Original Article

A Point Prevelance Survey Study of Anti-Microbial Consumption in a Tertiary Care Hospital

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Abstract

Background: As per WHO (2019), Antimicrobial resistance (AMR) is one of the top ten global public health threats facing humanity. Surveillance systems (Point Prevalence Study) are the cornerstones of successful implementation of sustainable antimicrobial stewardship programs and thus reduce AMR. This study was conducted to observe the antimicrobial consumption practices .

Objectives: The objectives of the PPS study were to estimate the prevalence of antibiotic use, most commonly prescribed antimicrobials, assess antibiotic usage as per AWaRe classification

Methods: A cross sectional PPS (on a single day in December 2021) was conducted in a tertiary care hospital with prior ethical approval. All admitted patients in the ICU/wards receiving at least one antimicrobial admitted before 9.00 am on the day of data collection were included. Data was collected using two structured case record forms: ward level and patient level data. The outcome measures were analyzed& represented in percentages.

Results: 278 patients with antibiotic prescriptions were surveyed & total antimicrobials prescribed were 429. Prescriptions with a single antibiotic are 55.1% (145), two antibiotics are 32.8% (118), ≥ 3 antibiotics are 12.1% (15). As per WHO AWaRe classification, 43.5% (187) were of Access, 55.4% (238) of Watch & 0.1% (4) of Reserve category. Community acquired infection (38. 5%) followed by Surgical prophylaxis (28.4 %) was the most common diagnosis. 8.6 % (24)&16.5 % (46) patients were receiving double anaerobic cover &double gram negative cover respectively. Most commonly used antimicrobials was Metranidazole (21.44%) followed by Ceftriaxone (19.11%).

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In this tertiary care hospital, Annual Hospital admissions accounted to 73283 in the year 2021. The total number of beds in the hospital are 1267. Round the year the total number of beds occupied in different wards is 100%.

In the surveyed departments, the number of patients admitted at the time of our survey were 533, out of which 450 (84.42%) patients are eligible. Of these eligible patients, patients receiving antimicrobial agents in various wards are 278 (61.7%). of which 46.7 %(130) are males and 53.3 % (148) are females.

Of 278 patients with antibiotic prescriptions on the day of PPS survey, the total number of antimicrobials prescribed were 429. Number of patients/prescriptions with a single antibiotic are 55.1% (145), two antibiotics are 32.8 % (118) , three or more than three antibiotics are 12.1% (15). Average antibiotics per eligible patient is 0.95 and Average antibiotics per patient on antibiotics is 1.54.

Table 1: Demographic characteristics of study participants

CHARACTERSTICS	**Frequency (%)**
No. of patients admitted	533
No. of eligible patients	450 (84.4%)
No. of patients receiving antimicrobials	278 (61.7%)
Age	49.5 ± 1.2 years
Gender	
Male	130 (46.7 %)
Female	148 (53.3%)
Average Days of stay	5.9 days
No. of antimicrobials per prescription	
1	145 (55.1%)
2	118 (32.8%)
≥3	15 (12.1%)
No. of antimicrobials prescribed	429
Route of administration	
Oral	126 (29.3%)
Parenteral	303 (70.6%)
Average antibiotics per patient on antibiotics	1.54
Prescriptions are with stop review date mentioned	10 (2.3 %)
Antibiotics based on WHO AWARE	Access: 187 (43.5 %)
classification of antimicrobial consumption	Watch: 238 (55.4 %)
	Reserve: 4 (0.1%)

Out of these, 70.6 % (303) & 29.3% (126) antibiotics are administered with parenteral and oral route respestively. Only 2.3 % (10) prescriptions are with stop review date mentioned.

According to WHO AWARE classification of antimicrobial consumption, the antimicrobials prescribed belong to category (Access: 187 – 43.5%, Watch: 238 – 55.4 %; Reserve: 4 – 0.1%). Out of the total prescriptions 10 antibiotic prescriptions were of the 'Not Recommended' category.

Conclusion: To preserve the future effectiveness of antibiotics, it is imperative to rationally scrutinize and improve prescribing practices. This PPS survey would be helpful in generating baseline data for identifying strategies directed at reducing antimicrobial use & to develop evidence based antimicrobial prescribing guidelines.

Keywords: AMR (Antimicrobial resistance), PPS (Point Prevalence Study), Antibiotic consumption, AMSP (Antimicrobial Stewardship Programme), AWaRe classification

Introduction

Health crises such as viral pandemics arise suddenly and require immediate actions, others emerge more slowly and are more unnoticeable and intractable. An example of the latter is antimicrobial resistance (AMR), which has been declared as one of the top ten global public health threats facing humanity by WHO in 2019 [1] .

This threat is aggravated by the drying pipeline of new antimicrobials[2]. In the dearth of newer antibiotics, the best possible approach is to efficiently handle the existing antimicrobials . A safe and effective approach for antibiotic use involves prescribing an antibiotic with the narrowest spectrum of antimicrobial activity, fewest adverse effects and lowest cost [3] .

WHO has declared that misuse and overuse of antimicrobials are the main drivers in the development of drug-resistant pathogens[4]. Other factors include over prescribing and improper dispensing of antimicrobial, poor infection prevention and control practices in hospitals and clinics, and lack of hygiene and poor sanitation[5].

Approximately 0.7 million people die every year worldwide from drug-resistant strains of microbes. The number is estimated to increase to 10 million by 2050, surpassing cancer (8.2 million deaths per year) [6]. A report from 2010 shows that India is the largest consumer of antibiotics recording 12.9 x 10^9 units (10.7 units per person) [7].

In 2015, World Health Organization (WHO) developed a global action plan, as mandated by the World Health Assembly (WHA) 2015 resolution on antimicrobial resistance (GAP AMR) wherein the member states are to produce national strategic plans for AMR [9]. India as a responsible signatory to GAPAMR rolled on the National Action Plan on AMR (NAP AMR) on 19th April 2017[10].

WAAW (world antimicrobial awareness week) is a global campaign that aims to raise awareness of antimicrobial resistance worldwide [11]. India launched the National programme on AMR containment in the year 2013 and the National Action Plan on Antimicrobial Resistance in 2017. Identifying the growing AMR and gross deficiency in practice of AMSP, NCDC (NARS-Net , NAC- NET) & ICMR (AMRSN) stepped up to establish country wide antimicrobial resistance surveillance and research network [12]. Globally, AMSP have resulted in a reduction of 22%–36% antibiotic usage with a significant cost savings in many countries.

To achieve this objective, National Centre for Disease Control (NCDC) co-ordinates antibiotic surveillance through National Antimicrobial Consumption Network (NAC-NET) comprising of 35 tertiary health care institutions. Through a comprehensive analysis of consumption patterns, they aim to highlight the amount and trends of antimicrobial usage, identify potential areas where interventions can be implemented and protect the health of future generations[13].

AWaRe classification (ACCESS, WATCH, RESERVE) - a stewardship framework (to measure and improve appropriate antibiotic use) - that categorizes antibiotics into Access, Watch, and Reserve groups. Access includes narrow-spectrum antibiotics recommended as first-line or second-line antibiotics; Watch includes broad-spectrum antibiotics with a high chance of resistance to be used only for specific indications; and Reserve includes antibiotics to be used only as a last resort[14].

A point prevalence survey can be defined as the prevalence calculated at a particular point in time and offers cross-sectional quantitative information about patterns of drug utilisation[15]. Surveillance systems (PPS) are the cornerstones of successful implementation of sustainable antimicrobial stewardship programs and thus reduce AMR[16]. The targets for interventions were- improving surgical prophylaxis, decreasing double anaerobic cover, initiating culture of sending cultures and de-escalation

therapy. So this PPS study was conducted to observe the antimicrobial consumption practices in this tertiary care hospital.

Objectives:

The main objective of the study

1. To estimate the prevalence of antibiotic use, commonly used antibiotics, patient variables associated with increased antibiotic use in the hospitals
2. To assess the proportion of patients on antimicrobials in a health care facility, to know the Clinical (therapeutic/prophylactic) indications where antibiotics are prescribed and to identify the most commonly prescribed antimicrobial

Methodology

Infectious diseases constitute an important cause of hospital admissions in Indian hospitals for which antimicrobial regimens are prescribed and consumed.

A cross sectional Point prevalence survey was conducted in the tertiary care hospital in the month of December 2021 after obtaining prior approval from institutional ethics committee. This hospital is a multispeciality (broad & superspeciality) tertiary care, teaching hospital with 1267 bedded capacity /

Inclusion Criteria

All admitted patients in the ICU/wards receiving at least one antimicrobial admitted before 9.00 am on the day of data collection were included in the study.

Exclusion Criteria

Outpatients and patients admitted after 9 am, those scheduled to be discharged on the day of data collection were excluded from the study.

The survey was conducted on a single day (1st December 2021) in the month of December. The data was collected from all the clinical departments in the tertiary care hospital {departments included are : Departments of General Medicine, Paediatrics, Surgery, Gynaecology adnd Obstetrics, Orthopaedics, Intensive care units and others (Neurology, Cardiology)}.

The study was conducted by a team of members under supervision of NCDC and Pharmacology HOD. A survey skill exercise was organized before the study to train all the survey members regarding the methodology of survey (collection of data). The survey was conducted at one point of time commencing at 9.30 a.m on that day (1st December 2021). The data was collected using two well structured case record forms: ward level data and patient level data. Data collected from the ward-level included the date of the survey, ward name, ward type and total number of available beds and admitted patients by healthcare facility. Patient-level data included age, sex, antimicrobials received, diagnoses, and indication for treatment. The survey was coordinated and monitored by the team leader (i.e Head of the Department of Pharmacology) to maintain the quality of the data collection process.

Statistical Analysis

The data collected was expressed as descriptive statistics. The data was exported to Microsoft Excel for further analysis.

The following parameters were analyzed –

Number (% of patients on antimicrobials), Number (%) of antimicrobials used for Community Acquired Infections (CAI), Hospital Acquired Infections (HAI), Medical Prophylaxis (MP), Surgical Prophylaxis (SP), Unknown and others, Number of patients receiving double anaerobic cover (DAC) and Double cover for Gram Negative Infections (DGNI), antibiotic usage as per AWaRe classification.

The study followed the standard PPS methodology (from WHO version) by global point prevalence survey of antimicrobial consumption and resistance

Results

Guntur Medical College is affiliated with the Dr. NTR University of Health Sciences and works in conjunction with Government General Hospital, a tertiary care hospital with 1267 beds, of which ICU beds are 145 and Acute Beds are 1122. It caters to the needs of the people of Coastal districts of Andhra Pradesh. It was included in the National Antibiotic Consumption Network (NAC - NET) under National Antimicrobial Resistance Containment Programme in phase 3 under the aegis of NCDC

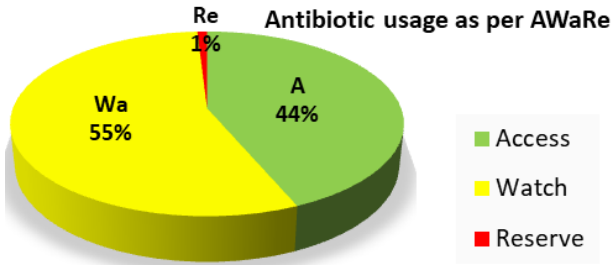

Figure 1: Overall Antibiotic usage as per AWaRe

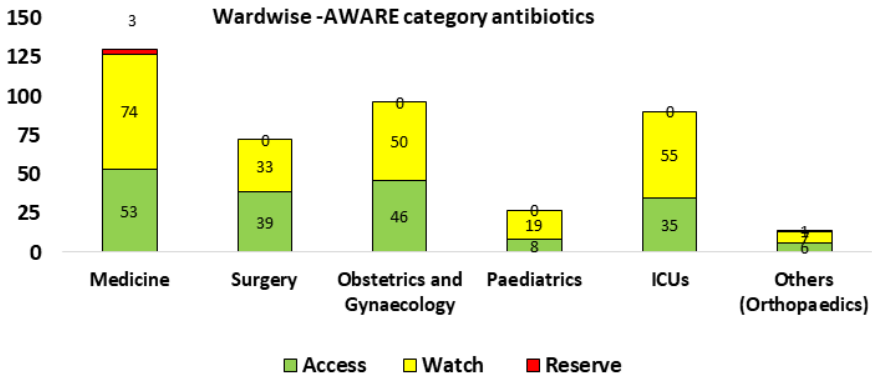

Figure 2: Ward wise break up of AWARE category antibiotics

Only 0.7% (2) patients are on definitive therapy. 8.6 % (24) & 16.5 % (46) patients are receiving double anaerobic cover &double cover for gram negative organisms respectively.

Most commonly used antibiotic/antimicrobial in the institution/hospital is Metranidazole. Most commonly prescribed antibiotics as per AWARE classification (METRONIDAZOLE – A,CEFTRIAXONE – W, PIPERACILLIN AND TAZOBACTUM –W, CEFIXIME – W, AMOXICILLIN AND POTASSIUM CLAVULANATE – A).

Table 2 : Clinical Conditions of common Antibiotics

Antibiotic	Clinical Condition
Metranidazole	Pleural Effusion, Acute Febrile Illness (AFI), Stroke, Pseudocyst
Ceftriaxone	Cellulitis, Appendicitis, Broncholiotis, Hydronephrosis
Piperacillin and Tazobactam	Dengue, Sepsis, Diabetic Foot, Cholelithiasis
Cefixime	Acute Gastroenteritis, AFI, Pyelonephritis
Amoxicillin and Clavulanic Acid	AFI, Meningoencephalitis, polytrauma

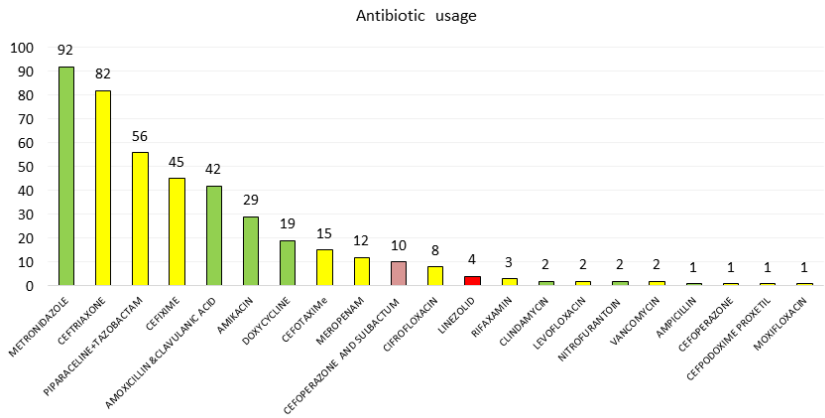

Figure 3: Overall Antibiotic usage

Piperacillin & tazobactam, ceftriaxone, metronidazole are the most common antibiotics used in Intensive care units.

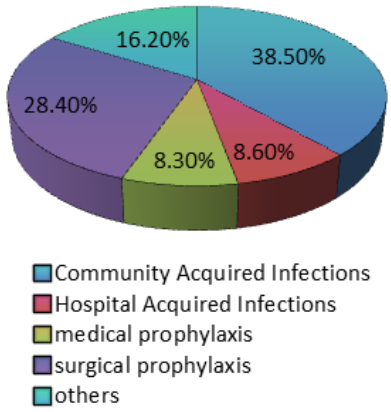

Fig 4: Antibiotic use by Diagnosis

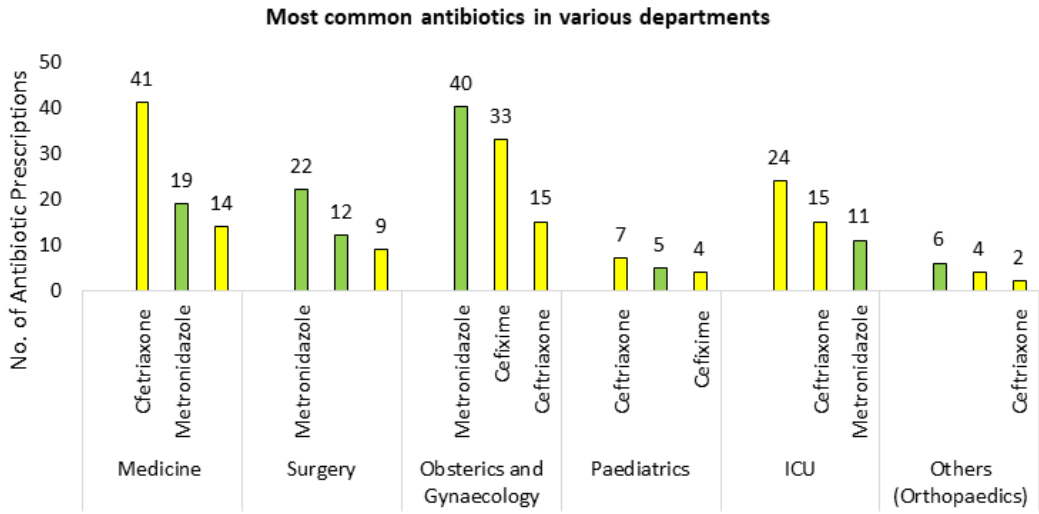

Figure 5: Most common antibiotics in various departments

Discussion

National Centre for Disease Control (NCDC-(NARS-Net , NAC- NET)) is the nodal agency for the National Programme on AMR containment in India. The network sites compile the data on the antibiotics consumed in their respective health facilities and send it to NCDC. This was a comprehensive antimicrobial PPS that involved most of the clinical departments of this tertiary care hospital. Data collection was carried out on a single day and all patients case sheets on at least one antimicrobial agent were assessed.

The prevalence of antimicrobial utilization at our hospital was recorded as 61.7 % (patients receiving AMA) with 278 antimicrobial prescriptions. The prevalence rate is comparable to other studies by Sumanth Gandra et al[17], N.shanmuga Vadivoo[18] et al and Nirula et al[19] where the rates are 61.52 %, 70.11 % &46.54 %. respectively.

In the present study, the percentage of male to female ratio treated in our survey are 46.7 %(130) and 53.3 % (148) . In contrast, other studies by Nirula et al[19] and Sumanth Gandra[17] et al has male to female ratio (58.4 % : 41.5%) and (59.1 % : 40.8%) respectively.

Out of 278 patients with antibiotic prescriptions, 55.1% (145) of prescriptions are with single antibiotic, 32.8 % (118) are with two antibiotics, 12.1 % (15) are with three or more than three antibiotics. This is in correspondence to a study by Nirula et al[19] & Sumanth Gandra et al[17] where 54.4%, 69.45%

of prescriptions are with single antibiotic, 33.6 % &20.28% are with two antibiotics, 11.8 % & 10.26%are with three or more than three antibiotics respectively.

In the present study, 70.6 % (303) & 29.3 % (126) antimicrobials were prescribed parenterally & orally. In a study by Aditi M Panditrao et al [20], Nirula et al[19] and Najmi A et al[16], 77.9%, 76.25% and 30.55% of overall antimicrobial prescriptions were administered parenterally respectively. In the present study, Only 2.3 % (10) prescriptions are with stop review date mentioned compared to a study by Najmi et al[16] where 19.48% were with stop review date mentioned. This indicator was very low and an area of concern which has to be improved.

In the present study, based on WHO AWARE classification of antimicrobial consumption, the antimicrobials prescribed belong to category (Access: 187 – 43.5 %; Watch: 238 – 55.4 % ; Reserve: 4 – 0.1%). Out of the total prescriptions 10 antibiotic prescriptions were of the 'Not Recommended' category. In a study by Aditi M Panditrao, et al [20], where 57.9%, 38.0% &4.07% of use was from the 'Watch', 'Access' and 'Reserve' categories which is comparable to the present study.

In the present study, 38. 5%&8.6% of antibiotic use seen with Community (CAI) & hospital acquired infections and 8.3 %&28.4 % with Medical& surgical prophylaxis respectively. & Others causes (16.2%). In a study by SK Singh et al[21], 26.87% & 19.20% were prescribed for community & hospital-acquired infections; 17.24% &28.70%for medical& surgical prophylaxis respectively ; and 7.99% for other or undetermined reasons. I n a study by Aditi M Panditrao et al [20], the most common indications for antimicrobial use were CAIs (40.2%) requiring hospitalization, similar to present study.

In the present study, number of patients receiving double anaerobic cover are 24(8.6%) &double cover for gram negative organisms are 46 (16.5 %). In a study by Aditi M Panditrao,et al[20], nearly 2.7%&7.1% of antimicrobial prescriptions were prescribed as double anaerobic cover and double cover for Gram-negative organisms respectively.

In the present study the most common antimicrobial prescribed is metronidazole (21.44 %) followed by ceftriaxone (19.11%). In contrast , a study by Nirula et al[19] reported ceftriaxone (28.12%) as the most common antimicrobial prescribed, & in other studies by Sumanth Gandra et al[17] and Singh SK et al[21] was betalactams (53.2 % & 47.6 %) followed by aminoglycosides (10.4 % & 10 %) respectively . In another study by Najmi et al[16], the most common antimicrobial class was betalactams followed by fluroquinolones.

Conclusion

To preserve the future effectiveness of antibiotics and reduce patient harm due to antimicrobial resistance, it is imperative to rationally scrutinize and improve the prescribing practices. A point prevalence survey can be used as a tool for measuring the quality of antimicrobial prescribing and the effect of interventions to improve prescribing.

The findings of this PPS survey were helpful in generating baseline data for identifying strategies for interventions directed at reducing antimicrobial use and for evaluating the impact of future interventions. The targets for interventions were: curtailing antibiotic prescriptions of not recommended category, decreasing double anaerobic cover, initiating culture of sending cultures (i.e., increasing the use of microbiology testing) and adopting stop/review date mentioning on the prescription, application of WHO AWaRe classification for selection of antibiotics, initiating a hospital specific local antibiotic policy, practising Antimicrobial Stewardship Programme interventions along with improving the infection control practices in the hospital. This will be of helpful to develop evidence based antimicrobial prescribing guidelines.

Ethical approval: Approval by NERC (NCDC ethics review committee dated 21 Jan 2020) = already attached the certifictae to the concerned mail

Conflict of interest: NIL

Source of funding: No

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