. The data obtained from the study sites were Compared and analyzed using WHO indicators described in WHO's "How to Investigate Antimicrobial use in Hospitals: Selected Indicators, Feb 2012". Results: The study involved 209 patients and the average number of antimicrobials prescribed was found to be 1.73 in a private hospital and 2.07 in the government hospital, average cost of antimicrobials was found to be 86.48 INR in private and 31.04 INR in the government hospital, average duration of antimicrobial treatment was 4.8 in private and 5.2 in the government hospital, and the percentage of antimicrobials prescribed in generic was 33.33% in private and 87.83% in the government hospital. Considering the spectrum of antibiotics, both private (94.7%) and government (88.8%) used broad-spectrum antimicrobials. In both hospitals, cephalosporins were the most frequently prescribed class of antimicrobials. Comparing the dosage of antimicrobials given, injection usage is at the highest in government (59.5%) as well as in the private hospital (68.4%). Conclusion: This study indicates that the average cost of antimicrobials was more in a private hospital than that in a government hospital and other indicators such as the number of antimicrobials per hospitalization, duration of antimicrobial treatment, and the percentage of generic antimicrobials prescribed were all found to be more in a government hospital. In both private and government hospitals broad-spectrum antimicrobials were widely used, with cephalosporin as the most prescribed class.

*Keywords:* Antimicrobials, private hospital, Government hospital, WHO indicators, Broad spectrum, Generic antimicrobials.

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#### \*Corresponding Author

Dr. Shaji George

M. Pharm, M. Res. (UK), Ph.D.

Professor and Head, Department of Pharmacy Practice

Nirmala College of Pharmacy, Muvattupuzha

Email: <a href="mailto:shajige@gmail.com">shajige@gmail.com</a>
Phone: +919446960634

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# Introduction

Increasing irrational antimicrobial use is an important concern in the health care system. According to WHO rational use of medicine is defined as the use of the right medicine, for the right patient at the required dose and duration and at the possible lowest cost. The rational use of medicine especially antimicrobials plays a pivotal role in defining the quality of the therapy as well as in providing proper medical care [1]. Antimicrobials are the most frequently prescribed drugs in a hospital setting.



Therefore, antimicrobials require more prescribing, dispensing, and administration [2]. Irrational use of antimicrobials will result in various health hazards [3], such as drug resistance, the increased incidence of side effects, reduced effectiveness of the drug therapy, increased cost of therapy, prolonged hospital stays, and increased morbidity and mortality [4]. WHO expertise provides various methodologies and set of indicators to access drug therapy across the world. Evaluation of antimicrobials using WHO prescribing indicators help to effectively access the antimicrobial use and it also promotes rational use of antimicrobials [5]. Prescribing indicators are mainly used to access the antimicrobial prescribing quality in hospitals. This set of indicators provides whether the hospital maintains WHO standards in antimicrobial prescribing or not6. In the whole world about more than fifty percent of the medicines are prescribed irrationally [7.8].

#### **Materials and Methods**

A prospective observational study was carried out for a period of six months. In a population enrolled in the general medicine ward of private and government hospitals for an infectious disease during the study period.

#### Study setting

The study site was the department of General Medicine in a multispecialty secondary care hospital of private and government sector in Central Kerala.

#### Study inclusion and exclusion criteria

The patients included in the study were inpatients of the medical ward and patients having signs of infections or diagnosed with infectious disease.

Patients who have incomplete medical reports were not included in this study.

#### Sampling method and data collection

Data were collected using the data collection form.

WHO's How To Investigate Antimicrobial Use In Hospital: Selected Indicators; Feb 2012; Strengthening Pharmaceutical System (SPS): describes 16 indicators related to AMA use in hospitals. In which, prescribing indicators were used for this study. There are 9 prescribing indicators and this study will be assessing 5 prescribing indicators [9].

The average number of antimicrobials prescribed per hospitalization determines the extent of antimicrobial used in hospitals for patients been prescribed with antimicrobials and is calculated by, dividing the number of antimicrobials prescribed for all hospitalization with the total number of hospitalizations with antimicrobials prescribed.

The average cost of antimicrobials prescribed per hospitalization in which antimicrobials were prescribed is calculated by dividing the cost of all antimicrobials prescribed by the number of hospitalizations in which at least one antimicrobials was prescribed.

The average duration of prescribed antimicrobial treatment is determined by dividing the total number of

days on antimicrobial treatment by the total number of antimicrobials prescribed.

Percentage of antimicrobials prescribed by generic name was calculated using; the total number of antimicrobials prescribed by generic name X 100/ total number of antimicrobials prescribed.

The average duration of hospital stay of patients who received antimicrobials is determined by dividing the total number of days of hospitalization required for the patient on antimicrobials by the number of patients who received antimicrobials.

#### Data analysis

Data storage and analysis were performed using Microsoft Excel 2016 and SPSS Version 24 software.

# **Ethical Consideration**

Ethical clearance for the study was obtained from Nirmala College of Pharmacy, under the Kerala University of Health Science. The approval to conduct a study in a government hospital was obtained from the District Medical Officer of the Idukki district in Kerala.

#### Results

The study reviewed a total of 209 cases collected from a private hospital (66) and from a government hospital (143) in which the antimicrobials were prescribed.

#### **Demographics**

Demographic data shows that in the private hospital most of the patients enrolled were from the age group of 31-60 (43.83%), while in the government hospital most of the patients were above 60 (40.55%). In both the hospitals, the least number of patients belonged to the age category of less than 30. Considering gender, in the private hospital, admission was near equal with males slightly dominating (50.68%), and in government hospitals, reverse domination was observed with females (54.54%).

Comparing the economic status of patients in both hospitals, most of the patients in government hospitals were from the BPL (Below poverty line) category (71.32%) to that of the APL (Above poverty line) category. In private hospitals, the patients belonging to the APL category (56.16%) were only slightly above the BPL.

## **Prescribing indicator**

Comparison of antimicrobial use in private and government using prescribing indicators.

Table 01: Antibiotic prescribing usage pattern

Antimicrobial use indicator	Private	Government	WHO ideal value
The average number of antimicrobials prescribed per hospitalization in which antimicrobials were	1.72	2.06	1.6 - 1.8



prescribed.			
The average cost of antimicrobials prescribed per hospitalization in which antimicrobials were prescribed	86.47	31.04	-
The average duration of prescribed antimicrobial treatment	4.85	5.24	-
Percentage of antimicrobials prescribed by generic name	33.33%	87.83%	100%
The average duration of hospital stay of patients who receive antimicrobials	5.9	6.8	-

WHO prescribing indicators were used to access the extend of antimicrobial use in both hospital settings, as well as was used to evaluate whether these hospitals are adherent to WHO values.

The result reveals that of the 209 patients (private hospital 66 and government hospital 143) enrolled, 114 antimicrobials were prescribed in private hospitals and 296 in the government hospital. Table 1 compared the antimicrobial usage pattern in private and the government hospital using the selected indicators of WHO. The average number of antimicrobials prescribed per hospitalization in which antimicrobials were prescribed was found to be 1.73 in the private hospital and 2.06 in the government hospital. The average number of AMA was less in private hospitals while comparing to the government hospital. Here, the private hospital shows more adherence to the WHO ideal values. The average cost of antimicrobials given is 86.48 INR in the private hospital and 31.04 INR in the government hospital. Considering this, the cost was found to be less in government than that in private.

The total number of days with antimicrobial treatment was 554 in the private hospital and 1552 in the government hospital. While considering the average duration of antimicrobial treatment, it was 5 days in the private and in government, it was 5.2 days, indicating a higher duration of antimicrobial treatment in the government hospital. While considering the average duration of hospital stay, in the private hospital it was 6 days and in government, it was 7 days.

In the private hospital out of the total 114 antimicrobials, only 33.33% were prescribed by generic name. While in the government hospital out of the total 296

antimicrobials 87.83% were prescribed by generic name. According to WHO values the percentage of generic prescribing should be 100%, while in both hospitals it was not fulfilled. But, the government hospital shows more adherence to these ideal values with prescribing at 88%.

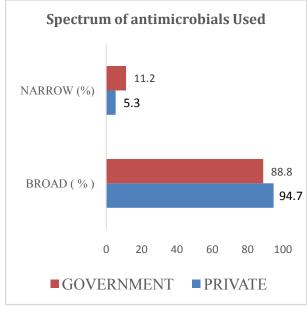


Fig 01: Spectrum of antimicrobials Used

In private and government hospitals, broad-spectrum antimicrobials were the most frequently prescribed category of antimicrobials (Figure 1). A comparative study clearly indicated broad-spectrum antibiotics were highly used in the private hospital rather than in the government hospital. In a private hospital, out of the 114 antimicrobials used 94.7 % were broad-spectrum and 5.3 % were narrow spectrum. In the government hospital, out of the 296 antimicrobials, 88.8 % used were broad-spectrum and the remaining 11.2 % of the antibiotics belonged to the narrow spectrum. As per WHO the use of narrow-spectrum should be more promoted since it is suitable to prevent resistance.

Table 02: Comparing the chemical classification of antibiotics given in private and government hospital.

Chemical class of antibiotics	Government (%)	Private (%)
Cephalosporins	40	43
Pencillins	19	11.4
Quinolones	8.5	2.6
Nitroimidazole Derivatives	8.1	5.3
Macrolides	5.4	7.9
Aminoglycosides	5.4	12.3
Antiviral	3.7	1.8



Tetracycline	2.7	_
Nitrofurantoin Derivative	2.4	4.4
Diaminopyrimidine	-	1.8
Carbapenem	-	5.3
Others	4.8	4.2

In both private and government hospital widely used class of antibiotics were cephalosporin (Table 2). In government out of the total 296 antimicrobials used 40% contributes to cephalosporin, followed by penicillins 19%, quinolones 8.5%, and nitroimidazole derivative 8.1%. whereas in a private hospital (total 114 antimicrobials), cephalosporin contributed to 43% followed by aminoglycosides 12.3%, Penicillins 11.4%, and Macrolides 7.9%.

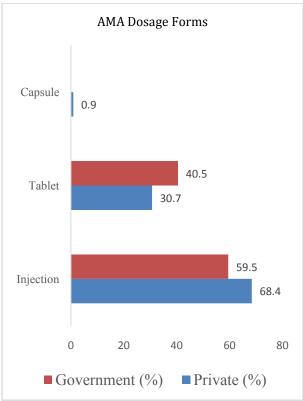


Figure 2: Comparison of AMA Dosage Forms in Private and Government

In both private and government hospitals injections were the most frequently prescribed antimicrobial dosage form (Figure 2). The antimicrobials as injectables in the government hospital accounted for 59.5% whereas in the private hospital it was 68.4%. Indicating, injections are highly used in private rather than in the government hospital. The percentage of tablets used was high in government (40.5%) while comparing to that of private (30.7%). In private hospitals, capsulated AMA was also used in a small proportion (0.9%) which was missing from the government setup.

#### Discussion

The study compares the AMA prescribing pattern of 66 cases in a private hospital with that of 143 cases in a government hospital.

## **Prescribing indicators**

The evaluation of antimicrobial use was done by using WHO prescribing indicators, first indicator shows the average no of AMA prescribed per hospitalization in which AMA was prescribed. The value for the private hospital is 1.72 and that of the government hospital is 2.06. According to WHO ideal values indicated in a study done by Amaha ND et.al, the average number should be 1.6-1.8 and this study indicates that in the government hospital, the average number of AMA per hospitalization is higher than that of the ideal value. In both, the hospital average number of antimicrobials prescribed was more than that of the Amaha N.D et al study [10].

The percentage of generic drug prescribing should be 100% according to WHO ideal value10-12, but the percentage of generic drug used in this study is comparatively very low in private (33.33%) than that of government (87.83%). Government hospital shows more adherences to the WHO ideal value in this indicator. As per Amaha ND et.al. study in the Malaysian population 10, the percentage of antimicrobials prescribed in generic form is 100%, and in the case of Yimenu D K et.al study11, it is 83.14%, which is less than the percentage of generic drug use in the government hospital. While considering the cost, the cost of antimicrobials is very less in government than that in private, the average cost of antimicrobials was 86.47 INR in the private hospital, and in the government hospital, it was only 31.04 INR. The average duration of AMA treatment and average duration of hospital stay varies depends on the type of infection, both these values were found to be more in a government hospital.

# Prescribing pattern of antimicrobials

Considering the spectrum of antibiotics, both private (94.7%) and government (88.8%) used highly broadspectrum antimicrobials. While Evaluating other studies for utilization of 'broad spectrum' antimicrobials, it was noted that the Ethiopian population were exposed much higher than this study towards the broad-spectrum antibiotics [12]. But according to the standards narrow-spectrum should be used more than that of broad-spectrum and this study indicates that 'narrow spectrum' antimicrobials are used in lower amounts in both government (11.2%) and private (5.8%) sector.

Comparing the classes of various antimicrobials usage, it was observed that in government cephalosporins (40%) was highly used, followed by penicillins (19%), whereas in the case of private hospital cephalosporins (43%), was followed by aminoglycosides (12.3%). According to an Ethiopian study [3], cephalosporins were the widely used antimicrobials in hospitals followed by ampicillin. A similar pattern is followed in this study and also



substantially supported by usage of cephalosporins in studies done in Malaysian [13], while some other studies [11] penicillin's were the most frequently prescribed drug followed by macrolides.

While comparing the dosage of antimicrobials given, in both the private and the government hospital the percentage of injections was considerably high. In government, it was 59.5% and in private it was 68.4%. According to the studies based on WHO prescribing indicators [10,11], the percentage of injectables should be between 13.4 – [10] of the total antimicrobials. In the Malaysian study, it was 81.410, which was much higher than the ideal value. When we consider the study by Yimenu D K et al the percentage of prescribing injectables was only 7.8%, which was much lower than the WHO ideal value. In this study, the values of injectable were very much higher in both the hospitals, with the highest injectable utilization at the private hospital.

#### Conclusion

The study result shows clear deviation from WHO standards in both the hospitals, But the degree of variation differed in both the hospitals. The study revealed the average cost of antimicrobials was more in a private hospital than that of a government hospital and other indicators such as the number of antimicrobials per hospitalization, duration of antimicrobial treatment, and the percentage of generic antimicrobials prescribed were all found to be more in the government hospital. In both private and government hospitals wide spectrum antimicrobials were widely used, cephalosporin was the most frequently prescribed class. Thus suggesting to adhere to the WHO guidelines to minimize antibiotic resistance and better patient care.

## Acknowledgement

No acknowledgement.

# **Conflict of Interest**

The authors declared no conflict of interest in this manuscript.

#### **Abbreviations**

WHO: World Health Organization; AMA: Antimicrobials.

#### References

- Atif M, Azeem M, Sarwar MR, Shahid S, Javaid S, Ikram H, Baig U, Scahill S. WHO/INRUD prescribing indicators and prescribing trends of antibiotics in the Accident and Emergency Department of Bahawal Victoria Hospital, Pakistan. Springerplus. 2016 Nov 8;5(1):1928.
- Sharma M, Eriksson B, Marrone G, Dhaneria S, Lundborg CS. Antibiotic prescribing in two private sector hospitals; one teaching and one non-teaching: a cross-sectional study in Ujjain, India. BMC Infect Dis. 2012 Jul 12;12:155.

- Demoz GT, Kasahun GG, Hagazy K, Woldu G, Wahdey S, Tadesse DB, Niriayo YL. Prescribing Pattern of Antibiotics Using WHO Prescribing Indicators Among Inpatients in Ethiopia: A Need for Antibiotic Stewardship Program. Infect Drug Resist. 2020 Aug 11;13:2783-2794.
- Rajalingam B, Alex AS, Godwin A, Cherian C, Cyriac C. Assessment of rational use of antibiotics in a private tertiary care teaching hospital. Indian Journal of Pharmacy Practice. 2016 Jan;9(1):14-8.
- Shrestha B, Dixit SM. The Assessment of Drug Use Pattern Using WHO Prescribing Indicators. J Nepal Health Res Counc. 2018 Oct 30;16(3):279-284
- Vooss AT, Diefenthaeler HS. Evaluation of prescription indicators established by the WHO in Getúlio Vargas-RS. Brazilian Journal of Pharmaceutical Sciences. 2011 Jun;47(2):385-90.
- 7. Pathak A, Gupta VK, Maurya A, Kumar A, Singh A. Assessment of drug prescribing pattern using WHO indicators in hospitalized patients at a tertiary care teaching hospital in rural area of India. Int J Basic Clin Pharmacol. 2016 Dec 30;5(3):651-5.
- 8. Mosisa, B, Sherefudin, R, Bayisa, G.Assessment of Prescribing Practices through WHO Prescribing Indicators at Nekemte Health Centre, West Ethiopia. Mahidol Univ J Pharm Sci. 2016;43(3): 107-114.
- How to investigate antimicrobial use in hospitals; selected indicators, November 2012, United States Agency for International Development
- 10. Amaha ND, Berhe YH, Kaushik A. Assessment of inpatient antibiotic use in Halibet National Referral Hospital using WHO indicators: a retrospective study. BMC Res Notes. 2018 Dec 18;11(1):904.
- 11. Yimenu DK, Emam A, Elemineh E, Atalay W. Assessment of Antibiotic Prescribing Patterns at Outpatient Pharmacy Using World Health Organization Prescribing Indicators. J Prim Care Community Health. 2019 Jan-Dec;10:2150132719886942.
- 12. Amaha ND, Weldemariam DG, Abdu N, Tesfamariam EH. Prescribing practices using WHO prescribing indicators and factors associated with antibiotic prescribing in six community pharmacies in Asmara, Eritrea: a cross-sectional study. Antimicrob Resist Infect Control. 2019 Oct 22;8:163.
- Ab Rahman N, Teng CL, Sivasampu S. Antibiotic prescribing in public and private practice: a cross-sectional study in primary care clinics in Malaysia. BMC infectious diseases. 2016 Dec;16(1):1-8.

