International Journal of Basic & Clinical Pharmacology
Senthilkumar S et al. Int J Basic Clin Pharmacol. 2020 Jul;9(7):1106-1113
http://www.ijbcp.com
pISSN 2319-2003 | eISSN 2279-0780

DOI: http://dx.doi.org/10.18203/2319-2003.ijbcp20202950

Original Research Article

Study on antibiotic use among geriatric patients based on anatomical therapeutic classification or defined daily dose methodology and world health organization-essential medicine list access, watch and reserve concept in tertiary care hospital of South India

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Received: 10 February 2020
Revised: 29 April 2020
Accepted: 30 April 2020

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ABSTRACT

Background: Geriatric patients are more vulnerable to infections and need special consideration on antibiotic use. Resistance to antibiotics among infectious bacteria has developed within a short span. There is a direct correlation between the consumption of antibiotics and the development of resistance. And surprisingly very few literatures were available on antibiotic consumption in geriatric population using defined daily dose (DDD) concept which paved the idea to conduct this study.
Methods: A prospective observational study was carried out from November 2018 to April 2019. A total of 206 prescriptions of elderly patients were included in the study. The antibiotics were categorized by anatomical therapeutic classification (ATC) and DDD indicator/1000 inhabitants/day (DID) was used to figure out antibiotic consumption.
Results: About 25.2% of patients were treated with antibiotics for respiratory tract infections. The patients received antibiotics empirically (53.8%) and without bacteriological investigation (58.73%). The overall consumption of antibiotics was 20.47 DID in which oral antibiotics was (8.5 DID) 42% and parenteral antibiotics (11.8 DID) 58%. Cephalosporins was observed to be the most consumed antibiotics (33.2%), specifically cefotaxime (14.6%) and ceftriaxone (12.6%). Moreover, 54.4% of antibiotics consumed from watch category of World Health Organisation (WHO) essential medicines list (EML) which was completely against WHO standard proportion.
Conclusions: Higher consumption of cephalosporins, which falls into watch category was analysed in geriatric patients. These broad-spectrum antibiotics have high potential to develop antimicrobial resistance. A strict antibiotic policy is needed to be framed that enhance rational prescribing practices in geriatrics.

Keywords: Essential medicine list, Antibiotic use, Defined daily dose, Geriatric, World health organization

INTRODUCTION

Countries with large population like India have 8.5% population falls under the age group of 60 to 85+ years, as a result of increased life expectancy. The life expectancy in India is expected to up to 75 years by 2025.[1] While aging is a natural and inevitable theory, not itself a disease. This age induced anatomical and physiological deviation makes them vulnerable to high risk of various chronic comorbidities, organ dysfunctions

and infectious diseases.[2] High use of antibiotics, injections and polypharmacy was indicated in preliminary Indian studies on geriatric patients.[3]

Antibiotics are the major class of antimicrobials used widely in treating infectious diseases. Treatments for a growing number of infections have become less effective in many parts of the world due to antimicrobial resistance that leads to clinical, economic and public health problem.[4] The available evidence suggests that the global consumption of antibiotics in humans has risen in the past two decades and there was a shift towards the use of broad-spectrum and last-resort antibiotics.[5] The patterns of inappropriate antimicrobial use include, antibiotics used to treat conditions that are not caused by a bacterial infections, the use of wrong type of antibiotics and the use of wrong dosage or route of administration. Drug-resistant infections can also be a result of poor access to antimicrobials.[6]

In response, World Health Organization (WHO) has published a global action plan (GAP) on antimicrobial resistance which aims to optimize the use of antimicrobials.[7] Due to the lack of standardized antimicrobial consumption data, WHO initiated a global program on surveillance of antimicrobial consumption as one of its key strategies to generate data. Antimicrobial stewardship program (ASP) is one of the important strategies for ensuring appropriate use of American medical associations (AMAs) and for controlling the emergence of antimicrobial resistance.[8] To complement this, WHO developed a standardized global methodology for the measurement of antibiotic consumption in 2016, based on the anatomical therapeutic chemical (ATC)/ defined daily dose (DDD)-methodology.[9] Data on antimicrobial consumption does not provide information about how antibiotics are used. Because for that information, data on the prescription, dispensing and use of antimicrobials at the patient level was required. Hence, WHO support countries to undertake point prevalence surveys on the use of antimicrobials in hospitals and in communities to supplement national surveillance systems using data on antimicrobial consumption.[10]

Antibiotic consumption in geriatric population should be taken into special consideration to prevent antibacterial resistance. This served as an idea to study antibiotic consumption in geriatrics using ATC/DDD concept and WHO indicators in rural tertiary care teaching hospital. In line with the GAP objectives, WHO updated its model list of essential medicines (EML) in 2017, and grouped antibiotics into access, watch and reserve (AWaRe) categories based on its treatment profile and potential for development of resistance, which was also analyzed.[11] Studies on this domain was very limited in literature therefore authors undertook the present study with the broad aim that this study data will help to make necessary recommendations to policy makers and prescribers to ensure rational prescribing of antibiotics in the geriatric population.

METHODS

Study design

A hospital based prospective observational study was undertaken from November 2018 to April 2019 in Rajah Muthiah Medical College and Hospital, a 1400 bedded multi- specialty, tertiary care teaching hospital located in South India. The study protocol was endorsed by the human research ethics committee of the institute prior to commencement of the study (approval letter no IHEC/0389 dated 09/01/19).

Study participants

Patients of either gender who had completed 60 years of age on 31st October 2018, or earlier who were admitted to the general medicine ward were included in this study. If the patient is on antibiotic therapy at 08:00 on the day of the survey and staying at least overnight (24 hours) were included as per WHO guidelines for point prevalence survey on antibiotic use in hospitals.[12]

Patients who are below 60 years of age, visiting as outpatient, unable to communicate i.e., on ventilators or critically ill (coma) patients requiring ICU admission, unwilling to participate and incomplete medical records, or no antimicrobial therapy during the hospital stay were excluded.

Study procedure

A self-designed form was developed for collecting the patient's full details prospectively, such as sex, age, diagnosis, laboratory investigations and antibiotics data which included its generic name, unit strength, pack size, quantity of packs, route of administration used until the patient discharged. Only antibiotics listed in ATC/DDD system and administered through oral, parenteral, rectal or inhalation routes was included in the study. For example, topical applications, eye drops, ear drops and vaginal suppositories were excluded. The study procedure was explained clearly to the patients who volunteered and fulfilled the inclusion criteria. Explained the purpose and nature of the study in a language they understood and written informed consent was collected before including them in the study.

After attaining the complete data, age and gender wise distribution, comorbidity pattern, Infection prevalence for which antibiotics prescribed were examined. Several parameters related to antibiotics such as number of antibiotics consumed, data on bacterial investigation were analysed. Type of antibiotic therapy was accessed as definitive, empiric and prophylactic based on following criteria. Prescriptions were considered empiric if the medical records contained information that the antibiotic was presented for therapy, an infectious disease was diagnosed, clinical signs of infection such as fever were present on the day that antibiotic therapy was initiated.

Antibiotics were classified as prophylactic if the medical record stated that the antibiotic was prescribed for prophylaxis, antibiotic started before culture test. Antibiotic were considered definite if antibiotic was given after culture test.[13]

Measurement of antibiotic consumption

The assessment of antibiotics use was conducted using ATC (anatomical therapeutic chemical classification)/ DDD (defined daily dose) methodology, which is globally accepted for measuring medicine within and across populations.[14] Defined daily dose indicator (DDD)/1000 inhabitants/day was used to study the consumption structure of antibacterial drugs for systemic action (with ATC code J01 for pharmacological subgroups), oral and parenteral antibiotics and WHO quality indicators were evaluated. Finally, antibiotics were categorized based on DID% according to WHO-EML aware classification.

Statistical analysis

The collected data were entered in Microsoft excel software 2016 and interpreted by descriptive statistical analysis that presented as counts and percentages in the form of tables. Drugs were classified according to the WHO-ATC classification and DDD/1000 inhabitants/ days (DID) was calculated.

RESULTS

A total of 206 geriatric patients were included which was male predominant study consisting of males 132 (64.1%) and females 74 (35.9%). Mean age of geriatric patients was 66.84 years. About 125 (60.7%) of patients were at the age group of 60-65 years and less patients in the age group >80 (1.9%) shown in Table 1.

Table 1: Demographic data of geriatric patients (n=206).

Parameters		N (%)
Gender	Male	132 (64.1)
	Female	74 (35.9)
Age (in years)	60-65	125 (60.7)
	66-70	37 (18)
	71-75	24 (11.7)
	76-80	16 (7.7)
	>80	4 (1.9)
literacy	Illiterate	148 (71.8)
	Literate	58 (28.2)

Various co-morbid conditions such as Endocrine diseases (56%), Respiratory diseases (31%) and cardiovascular disease (32.84%) were commonly found. The study monitored the pattern of co- morbidity which showed that most of the elderly patients on antibiotics were with 1 co-morbidity (61.75%) followed by 2 co-morbidities (23.54%) and then ≥3 co morbidities (14.71%). The infection patterns for which antibiotics were prescribed was maximum with respiratory tract infections 52 (25.2%) followed with 31 (15%) of gastrointestinal infection and 28 (13.59%) with urinary tract infections which has been shown in Table 2.

Table 2: Co-morbidity and infection pattern of geriatric population (n=206).

	N (%)
No. of co-morbidity	
One	127 (61.75)
Two	49 (23.54)
Three and above	30 (14.56)
Infection	
Respiratory tract infections	52 (25.24)
Gastrointestinal tract infections	31 (15.05)
Urinary tract infections	28 (13.59)
Skin infections	26 (12.62)
Infectious diseases	20 (9.71)
Surgical infections	17 (8.25)
Ocular infections	14 (6.8)
CVS infections	12 (5.83)
Others	6 (2.91)

Table 3: Various characteristics of antibiotics prescribed in geriatric patients.

Various characters	N (%)
No of antibiotics prescribed	
Only one antibiotic	131 (63.61)
Two antibiotics	64 (31.06)
Three or more antibiotics	11 (5.33)
Selection of antibiotics	
Empiric	111 (53.88)
Definitive	63 (30.58)
Prophylactic	32 (15.54)
Bacteriological investigations	
Done	85 (41.27)
Not done	121 (58.73)
WHO core indicators	
Average number of antibiotics per prescription	1.57
Percentage of antibiotics prescribed in generic name	90.8
Percentage of antibiotics prescribed from NLEM- 2015	87.6
Percentage of antibiotics from WHO- essential drug list (EDL) 2019	94.1

The prescribing pattern for antibiotics showed that 63.6% of patients were in monotherapy and two antibiotic agents were given to 31.06% patients. Remaining 5.3% patients received 3 or more. Bacteriological investigations were not done in most of the patients 121 (58.7%) to select

appropriate antibiotics for suspected infection. The drug prescriptions were analysed by using WHO core indicators for antibiotic usage pattern. A total of 1795 drugs of which 324 antibiotics were prescribed in 206 prescriptions. The average number of antibiotics per prescription was 1.57. Out of 324 antibiotics prescribed, 284 (87.6%) were from the national list of essential medicines, India and 305 (94.1%) were in adherence to 21st WHO essential drug list 2019 while rest 10% were not. Furthermore, 90.8% antibiotics were prescribed by generic name as depicted in Table 3.

Antibiotic consumption data

Table 4 represents the overall consumption data of antibiotics among geriatrics inpatient with systemic antibiotics (J01) amounting to 20.47 DID as per the WHO indicator defined daily doses (DDDs)/1000 inhabitants/day (DID). Further it lists individual antibiotics based on the DID% in descending order so as to access which antibiotics consumed more.

Table 5 shows the antibiotic consumption according to the route of administration that included both oral (O) and parenteral (P) forms of drug formulations. The total DID of parenteral antibiotics was 11.8802 which constitute 58% of overall consumption of antibiotics whereas total DID of oral antibiotics was 8.5987 which constitute only 42 %. In the analysis of the consumption of parenteral antibacterial drugs, the leader in terms of consumption was cefotaxime with DID value 2.99, which accounted for 25.2% followed by 21.8% of ceftriaxone (DID value of 2.58) and 13% of metronidazole (DID value of 1.5) which was 60% of the total consumption of parenteral antibacterial drugs. Cefoperazone (0.8%) and meropenem (0.5%) were the least consumed among parenteral form. In concern with oral forms, azithromycin consumed more, whose DID value was 1.92, which accounted for 22.5% of the total consumption of oral forms of antibiotics followed by amoxicillin (DID value of 1.18) and cefixime (DID value of 1.13). Nitrofurantoin (2.4%) and erythromycin (1.8%) were the least consumed among oral form. Azithromycin (22.5%), amoxicillin (13.8%) and cefixime (13.2%) were consumed about 49.5% of the total consumption of oral antibacterial drugs.

Table 4: Consumption data of antibiotics based on DID% in geriatric patients.

Class	Drug	ATC code	No. of patients received	WHO DDD (g)	Total units used (g)	DDD	DID	%
Cephalosporin	Cefotaxime	J01DD01	59	4	440	110	2.9956	14.6
Cephalosporin	Ceftriaxone	J01DD04	33	2	190	95	2.5871	12.6
Macrolides	Azithromycin	J01FA10	18	0.3	21.25	70.83	1.9290	9.4
Imidazole	Metronidazole	J01XD01	27	1.5	84.8	56.53	1.5395	7.5
Aminoglycoside	Amikacin	J01GB06	16	1	49	49	1.3344	6.5
Penicillin	Amoxicillin	J01CA04	10	1.5	65.5	43.66	1.189	5.8
Cephalosporin	Cefixime	J01DD08	18	0.4	16.6	41.5	1.1302	5.5
Fluroquinolone	Ciprofloxacin(P)	J01MA02	22	0.8	25.8	32.25	0.8783	4.3
Fluroquinolone	Moxifloxacin	J01MA14	9	0.4	12	30	0.817	4
Penicillin	Piperacillin and tazobactam	J01CR05	12	14	373.5	26.67	0.7265	3.5
Macrolides	Clindamycin	J01FF01	11	1.2	31.8	26.5	0.7217	3.5
Fluroquinolone	Ciprofloxacin(O)	J01MA02	8	1	25.5	25.5	0.6944	3.4
Fluroquinolone	Levofloxacin	J01MA12	5	0.5	12.5	25	0.6808	3.3
Penicillin	Amoxicillin and β-lactamase inhibitor	J01CR02	14	3	62.4	20.8	0.5664	2.8
Tetracycline	Doxycycline	J01AA02	2	0.1	1.7	17	0.463	2.3
Aminoglycoside	Gentamicin	J01GB03	9	0.24	3.92	16.33	0.4447	2.2
Fluroquinolone	Norfloxacin	J01MA06	5	0.8	11.2	14	0.3813	1.9
Penicillin	Ampicillin	J01CA01	12	6	78	13	0.354	1.7
Other antibiotics	Clofazimine	J04BA01	3	0.1	0.85	8.5	0.2315	1.1
Nitrofuran derivatives	Nitrofurantoin	J01XE01	3	0.2	1.3	7.5	0.2042	1
Fluroquinolone	Ofloxacin	J01MA01	2	0.4	2.4	6	0.1634	0.8
Macrolides	Erythromycin	J01FA01	5	1	5.75	5.75	0.1566	0.8
Oxazolidinone	Linezolid	J01XX08	3	1.2	6	5	0.1362	0.7
Cephalosporin	Cefoperazone	J01DD12	6	4	14	3.5	0.0953	0.5
Carbapenems	Meropenem	J01DH02	2	3	6.5	2.16	0.0588	0.3
Total DID of antibiotics = 20.4789								100

Table 5: Analysis of consumption of parenteral and oral antibiotics in geriatric patients.

Parenteral antibiotics			Oral antibiotics		
Drug	**DID**	**%**	**Drug**	**DID**	**%**
Cefotaxime	2.9956	25.2	Azithromycin	1.9290	22.5
Ceftriaxone	2.5871	21.8	Amoxicillin	1.189	13.8
Metronidazole	1.5395	13	Cefixime	1.1302	13.2
Amikacin	1.3344	11.2	Moxifloxacin	0.817	9.5
Ciprofloxacin	0.8783	7.4	Clindamycin	0.7217	8.4
Piperacillin and tazobactam	0.7265	6.1	Ciprofloxacin	0.6944	8.1
Amoxicillin and clavulanic acid	0.5664	4.8	Levofloxacin	0.6808	7.9
Gentamicin	0.4447	3.7	Doxycycline	0.463	5.4
Ampicillin	0.354	3	Norfloxacin	0.3813	4.4
Ofloxacin	0.1634	1.4	Clofazimine	0.2315	2.7
Linezolid	0.1362	1.1	Nitrofurantoin	0.2042	2.4
Cefoperazone	0.0953	0.8	Erythromycin	0.1566	1.8
Meropenem	0.0588	0.5			
Total DID of parenteral antibiotics = 11.8802			Total DID of oral antibiotics = 8.5987		

Table 6: WHO quality indicators on the use of antibiotics.

WHO quality indicators	%
Total utilization of beta-lactam antibiotics as a % of total antibiotic use	47.3
Total utilization of cephalosporins (J01D) % of total antibiotic use	33.2
Total utilization of quinolones (J01MA) as a % of total antibiotic utilization	17.7
Total utilization of macrolides (J01F) as a % of total antibiotic use	13.7
Total utilization of aminoglycoside (J01G) % of total antibiotic use	8.7
Total utilization of penicillin (J01C) as a % of total antibiotic use	7.5
Utilization of combination penicillin (J01CR) as a % of total antibiotic use	6.3
Total utilization of tetracycline (J01A) % of total antibiotic use	2.3
Total utilization of carbapenems (J01DH) % of total antibiotic use	0.3
Total utilization of other antibacterial(J01MA) as a % of total antibiotic utilization	10.3

Table 7: Classification of antibiotics based on WHO- EML AWaRe category.

EML AWaRe category	Antibiotics prescribed	DID (%)
Access antibiotics	Metronidazole	7.5
	Amikacin	6.5
	Ampicillin	1.7
	Clindamycin	3.5
	Amoxicillin	5.8
	Gentamicin	2.2
	Amoxicillin + clavulanic acid	2.8
	Nitrofurantoin	1
	Doxycycline	2.3
	Total access antibiotics consumed	33.3
Aware antibiotics	Cefotaxime	14.6
	Ceftriaxone	12.6
	Ciprofloxacin	7.7
	Cefixime	5.5
	Azithromycin	9.4
	Erythromycin	0.8
	Piperacillin and tazobactam	3.5
	Meropenem	0.3
	Total watch antibiotics consumed	54.4

Continued.

EML AWaRe category	Antibiotics prescribed	DID (%)
Reserve antibiotics	Linezolid	0.7
	Total reserve antibiotics consumed	53.6
Unclassified antibiotics	Moxifloxacin	4
	Levofloxacin	3.3
	Clofazimine	1.1
	Total unclassified antibiotics consumed	8.4

The antibiotics was classified according to ATC index as pharmacological groups of systemic antibiotics (J01). Then the consumption data was evaluated using WHO Quality indicator as mentioned in Zhussupova et al study.[15] It showed that antibiotics belonging to the pharmacological groups "J01D beta-lactam antibiotics" ("J01DD cephalosporin", "J01C and J01CR penicillin" and "J01DH carbapenem") had 47.3% DID and "J01M quinolone antibacterial" had 17.7% DID which remained as the most consumed as percentage of total antibiotic use. More specifically the high proportion was J01DD cephalosporin (33.2% DID) followed by J01M quinolone (17.7% DID) consumption as throughout the whole took the leading position. In this study J01C and J01CR i.e. penicillin and combined penicillin as a whole with 13.8% DID and J01F Macrolide with 13.7% DID are consumed equally in geriatrics. The low consumption of aminoglycoside (8.7%) tetracycline (2.3%), carbapenems (0.3%) was encountered as whole percentage of antibiotic use. The "other antibiotics" (metronidazole, nitrofurantoin, linezolid, clofazimine) holded 10.3% DID (Table 6).

The results of consumption data grouped according to AWaRe categorization was depicted in Table 7. Antibiotics that are not included in the WHO model list of essential medicines have not categorized, and reported as "unclassified antibiotics". This should not be confused with antibiotic substances in the ATC group J01X (other antibacterial). The percentage of geriatric patients consumed Access antibiotics was only 33.3%. Authors encountered the highest percentage of watch antibiotic use with 54.4%, followed by very less use of reserve antibiotics about 0.7%. Authors found that 8.4% of unclassified antibiotic was used. Authors also observed substantial variation between this study data and WHO recommended standards i.e., the proportion of access antibiotics should be more than 60% of overall antibiotic use.

DISCUSSION

Antibiotic resistance is sloping upward to breakneck level in all parts of the world. In India, very confined data is available on drug utilization for elderly patients. The present study was conducted among geriatric patients admitted in RMMCH. A total of 206 patients were incorporated in the study that showed male preponderance with 64.1% as similar to the study conducted by Jyothsna et al.[16] This implicit that the female population were less exposed to environmental influences when compared to males where the latter get more infectious diseases which has to be treated with antibiotics as reported in Akram Ahamad et al study.[17] Authors found 78.7% of patients were between the age group of 60-70 years. These trends in age group patterns are same as Bhaveshaikh et al study which denotes increase life expectancy in India.[18] About 148 (71.8%) were illiterate which shows that most of the people were unaware of antibiotics and its resistance. The pattern of morbidity was similar to other common Indian geriatric population. The common morbidities included endocrine diseases, respiratory diseases, cardiovascular disease and others. In this study single comorbid condition was encountered in 61.7% of patients whereas it was 66% in a study conducted by Nayaka et al.[19] Infection pattern of this study showed Respiratory tract infections (25.2%) followed by gastrointestinal tract infection (15%) and urinary tract infections (13.5%) as the most common condition for which antibiotics were prescribed which coincides with Bist et al study conducted in Karnataka.[20]

The WHO prescribing indicators layouts a comprehensive idea, scope for review and educational intervention in prescribing audit. In this study an average of 8.7 drugs/prescription were prescribed with denotes polypharmacy which is common in geriatrics due to co-morbidity and out of which the average number of antibiotics per prescription was found to be 1.57. The mean number of drugs per prescription should be as low as possible because higher the number of drugs, greater the risk of drug resistance and non-compliance. As a result of mean value, most of the population was treated with single antibiotics (63.6%), followed by two antibiotics (31.06%) and ≥3 antibiotics (5.3%) which was contrast to the study findings of Chandrasekhar et al (monotherapy: 31.1%, 2 drugs: 40%, ≥3 drugs: 28.2%).[21] Overall, 82.1% of drugs were prescribed in generic names and 90.8% antibiotics in generic (ideal 100%). This is government undertaken hospital that provides free medicines offered are in generic drugs, which is highly appreciable. The practice of using generic names in prescriptions is yet to catch up throughout the Indian health centers. As per this study, the percentage of antibacterial agents as figured in the essential drug list (EDL - 2019) of WHO was 94.1% (ideal 100%) Which was more than that of Nishandar et al study (83%) conducted in Maharashtra.[22]

The present study revealed that 53.8% patients received antibiotics as empirical therapy and 30.5% as definite

therapy. This is because the bacterial investigation was done only for 85 (41.27%) of patients and remaining patients were started empirically in contrast to Shinu et al, where 64.9% was on empiric therapy.[23] Culture and sensitivity reports play a vital role in appropriate selection of antibiotics which promotes definite therapy for infection that can reduce the antibiotic misuse and resistance. The probable reasons for less bacterial investigation in study hospital setting was time factor for culture results and ineffective microbiology laboratory facilities.

The DDD system is most frequently used in academic articles and as a tool for national as well as International comparison of drug consumption. To the best of authors knowledge, this is the only study to report the antibiotic consumption among geriatric using the WHO methodology which serve as a baseline data for comparison in future studies that can be done in similar setup to identify the trends in drug consumption over years. Antibiotic consumption is the major driver leading to antibiotic resistance. This study has indicated that the overall consumption of antibiotics was 20.47 DID in which oral antibiotics ranged (42%) and parenteral antibiotics (58%). Increased parenteral use may be due to fast onset of action that produce better outcome but also boost up the cost of care, drug related issues and risk associated with intravenous catheters. The change from I.V. to oral treatment is said to be Switch therapy which had studied by several investigators over the past few years and have been shown to save costs, shorten the length of hospital stays, and decrease the adverse reactions all with same therapeutic outcome.[24] The hospital protocol provides no clear guidelines for choosing parenteral route.

The consumption data was analysed using pharmacological group according to WHO indicators. The consumption of "J01DD cephalosporin" took leading usage 33.2% DID followed by J01MA quinolones with 17.7%, penicillin (J01C) and combination penicillin (J01CR) with 13.8% DID and macrolides (J01F) with 13.7% DID as a total antibiotic use. The least consumed antibiotics was tetracycline and carbapenem group. Overall data shows that beta-lactam antibiotics which comprises of cephalosporin and penicillin were consumed more in geriatric patients. More specifically cefotaxime and ceftriaxone were consumed more among cephalosporin as same as that of Chandrasekhar et al and Singha et al.[21,24]

Cephalosporins have continued to be a mainstay of therapy in hospitals because of its lower hypersensitivity reaction, broad spectrum of activity, cheaper cost, clinical efficacy and favourable tolerability profiles probable reason prompting its excessive use. Even though aminoglycosides were highly sensitive to commonly isolate organisms of UTIs, they were used less often due to renal toxicity of drugs and age-related renal impairment among the patients which is considered to be significant. It was observed that cefotaxime and ceftriaxone was consumed high for the prophylaxis purpose and treatment of RTIs which is more prevalence infection in this study as that of Shinu et al and Lee et al.[23,26] The top 10 most consumed antibiotics were cefotaxime, ceftriaxone, azithromycin, metronidazole, amikacin, amoxicillin, cefixime ciprofloxacin (P), moxifloxacin and piperacillin + tazobactam (Table 4).

Antimicrobial resistance is a rapidly emerging global public health crisis. As a response to it, the World Health Organization has published a 2017 update of the model list of essential medicines, that has new classification of antibiotics, the AWaRe classification (access, watch, reserve). Based on this classification, the Access antibiotics consumed in this study was 33.3% whereas watch antibiotics consumed about 54.4% which was completely against WHO standard proportion. The WHO recommends that Access antibiotics should be more than 60% of overall antibiotic use. The watch and reserve group of antibiotic classes that have higher resistance potential and includes most of the highest priority agents among the critically important antimicrobials for human medicine that has relatively high risk for selection of bacterial resistance. In this study reserve antibiotics was consumed very low whereas watch group was consumed more than 50%. As a result, strict antibiotic policy is needed to use access antibiotics which shows lower resistance potential, unless until definitive therapy is required to use watch and reserve groups for more specific infections. The unclassified antibiotics used in geriatrics was about 8.4%. This unclassified antibiotics in WHO-EML was considered as limitation that has to be rectified in upcoming version. It is evident from this study, that the prescribing practices for antibiotics deviate significantly from the standards recommended by WHO.

CONCLUSION

This study highlights the trend of marginally higher utilization of cephalosporins especially third-generation and increased parenteral route of administration in the hospital settings has a matter of concern. Broad spectrum antibiotics such as third generation cephalosporins and quinolones are categorized as watch antibiotics which should be used with caution because of their high potential to develop antimicrobial resistance and side effects. A strong recommendation to improve the quickening the availability of culture and sensitivity reports which helps for definite antibiotic therapy. Physicians should be exhorted to switch over from the practice of prescribing broad-spectrum antibiotics to prescribe narrow spectrum antibiotics to make resistance-free world. A strict antibiotic policy and antibiotic treatment guidelines is needed to be framed. This could be possible only when a multidisciplinary crew comprising of pharmacist, physician, infectious diseases experts, microbiologist and nurse join hands to develop a system, structures and processes to monitor and regulate the use of antibiotics to enhance rational prescribing practices in geriatrics.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Senthilkumar S, Arun RSA, Padmavathi K, Dhanapal CK, Periasamy K. Study on antibiotic use among geriatric patients based on anatomical therapeutic classification/defined daily dose methodology and world health organization-essential medicine list access, watch and reserve concept in tertiary care hospital of South India. Int J Basic Clin Pharmacol 2020;9:1106-13.