ORIGINAL RESEARCH

Point prevalence survey of antibiotic consumption in a tertiary care hospital of central India

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ABSTRACT
Drug resistance is increasing now a days and there is no National policy for guiding clinician to prescribed Antibiotics. Also there is limited data are available regarding consumption of antibiotic in Health care setting. A point prevalence study was conducted in Dec 2021 in our tertiary care hospital with aiming to know consumption of antibiotics at our end on particular period of time. 360 eligible patients' data were collected and analysed using Google form and excel sheet. Most common cause of antibiotic prescription was found to be surgical (29.4%) and medical prophylaxis (28.3%).Ceftriaxone (37.2%)was found to be most common prescribing antibiotic .Antibiotic consumption was found highest in Obstetrics and Gynaecology Department 34.9% .

Key Words: Antibiotic, Point prevalence, Surveillance

INTRODUCTION

Antimicrobials are commonly used in acute care hospitals for the treatment of community-acquired infections, healthcare-associated infections and for surgical prophylaxis. However, inappropriate use (overuse as well as misuse) of antimicrobials can lead to development of antimicrobial resistance (AMR) which has become a growing public health concern worldwide. [1,2] Antimicrobial-resistant infections are responsible for serious illnesses and prolonged hospital stays, increasing health-care costs, treatment failures, and high morbidity and mortality rates. [3,4]

The global rise of AMR has attracted the attention of World Health Organization (WHO). WHO has announced AMR as an urgent priority area and has initiated framing action plans for the containment of AMR which provides a broad framework for combating AMR. [5] WHO reported India as one of the countries for high irrational antimicrobial use and inadequate surveillance and high rates of drug resistance. [6] India has also framed its National Action Plan to contain AMR (NAP-AMR) to promote surveillance on antimicrobial use in the community and hospitals settings across the country. [7,8] WHO advocates the adoption of antimicrobial stewardship (AMS) initiatives to monitor antimicrobial use and tackle the AMR burden [9].

Point prevalence surveys (PPSs) to monitor antimicrobial use and resistance are a feasible method to assess antimicrobial use in hospitals. [10] Point prevalence refers to the prevalence measured at a particular point in time. Point Prevalence Survey (PPS) is a structured qualitative assessment of antimicrobial consumption at a given point of time. PPSs can be used as a tool for measuring the quality of antimicrobial prescribing, assess the effect of interventions to improve prescribing and development and implementation of antimicrobial stewardship programs. [11]

In India, there is still scarce data from PPSs on the antimicrobial use particularly in the hospital setting. Hence this point prevalence study was undertaken in

the tertiary care teaching hospital of central India to explore data regarding antimicrobial use which could be of immense help in limiting development of AMR by improving antimicrobial prescribing behaviour.

METHODOLOGY

The present PPS study was designed and conducted using a structured web-based PPS tool based on point prevalence survey methodology on antibiotic use in hospitals from WHO - version 1.1 as a reference tool. [12,13] The WHO PPS methodology collects basic information from medical records of all hospitalized patients, which are of relevance for treatment and management of infectious diseases regardless of whether these patients are on antibiotic treatment at the time of data collection.

Study site

This was a cross-sectional point prevalence observational study. Single day hospital-wide point prevalence survey was conducted in Maharaja Yashwantrao Hospital associated with Mahatma Gandhi Memorial Medical College Indore which is a tertiary care teaching hospital from Central India. Data was collected from in-patient wards of medicine and infectious diseases, surgery, obstetrics and gynaecology, orthopaedics, paediatrics and ENT department. Day care, emergency, casualty, ophthalmology and skin departments were not included in the study.

Inclusion and exclusion criteria

In the hospital, all the in-patients admitted before 9 am receiving at least one antimicrobial on the day of the survey were included in the study. All patients admitted after 9:00 am on the day of survey, patients discharged or antibiotic stopped before 9:00 am, day care admissions e.g. endoscopy, renal dialysis or others were excluded. Only oral and parenteral formulations were included in this survey, topical formulations were excluded.

Data collection

Data of all the inpatients who met the inclusion criteria were collected on a single day using a well-structured form for antibiotic use pattern based on point prevalence survey methodology on antibiotic use in hospitals from WHO- version 1.1 as a reference tool.

Data collected included; hospital type and size, ward specialty, admission date, patient demographic data, date, number of antibiotics prescribed, name of antibiotics, antibiotic start date, dose, route of administration and duration of antibiotic treatment, indication for prescribing antibiotic (e.g. community-acquired infections (CAIs), hospital-acquired infection (HAIs), medical prophylaxis, surgical prophylaxis), type of treatment (empirical or targeted), date of review/stop and availability of microbiology data was collected. Data quality was assured through continuous supervision and checks on data completeness, accuracy and clarity.

The 2018 version of the Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) index of the World Health Organization (WHO) Collaborating Centre for Drug Statistics Methodology was used for calculating the prevalence of antimicrobial use and the number of DDDs per 100 patients on the day of PPS [14]. Antimicrobial agents for systemic use within ATC groups A07AA (intestinal antiinfectives), J01 (antibacterials for systemic use), J04 (antimycobacterials) as second-line treatment of e.g. meticillin-resistant Staphylococcus aureus (MRSA) infections (rifampicin) or for treatment of mycobacteria other than tuberculosis (MOTT) and P01AB (nitroimidazole-derived antiprotozoals) were included. Antiviral and antifungal agents and antimicrobials for the treatment of mycobacteria were not included. For the calculation of the number of DDD per 100 patients, children and adolescents (< 18 years of age) and neonates were excluded, as DDDs are defined for adults only.

All the study data was collected from medical records only and did not involve any patient examination or any intervention. Additional information (if required) was obtained from the floor residents or nurses. All the study data were completely anonymized, no unique identifiers were recorded and the survey did not require direct contact with patients. Therefore, patient consent was not required.

Data analysis

Anonymized data was collected using two different forms (web-based Google forms), one for ward-level data and the other one for patient level data and then exported to Microsoft Excel for further analysis. Only descriptive statistics were used for summarizing the data. Discrete data were expressed as counts or percentages.

RESULT

On the point of survey date 470 patients were admitted in different ward selected for survey . Out of the total admitted patients we have enrolled 360 eligible patients for our surveys they were receiving antimicrobials .Maximum number of patients were between 18-40 years of age group 212(58.9%). Females patient were more 201(55.9%) than male 159(44.1%)(Tabe-2).On the day of survey 456 antibiotics were prescribed for 360 patients with antibiotic prescribing ratio of 1.2 per patient. Maximum number of patients were from Obstetrics and Gynaecology department 114(31.7%), followed by Medicine 97(26.9%), Surgery 74(20.6%), Orthopaedic 30(8.3%)and other department, ENT23(6.4%)and Paediatric17(4.7%) (Table-1). Antibiotic consumption was found highest in Obstetrics andGynaecology ward 34.9%, followed by Medicine ward 26.3% than Surgery ward 19.7% and then in other wards shown as in (Chart-1).277

(76.2%) patients were found on single antibiotics, 69(19.2%) patients were on two antibiotics and 14(3.9%) patients were on more than 2 antibiotics. (Table-2). Most of the patients were receiving antibiotics through Par-enteral route 250(69.4%) whereas 110(30.6%)patients were on Oral route .In a number of patients antibiotic were prescribed empirically 280(77.8%) (Table-2).

In our survey among top 5 antibiotics used,we have found that Ceftriaxone 165(37.2%) was most commonly used antibiotic followed by Amoxicillin-Clavulanic acid (11%), Piperacillin-tazobactum (7.9%), Metronidazole (6.80%)and Clindamycin 30(6.8%) (Table 3).Ceftriaxone was also most common to administer as parenteral antibiotic 47.6% whereas most common oral antibiotic used was Amoxicillin with clavulanic acid 44.9%(Table3).We have also analysed use of antimicrobials as per AwaRe classification of WHO and found that out of total 22 antibiotics used 54.5% were from Watch category, 31.8% from Access and,13.6% were from reserve category(Table4). In our study a higher percentage of antibiotics were used for Surgical prophylaxis 106(29.4%) followed by medical prophylaxis 102(28.3). A very low percentage of antibiotics were used for Hospital Acquired infection 7.5% .(Table 2) . The use of Microbiology laboratory services was poor as antimicrobial sensitivity was available only among 38(10.6%) cases.

Table:1 No of patients enrolled from different wards

Type of Wards	No of patients	Percentage
Medicine	97	26.9
OBG	78	21.7
General surgery	65	18.1
Orthopaedic	30	8.3
Post Natal	27	7.5
ENT ,Dental ,Surgery	23	6.4
paediatric	17	4.7
Paediatric surgery	9	2.5
Pre-operative	9	2.5
Burn	3	0.8
Neurosurgery	1	0.3
NICU	1	0.3
Total	**360**	

Table: 2 Patient Characteristics

Parameters	Frequency	Percentage
Age(years)		
0-17	49	13.6
18-40	212	58.9
40-65	83	23.1
>65	16	4.4
Total	**360**	
Gender		
Male	159	44.1
Female	201	55.9
Total	**360**	100
Route of Administration		
ORAL	110	30.6
Parenteral	250	69.4
Total	**360**	
Number of antibiotics per patient		
One antibiotic	277	76.9
Two antibiotic	69	19.2
Three antibiotic	14	3.9
Total	**360**	
Indication for Antibiotics n=360		
Surgical Prophylaxis	106	29.4
Medical Prophylaxis	102	28.3
Other	75	20.8

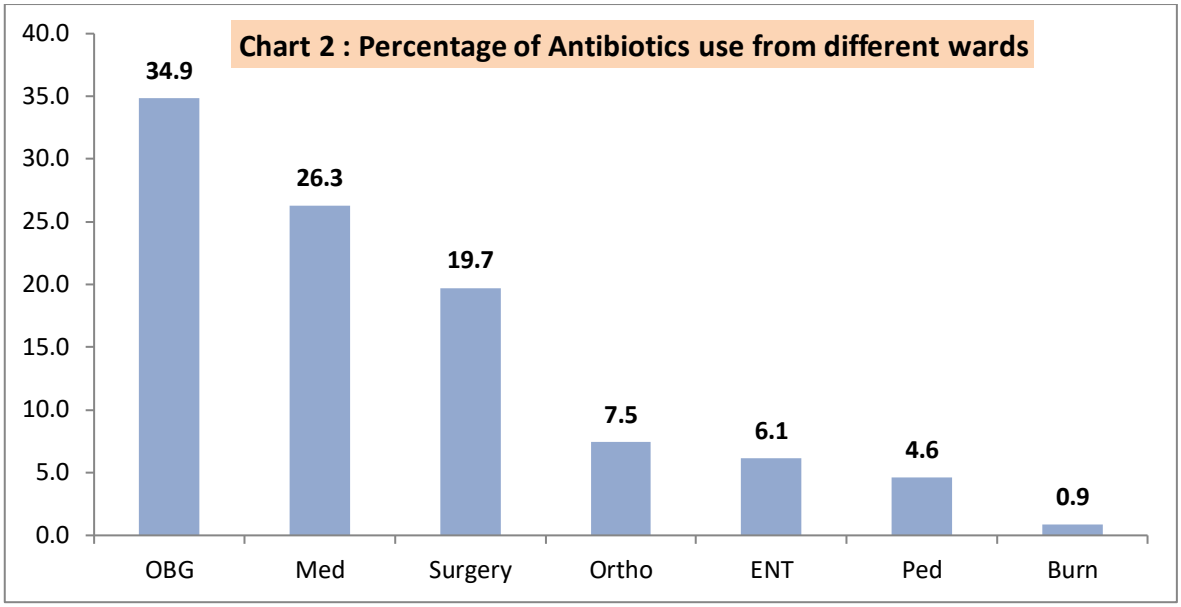
Community acquired infection	50	13.9
Hospital acquired infection	27	7.5
Total	**360**	
Indication for antibiotic given		
YES	80	22.2
No	280	77.8
Total	**360**	
Antibiotic sensitivity available		
Yes	38	10.6
No	322	89.4
Total	**360**	
Stop/ review date documented?		
YES	22	6.1
No	338	94.0
Total	**360**	

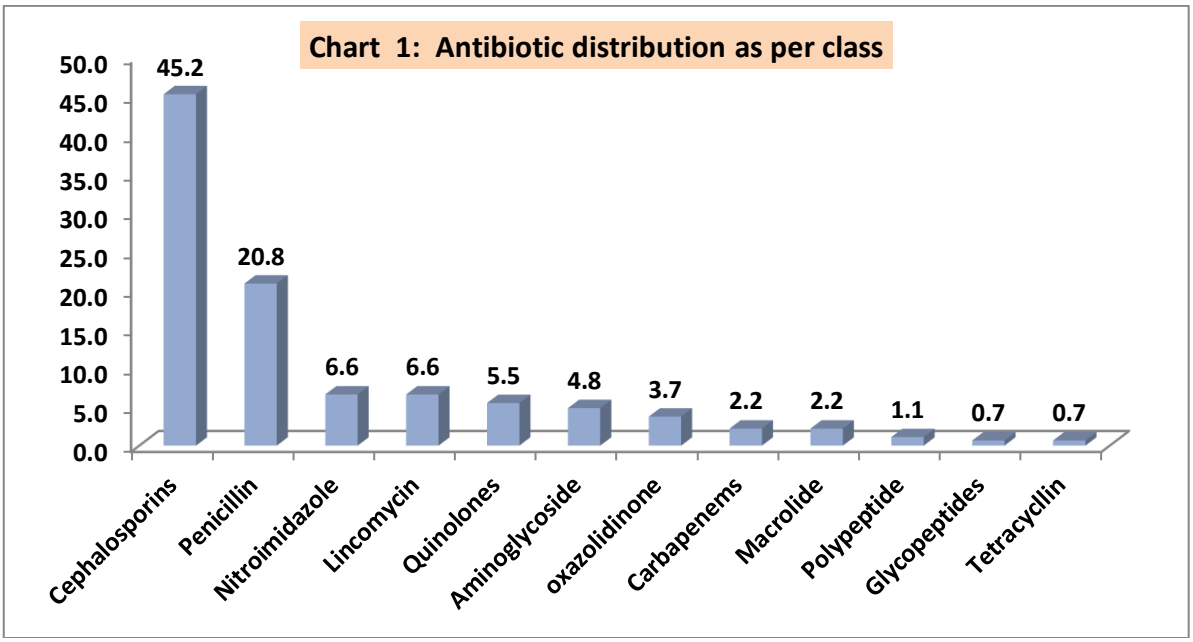
Table: 3 Different antibiotics use

Name	Number	Route	Percente
Amoxycillin-clavulanic acid	49	Oral	11.0
Amoxicillin	11	Oral	2.5
Levofloxacin	11	Oral	2.5
Azithromycin	10	Oral	2.3
Ciprofloxacin	10	Oral	2.3
Cefadroxil	5	Oral	1.1
Cefixime	5	Oral	1.1
Norfloxacin	4	Oral	0.9
Doxycyclin	3	Oral	0.7
Cefpodoxim	1	Oral	0.2
Ceftriaxone	165	Parenteral	37.2
PiperacillinTazobactum	35	Parenteral	7.9
Metronidazole	30	Parenteral	6.8
Clindamycin	30	Parenteral	6.8
Amikacin	22	Parenteral	5.0
Cefoperazone-sulbactum	20	Parenteral	4.5
Linezolide	17	Parenteral	3.8
Meropenem	10	Parenteral	2.3
Cefotaxim	8	Parenteral	1.8
Colistin	5	Parenteral	1.1
Vancomycin	3	Parenteral	0.7
Ceftazidime	2	Parenteral	0.5
Total	**456**		

Table: 4 Antibiotics Used as per WHO AWaRe Classification

Access	7	31.8
Watch	12	54.5
Reserve	3	13.6
Total	**22**	





DISCUSSION

This study is probably first study from Madhya Pradesh to describing antimicrobials use in Hospital . In this study we are describing data of antimicrobial use from a tertiary care hospital of central India .

The Point prevalence of antimicrobials at our hospital was found 76.59% whereas various studies from other part of India reported 57.4% , 46.5% , 62%, and 69.1% .(15-18). Ourprevalence rate is much higher as compared to studies reported from Other Indian studies.Data for the prevalence of antimicrobial consumption to adult hospitalised patients in other PPS studiesvaried between different regions of world also ; 43% in Australia , 56% in China , 32.9% in Europe , 38% in Canada ,and 34.4% from the reported data collected across different countries .(19).It indicate a higher use of antibiotic in our setup compare to otherstudy. Reason is not clear but may be multifactorial . As patient load is high and there is no protocol for taking specimen for culture prior to initiate antibiotics and also there is no antibiotic policy or any stewardship program is going on so clinician start antibiotic on basis of their clinical judgement . Microbiology facility is available but it is a resource limited Govt set up therefore no automation or no any means of rapid reporting is there so clinician don't want to wait for culture report .

In our study 106(29.4%)antibiotics were used for Surgical Prophylaxis whereasstudies from other part of India reported it to be 67.4% and 32.6 % respectively (20-21) .In a study ofVinella et al(21). Maximum use of antibiotic was done for surgical prophylaxis as in our study whereas Aditi et al(20) reported maximum use for CAI (40.2%). In our study Microbiology reports were available only in 10.6% cases ,other report from India showed it to be 22.6%

.(21) In our study 69.4% antibiotics were used parenteral, almost similar to other study reported 79.88% use from Pakistan 9.22.

Data in our study showed that 57.8% antimicrobials were used for Prophylaxis whereas 42.2% were used for CAI,HAI and other infections(Table-2).Other studies from India reported 48.51% and 30.2% for prophylaxisand 49.5%and 51.4% fortreating infections.(16,18)

It was also observed in our study that most antibiotics i.e. 29.4% were usedfor surgical prophylaxis(SP) and 28.3%for Medical Prophylaxis(MP) whereas other Indian studies reported 34.65% for surgical prophylaxis and 13.86% for medical prophylaxis respectively (16,18). The reason for more use of antibiotics for surgical prophylaxis was that many of the patient do not having culture positive infections so in such cases clinician considered antibiotics for prophylaxis as a need .None of the patients from our study received antibiotic for < 24 hrs for surgical prophylaxis whereas a other study from India reported 14% of patients received single dose antibiotics as recommended as per protocols for surgical procedures.(15)Many study showed that prolonged prophylaxis is not needed and it can lead to development and spread of drug resistant bugs .So it is very urgent to implement A good antibiotic stewardship programme to prevent unnecessary use of antibiotics, prevent development of drug resistance and decreasing treatment cost .We also observed a high use of antibiotic for Medical Prophylaxis and other therapeutic purposes and in most of the patient it was used as empiric therapy without any stop or review order . So it again warrant us to start a local stewardship and infection control program to minimise use of antibiotics .Ahigh use of antimicrobials indicate a poor quality management and infection control practices .A study conducted at China suggested that pharmacist intervention in ward can play an important role in minimising and judiciously use of antimicrobials .(23)

The most commonly used antibiotic in our study was Ceftriaxone 37.2%, followed by Amoxicillin–clavulanic acid 11%, is similar to other study from India who reported 28.12% and 19.37% use respectively(16)In our study most frequently used class of antimicrobials is third generation cephalosporin around 45% but the current protocol recommend to use this class of drugs only when first line drugs are not effective(24) . One study emphasised that with excessive use ofthird generation cephalosporins among children thereis a very high risk of colonisation and thespread of Extended Spectrum Beta Lactamase toother members of the family.(25) So it is need of concern and if we do not control use of antibiotic as per the WHO or National guidelines it will become big problem in future for our population. We observed use of 22 antibiotics from different classes without following any guidelines . Most of the antibiotics used in our study belong to the Watch category of WHO AWaRe classification similar to study by Obed Kwabena et al (26). Good part of our study was, very few patients received reserve class of antibiotics as per WHO AWaRe classification (Table 4), also similar to study by Raja et al from west Bengal .(27)

Inspite of availability of good microbiology services at our set up,89.4% antibiotics were prescribed empirically,it may be because of multiple reasons as high patients load is there and many of critically ill patients visit the hospital as largest Tertiary care Government hospital in district therefore keeping in view of saving life of patients and to protect him from infection, clinician can't wait for Microbiology report and he started antibiotic empirically. But it is a serious matter indicating poor utilization of microbiological services and require urgent need for a good stewardship and infection control practices to establish. There is no Institutional Antibiotic policy nor any stewardship programm is going on in our institute, however all department are having antibiogram prepared by Microbiology department regularly on the basis of culture report data from different department.

CONCLUSION

A point prevalence survey is a feasible and effective tool that can be used for measuring the quality of antimicrobial prescribing and the effect of interventions to improve prescribing. This study documented high use of antimicrobials in admitted patients both for prophylactic and therapeutic indications. Prolonged and irrational use of antibiotics for surgical prophylaxis was observed in surgical indoor patients. Most of the antibiotic therapy was empirical and not guided by culture and drug susceptibility testing. In majority of cases antibiotics were used empirically without any written documentation of stop or review orders.

These findings indicate critical areas for interventions and propose implementation of antimicrobial stewardship policies in the present study hospital. The findings of the survey can be useful in generating baseline data for planning strategies for interventions aimed at reducing antimicrobial use and for evaluating the impact of future antimicrobial stewardship interventions.

The data suggests need for rational prescribing of antibiotics, using microbiological facilities by increasing use of culture and antimicrobial susceptibility data to guide infectious disease therapy and de-escalation with targeted antimicrobial therapy. Implementation of these interventions is expected to improve the antimicrobial prescribing behaviour in hospital which would be helpful in limiting the development of antimicrobial resistance.

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