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Original Research Article

A point prevalence survey study (PPS) of antimicrobial consumption in a tertiary care super-speciality hospital of West Bengal

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ABSTRACT

Objective: Antimicrobial resistance (AMR) is an emerging global health issue. Resistance occurs when bacteria, parasites, viruses or fungi are exposed to antimicrobials but not killed by them. The study was conducted to gather baseline information to assess the antimicrobial consumption practices across six departments in a tertiary care super speciality hospital of West Bengal.

Materials and Methods: Modified version of a patient data collection form proposed by Global PPS was developed on Epi Info software version 7 (CDC). Data of all patients in ward at 08.00 am data were studied. The use of antimicrobials was categorized as empiric, prophylactic or lab based. This classification is not mentioned in the files, so a response from the doctor taking care of the patient was noted.

Results: A total of 85 patient related data was collected in the designated survey form. Total beds covered was 340 and the number of patients on antimicrobials was found to be low at 21.27 %. The patients surveyed were predominantly female (78.8 %). The mean number of antimicrobials per patient was found to be 1.62 (range of 1.4 to 2.2) Relatively low number of patients were found to be on 2 or more antimicrobials. Double gram negative and Double anaerobic coverage of AM used varied across departments covered.

Conclusion: Our point prevalence study was able to facilitate conducting of point prevalence survey in high patient volume tertiary care hospital with paper based medical record system and also depicted the baseline parameters of intervention for instituting future action and policy changes.

1. Introduction

The present global AMR crisis is the result of a number of factors, including over prescribing and dispensing of antimicrobial medicines by health workers, noncompliance with treatment courses, low-quality medicines and incorrect prescription with wrong dosage, poor infection prevention and control practices in hospitals and clinics, and lack of hygiene and poor sanitation.[1,2] AMR is a complex problem with many interrelated causes. Inappropriate use of antimicrobials and lack of surveillance systems are core contributors to the spread of AMR. Other factors influencing AMR, such as poor infection prevention and control in healthcare facilities and lack of available, inexpensive and rapid diagnostic tests, are also important factors that require urgent address.[3]

Customizing the usage of antimicrobial agents, referred to as antibiotics in this document, is a challenge and selecting the right antibiotic may not be straightforward. The number of antibacterial subclasses and substances is relatively large compared to other antimicrobial classes, antibiotics often target not one specific microorganism but a range of pathogens depending on the spectrum of activity of the antibiotic, bacteria may develop different mechanisms of resistance to antibiotics, and finally, the majority of the antibiotic treatments, at least in the community,

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are given empirically. It is likely that inappropriate use of antibiotics is widespread; however, information on antibiotic consumption and use is scarce in low-and middle-income countries. In order to inform effective policies and interventions that optimize use and promote equitable access to medicines, it is essential to collect information on the current situation of antibiotic use in all countries.

Data collection and strengthening of monitoring systems is needed to provide a reliable global picture of the use of antibiotics. High level data on the quantity of antibiotics used nationally, e.g. through sales, provide important information on antibiotic consumption. In 2016, WHO developed a global methodology for monitoring antimicrobial consumption,[4] including antibiotics, and supports countries in implementing surveillance of antimicrobial consumption to obtain national estimates of antimicrobial consumption. However, one limitation of consumption data is the lack of information on how antibiotics are prescribed and used at the patient level. Data on antibiotic use at the patient level is sparse, due to the difficulties associated with collecting prescribing data from fragmented data sources. Hospitals are excellent settings for gaining understanding of antibiotic prescribing. They have a high concentration of patients with diverse pathologies, often requiring antibiotic treatment. This creates high selection pressure on bacteria due to the quantities and broader spectrum of antibiotics used, contributing to the development and emergence of resistant bacteria.

Collecting hospital data and subsequently implementing informed interventions to optimize antibiotic use in hospitals has significant potential to lower antibiotic resistance at local and higher levels. Furthermore, the concentration of patients requiring antibiotics provides an excellent opportunity to survey antibiotic prescribing while reducing the workload of collecting prescribing data and providing a range of different situations where antibiotics are used. In the vast majority of countries worldwide, continuous data collection on antibiotic prescribing is not possible due to the high workload and level of resources needed for regular monitoring. A viable alternative is to collect data at a specific point in time, which can be done successfully using the point prevalence survey (PPS) methodology. PPS on antibiotic use are already in use in hospitals around the world.

The WHO PPS methodology is an adaptation of the ECDC protocol for Point Prevalence Survey of healthcare associated infections and antimicrobial use,[5] complemented by methodologies from the Global PPS project from University of Antwerp[6]

To account for challenges associated with data collection in resource-limited settings, the methodology has been developed with flexibility in mind. A set of core variables has been selected by the WHO that is necessary for data analysis and interpretation, and provides the possibility to implement follow-up activities. Depending on the resources and availability of information, hospitals and countries may include additional variables (e.g. microbiology results) that improve the understanding of antibiotic use in hospitals. For better comparability and interpretation of results, it is advisable to select the variables to be collected (core and optional) at country level and by hospital category, and not differ between hospitals.

The WHO PPS methodology adopts collecting basic information from medical records and associated patient documentation on 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. In addition to assessing the use of antibiotic treatment the information can be used for other objectives, such as improving quality of care or infection prevention and control (IPC) in hospitals. It is important to emphasize that this methodology does not collect additional information aside from what is already recorded through routine processes.

Thus, there is no direct contact with patients where they are asked to provide supplementary information. The WHO methodology has been developed with the aim of collecting baseline information on the use of antibiotics in hospitals, and is expected to be repeated once every few years. It is, however, possible to adapt and tailor the methodology for specific purposes, such as follow-up surveys to assess specific interventions or to support the objectives of improving quality of care.

2. Materials and Methods

2.1. Study design and setting

The study followed the standard guidelines of point prevalence survey (PPS) methodology as described by Global PPS of Antimicrobial Consumption and Resistance (version January 2019).[3,7] The total patient bed of the multi speciality referral hospital is around 2100 beds and the yearly patient load in IPD setting was nearly 85,000 (as of 2018). Ethical permission for conducting the study was sought and accorded by the institutional ethical Committee of the institute. All study data was completely anonymised, and no unique identifiers were recorded.

2.2. Data collection

The survey was collected for around 4 weeks in September and October, 2019 in the six designated departments. For the same a modified version of the patient data collection form proposed by Global PPS was prepared on Epi Info software version 7 (CDC) and in subsequently converted into a paper-based form. This one page form captured the demographic characteristics of the patient, particulars of antimicrobials (up to 5 antimicrobials) including generic name, dose, frequency in hoursand route of administration, diagnostic

Table 1: Baseline characteristics of patients surveyed across departments (N=85)

Patient Characteristics		
Age (Mean, SD) (in yrs)	32 (1.4)	
Gender n, (%)	Male 18 (21.1 %)	Female 67 (78.8 %)
Departments n. (%)	CCM 18 (21.17 %) CTVS 11 (12.94 %) Orthopedics 23 (27.05 %) Ped Surgery 3 (3.52 %) Plastic surgery 8 (9.41 %) Urology 22 (25.88 %)	
Mean number of AM	1.62 (range 1.4 to 2.2)	

Table 2: Antimicrobialuse and consumption profile across departments surveyed including treatmentbasis.

Department	CCM	Orthopaedics	Urology	CTVS	Plastic Surgery	Paediatric surgery
No of beds surveyed	20	80	100	60	30	70
No (%) of patients on AM	18 (90%)	23 (28.75%)	22 (22%)	11 (18.3%)	08 (26.6%)	03 (4.28%)
No of AM prescribed (Mean, SD)	2.22±1.21	1.34±0.48	1.09±0.29	1.09±0.30	1.25±0.46	1.33±0.57
No. of patients on 1 AM	7 (38.88)	15 (65.21)	22 (100)	10 (90.91)	6 (75)	3 (100)
No. of patients on 2 AM	3 (16.67)	8 (34.78)	0	1 (9.09)	2 (25)	0
No. of patients on 3 AM:	6 (33.33)	0	0	0	0	0
No. of patients on 4 AM	1 (5.55)	0	0	0	0	0
No. of patients on 5 AM:	1 (5.55)	0	0	0	0	0
No (%) on Double gram negative cover	7 (38.88)	1 (4.34)	1 (4.54)	0	0	0
No (%) on Double anaerobic cover	1 (5.55)	0	1 (4.54)	1 (9.09)	1 (12.5)	0
No of patients on Empirical treatment	1 (1.17)	19 (22.35)	20 (23.52)	10 (11.76)	7 (8.23)	1 (1.17)
No of patients on Test based treatment	17 (20)	0	0	1 (1.17)	0	2 (2.32)
No of patients on Prophylactic treatment	0	4 (4.70)	2 (2.32)	0	0	0
No of patients on Carbapenems	8 (9.41)	1 (1.17)	0	0	0	0
No of patients on Polymixins (Poly B, Poly E)	3 (3.52)	0	0	1 (1.17)	0	0

codes and therapeutic indication for antimicrobials on page one. The use of antimicrobials was categorized as empiric, prophylactic or lab based.

2.3. Inclusion criteria

All inpatients present in the ward, admitted before 8:00 a.m. on the day of data collection were included. These included neonates born on that day before 8:00 a.m. Data of patients receiving at least one antimicrobial were collected on the patient data collection forms.

2.4. Exclusion criteria

Outpatients and patients in emergency units were excluded. Additionally, patients admitted after 8.00 a.m., or those scheduled to be discharged, or those posted for surgical intervention on the day of data collection were also excluded.

3. Data analysis

The focus was on prescription of antibiotics for systemic use. Antimicrobial prescribing rates were expressed as a percentage of patients on antimicrobials, or as a percentage of all antibiotic or antimicrobial prescriptions.

The following parameters were analyzed –

1. Number (% of patients on antimicrobials)
2. Number (% of antimicrobials used empirically, prophylactically, laboratory based)
3. Number (%) of antimicrobials used for Community Acquired Infections (CAI), Hospital AcquiredInfections (HAI), Medical Prophylaxis (MP), Surgical Prophylaxis (SP), Unknown and others
4. Number of patients receiving double anaerobic cover (DAC) and Double cover for Gram NegativeInfections (DGNI)
5. Number (% of on designated antimicrobials (Percentage calculated out of those who are onantimicrobials

4. Results

A total of 340 beds were surveyed patients from our tertiary healthcare center was included in the study. Of these, 72 (21.27%) patients were on antimicrobials (Table). The study recorded antimicrobials with an average of 1.62 antimicrobials per patient (range of 1.4 to 2.2). (Tables 1 and 2)

Relatively low number of patients were found to be on 2 or more antimicrobials. Double gram negative and Double anaerobic coverage of AM used varied across departments covered.

5. Discussion

It is believed Infectious diseases constitute an important cause of hospital admissions in Indian hospitals. 12.3% patients received 3 or more antimicrobials (range from 6.5% to 30.9%).[8,9] Our point prevalence survey conducted at this tertiary care centre a total of 340 patients over two weeks brought forth some important findings. Foremost, the antimicrobial use across the centers was reasonably low at 22.71 %. This relatively low use of antimicrobials is in contrast from an earlier survey conducted in India where a prevalence of around 57.4% was noted[10]. Our survey included a single public sector based super speciality referral hospital from public sector. The departments covered included Critical care medicine (CCM), Orthopedics, Urology, Plastic surgery, Cardiovascular and thoracic surgery (CTVS) and Pediatric surgery, affiliated with the main hospital.

High burden of antimicrobials was not confined to intensive care units alone in some centers. This may be explained by the fact that because of limited availability of intensive care unit beds, critically ill patients are often managed in medical or surgical wards. It was interesting to note that majority (40.1% total use, ranging from 14.8% to 64.7%) of the use of antimicrobials was empiric. Although all the included centers have functioning microbiology labs, relatively less proportion of antimicrobials was lab based (22.8%; ranging from 7% to 68.9%). These hospitals often receive patients from other hospitals who are already on antimicrobials which makes culture positivity yield less efficient. Furthermore, for the patients admitted through emergency departments, appropriate cultures are often not sent because of overcrowded emergencies and resource constraints. However, working towards culture of sending cultures is an important interventional strategy for antimicrobial stewardship which has emerged from this data.[2,10–22]

While community acquired infections accounted for majority of antimicrobial used, surgical prophylaxis followed closely. What is most striking is that surgical prophylaxis was continued for more than 24 hours in nearly half of the patients. Secondary infections and febrile reactions was an important reason cited for continuing the prophylactic regimen. Hospital acquired infections continue to remain important drivers for antimicrobial use, particularly so in our country where infections due to multidrug resistant pathogens are quite common.[3–5,7,23–26]

Importantly, with regards to redundant antimicrobial use, this practice was not that fairly common. Double anaerobic cover was more than 2% in one department. Double cover for suspected or proven gram negative infections was a bigger concern. There are very limited indications for empiric or lab based use of more than one antimicrobial agent for Gram negative infections. However, the practice seems fairly common and needs deeper evaluation.

of the designated antimicrobials the use of carbapenems, teicoplanin and vancomycin was varied across departments surveyed. However, was fairly low in most. Polymyxin use was relatively varied in some departments of the hospital and largely for the management of healthcare associated infections due to multidrug resistant organisms However, there is a need to strengthen infection control practices along with antimicrobial stewardship in order to bring down the use of these antimicrobials.[27]

However, our survey was not without some limitations. Firstly, the data collection involved only 340 beds out of around 2100 beds in this hospital although it covered five departments. Secondly, microbiological and biomarker related data was not always available from the patient treatment sheets and records and in the absence of hospital information system this . Further, the purpose of use of antimicrobials, for the categories of empiric and prophylactic, on occasions a discordance was noted in the responses given by the treating physician and that by the data collection team. In the absence of hospital information system for culture and biomarker reports, in some cases, the reports may be verbally communicated in some situations while the final reports follow after sometime. However, lab-based classification was considered only if the reports were available in the file.

6. Conclusion

The study was not only able to demonstrate the feasibility of conducting point prevalence survey in high patient volume and paper based medical record system but also generated the baseline intervention for evaluating the impact of future interventions. The targets for interventions that emerged out were- improving surgical prophylaxis, decreasing double anaerobic cover, initiating culture of sending cultures and de-escalation. This survey will help generating data in evaluating the impact of various antimicrobial stewardship interventions.

7. Source of Funding

None.

8. Conflict of Interest

None.

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