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EVALUATION OF OUTPATIENT ANTIBIOTIC PRESCRIBING PATTERN IN GENERAL MEDICINE DEPARTMENT OF A SECONDARY REFERRAL HEALTHCARE HOSPITAL IN SOUTH INDIA

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ABSTRACT:

India's antibiotic resistance problem is worsened by excessive antibiotic use and inadequate prescription practices. To address this issue, the current study was conducted in a rural secondary care referral hospital of southern India; which analyzed the pattern of antibiotic prescriptions using the WHO's AWaRe classification and specific indicators for antimicrobial usage in the hospital's pharmacy. The study included adult patients over 18 years old diagnosed with infections and prescribed at least one antibiotic, excluding incomplete prescriptions. In our study, ceftriaxone was the most commonly used (35.05%), followed by Amoxicillin/clavulanic-acid (14.8%) and azithromycin (13.83%). A total of 2618 drugs were prescribed with 23.76% of antibiotics in 384 prescriptions. On an average, there were 6.82 drugs and 1.62 antibiotics per encounter. Upon categorizing the antibiotics according to the WHO AWaRe classification, 62% of the total antibiotic prescriptions were in the Watch category, while one-third (36.5%) fell under the Access category, and 1.61% were categorized as not recommended, and the Access to Watch index is less than 1. In conclusion, our research highlights the pressing need to address gaps in responsible prescription practices; and this data can assist in shaping national formularies and antimicrobial stewardship strategies.

Keywords: Antibiotics, AWaRe classification, ceftriaxone, prescribing pattern, prescribing indicators, stewardship.

1. INTRODUCTION

Antibiotic resistance poses a significant barrier to global public health (Pulingam et al., 2022), with irrational prescriptions exacerbating the issue at both national (Shahbazi, 2018; Wattal, 2017; Travasso, 2016; and Kotwani, 2011) and international levels (Zhussupova, 2020; Gurtler, 2019; Yan, 2018; Atif, 2017; and Wang, 2014). This resistance reduces the efficacy of current therapies, rendering infections more challenging to manage and heightening the likelihood of transmission. Failure to address antibiotic resistance could result in the inability to treat numerous common infections, leading to elevated mortality rates, prolonged illnesses, and escalated healthcare expenses (Cassini, 2019; Naylor, 2018; and Temkin, 2018). India ranks among the top consumers of antibiotics globally (Sulis et al., 2021), and inadequate prescription practices (Singh et al., 2019) are a major factor driving the high levels of resistance observed (Sumanth et al., 2017). The Drug Resistance Index for the country in 2019 (Klein et al., 2019) underscores the urgency for implementing regional monitoring and management initiatives within healthcare facilities (Klein, 2019 and WHO, 2015). The WHO (World Health Organization) prescribing indicators (Ofori-Asenso, 2016; Atif, 2016 and Desalegn, 2013) and the ACCESS, WATCH, and RESERVE (AWaRe) tool, developed by the WHO, addresses global antimicrobial resistance and promotes responsible antibiotic use as part of antimicrobial

stewardship (Darkwah, 2021; Sharland, 2022; WHO, 2022 and Sharland, 2018). The WHO prescribing indicators are widely used in developing countries, with over 30 nations successfully implementing them. These indicators focus on facility, prescribing, and complementary drug use (Jain et al., 2015). The AWaRe classification of antibiotics aims to improve global antibiotic usage data by 2023, with a focus on increasing Access category consumption to at least 60% (Darkwah, 2021 and WHO AWaRe, 2021) and reducing the use of Watch and Reserve antibiotics (Hsia, 2019 and Budd, 2019). Thus, antimicrobial stewardship (AMS) programs are essential for tackling AMR (Godman, 2021; Sefah, 2022; Kimbowa, 2022 and Pacios, 2022). Countries can utilize the WHO AWaRe tool to track antimicrobial usage (Sharland et al., 2022) and encourage proper prescribing for common infections in all age groups (WHO, 2022). In India, there is a paucity of data regarding the antibiotic prescription trends (Gulwani, 2023; Mugada, 2021; Kotwani, 2014; Mandal, 2023 and Bansal, 2022). The objective of the current study was to evaluate the prescription patterns in the medical outpatient department of our healthcare facility, and to compare these prescription metrics with the recommended benchmarks established by the World Health Organization. This analysis aims to aid hospital management in enhancing the judicious use of medications, particularly antibiotics.

2. MATERIALS AND METHODS

The descriptive cross-sectional study, approved by the hospital ethics committee was performed in the general medicine outpatient department dispensing pharmacy of a rural secondary care referral hospital in south India; which dispenses most of the medicines for adult patients with common diseases such as infections, diabetes, and hypertension. In our study, in accordance to Cochran's formula the minimum sample size estimated was 384, as explained by Charan and Biswas (2013). The 384 complete prescriptions of adult patients of both genders > 18 years of age, diagnosed with infections, and started on at least one antibiotic agent, over a period of 3 months (October 2023 to December 2023) were included; and prescriptions with incomplete data were excluded. Prescriptions were randomly collected at the exit point of the pharmacy queue adjacent to the general medicine outpatient department (OPD) at least 3 days a week. Patients' personal details, baseline conditions, laboratory investigations; antibiotic agent name, dose, dosage, therapy days, route and rate of administration, prescribed as generic or brand, and fixed-dose combination (FDCs), and its availability in hospital pharmacy were obtained and recorded in the data collection form, after obtaining consent a proper consent from the patient. The antibiotic prescribing pattern and its use were investigated by using WHO AWaRe 2021 Classification and WHO core prescribing indicators (SPS, 2012 and WHO, 2018). Descriptive statistical analysis was carried out using MS Excel and GraphPad Prism. Absolute numbers and frequencies (%) were calculated for qualitative variables, while arithmetic means and standard deviations (SD) were calculated for quantitative variables respectively.

3. RESULTS

The data was processed using Microsoft Excel and displayed as percentages. Out of 384 patient encounters, 184 (48%) were male and 200 (52%) were female, Figure (1) summarises the characteristics of the demography. In our study, we examined a total of 384 patient encounters and identified a total of 2,618 drugs. On average, there were 6.82 drugs per encounter. Among these encounters, 622 (23.76%) were prescribed with antibiotics. The mean antibiotic in each prescription was 1.62%. Additionally, we found that 58% of the encounters involved the use of generic name drugs, and all of these drugs were from the hospital formulary containing

essential drugs. The detailed responses are comprehensively examined and outlined in Table (1). The most commonly utilized antibiotic in the department of general medicine was ceftriaxone, accounting for 35.05% of the prescriptions. This was followed by Amoxicillin/clavulanic-acid (14.8%) and azithromycin (13.83%). The relative distribution of these antibiotics is presented in Table (2). The prescription of antibiotics for respiratory tract infections was primarily influenced by disease prevalence, which stood at 35%, as illustrated in Figure (2). Upon categorizing the antibiotics according to the WHO AWaRe classification, it was observed that the Watch category accounted for the highest number of prescriptions, totalling 385 or 62% of the overall count. The Access category represented one-third of the total antibiotic prescriptions at 36.5% (227), while the remaining prescriptions were classified as not recommended at 1.61% (10). Interestingly, none of the prescriptions contained antibiotics from the reserve category. The detailed analysis and presentation of these results can be found in Table (3) and Table (4).

4. DISCUSSION

Antibiotics play a crucial role in healthcare and can be a significant expense for hospitals. When administered appropriately, they can enhance patient outcomes (WHO, 2010). Monitoring antibiotic usage is essential in stewardship initiatives (D'Amore et al., 2021). In India, the increasing antibiotic resistance (Hawser, 2009; Mathai, 2008 and Wattal, 2010) is attributed to inappropriateness in prescribing and its use; leading to high treatment costs, decreased effectiveness, and limited access (Cameron, 2009; Kotwani, 2007; Prinja, 2015 and Selvaraj, 2010). Hospital based stewardship could play a vital role in decreasing antibiotic consumption and enhancing patient results (CDC, 2019).

The demographic results in the department of general medicine showed that female was 200 (52%). The mean age group was found to be around 50 years, observations of which are consistent with the findings of (Mudenda, 2023; Demoz, 2020 and Mugada, 2021). The current investigation demonstrates that the rate of antibiotic prescriptions stands at 23.76%, a figure in line with the recommended WHO standard (20-26.8%), suggesting that antibiotic usage is not extensive. This value is less in comparison to those observed in previous studies (52.3%, 48.5%, 64.7%, 58.1%, and 66.9%) from Ethiopia (Demoz, 2020; Erku, 2018; Gube, 2017; Desalegn, 2013 and Gashaw, 2018) Ghana (55.2%) (Prah et al., 2017), Nigeria (51%) (Enato and Chima, 2011), Pakistan (51.5%) (Atif et al., 2016), China (54.6%) (Yan et al., 2018), Eritrea (79.05% and 69%) (Amaha, 2017 and Yohannes, 2009), Congo (68%) (Wambale et al., 2016), and India (66%) (Landstedt et al., 2017). In contrast, it is higher than the rate reported from other India studies (17.5% and 9.6%) (Priyadharsini, 2022 and Prasad, 2015).

In our study, the mean number of drugs per prescription was 6.82, which exceeded the standard recommended by the WHO; but similar to the findings reported by (Taskeen et al., 2012) with a mean of 6.07. Moreover, the average number (1.62) of antibiotics per patient encounter in our study is line with WHO core prescribing indicators; result of which is similar (1.65) to the findings of (Sam et al., 2015). Prescribed antibiotics are low, indicating appropriate prescribing practices that reduce poly pharmacy, drug interactions, and side effects.

The percentage of encounters with the generic name is 58% which is lower when compared with the WHO standard value. But it is a reasonable value when compared with other Indian studies (42.9%, 56.6%, and 31%) (Prasad, 2015; Atif, 2016 and Mani, 2017). Using generic names for prescriptions can reduce costs and prevent medication errors. It is important for physicians to provide cost-effective treatment. Our research shows that the percentage of encounters with drugs prescribed from essential drug lists is in line with the WHO recommended value of 100%, which is higher than the results of previous studies conducted in India (Priyadharsini, 2022; Prasad, 2015; Atif, 2016 and Mani, 2017). Moreover, the

prescriptions were collected from the general medicine department outpatient department dispensing pharmacy, it does not include injections. In our study, antibiotic was prescribed for respiratory tract infections primarily based on disease prevalence, which was found to be 35% (Meher et al., 2014). Ceftriaxone was majorly prescribed 35.05%, results of which is similar to observations of Gowthami et al., 2016.

Improving antibiotic use involves better access to diagnostic tools, following evidence-based guidelines, and allowing more time for patient consultations. In our study, prescriptions for antibiotics meet WHO standards, indicating cautious prescribing for infections.

In 2022, the G7 pledged to set goals for human antibiotic usage, focusing on both volume and suitability (Shiozaki et al., 2016). The WHO's 13th General Programme of Work aimed for 60% of national antibiotic consumption to be Access antibiotics (Darkwah, 2021 and WHO AWaRe, 2021). The current study assessed the prescribing of antibiotics according to the WHO AWaRe classification at a secondary referral healthcare hospital in rural south India. The current study showed that ceftriaxone, a third-generation cephalosporin in the 'Watch group' by WHO AWaRe, was the most prescribed antibiotic at 35.05% due to its broad-spectrum effectiveness (Kizito, 2021; Sonda, 2019; Ayele, 2018 and Gelaw, 2022). However, overuse of third-generation cephalosporins can lead to ESBL-producing microorganisms (Kim, 2021; Castanheria, 2021 and Ur Rahman, 2018). Similar trends were seen in hospitals in Zambia (Mudenda, 2023; Mudenda, 2022 and Kalungia, 2022), Ethiopia (Desalegn, 2013; Demoz, 2020; Gube, 2017; Gutema, 2018; Gidebo, 2016 and Sisay, 2017), Pakistan (Mushtaq et al., 2021), and India (Bansal et al., 2014); and globally (Pauwels et al., 2021). Amoxicillin and clavulanic acid, in the 'Access group,' were the second most prescribed at 14.8%, consistent with studies in India[38] and Switzerland.[98] Azithromycin, a 'Watch group' antibiotic, accounted for 13.83% of prescriptions, aligning with studies in India (Mugada et al., 2021), Malaysia (Mohamad et al., 2022), EMR countries (Jirjees et al., 2022), and Ethiopia (Tadesse et al., 2022).

From 2007 to 2012, the sales data of antibiotics in India revealed a significant increase in the consumption of Watch and Reserve antibiotics compared to access group antibiotics (Mc Gettigan et al., 2017. Our study indicates that the Access to Watch index is less than 1, which aligns with findings from other studies (Wang, 202; Wushouer, 2021 and Hsia, 2019). Our study also found that the “Watch” group of antibiotics was the most prescribed (62%), compared to the “Access” (36.5%) and “Reserve” (1.61%) groups of antibiotics. Similar results were reported from other studies that were conducted in Bangladesh (Rashid et al., 2022) and Caribbean parts (Rocke et al., 2022). Our results and those from similar studies of India (Bansal et al., 2022) and Ghana (Amponsah et al., 2022) indicate a different trend or pattern in the prescribing of these AWaRe antibiotics. Moreover, our findings deviate from the World Health Organization's recommendation to use Access-group antibiotics in at least 60% of cases. In specific scenarios, the absence of initial antibiotics may contribute to the occurrence of this singularity (Ventola 2015). The observation of the current study illustrates the magnitude of India's challenge in decreasing the utilization of Watch and Not Recommended Group antibiotics as outlined in the WHO's antibiotic resistance action plan.

5. CONCLUSION

In conclusion, our research highlights the pressing need to address gaps in responsible prescription practices. These gaps include the overuse of Watch antibiotics and the absence of Reserve group antibiotics. The data we provide can inform the development of national formularies and policies on antimicrobial stewardship in the analyzed settings and the broader region. By utilizing the most up-to-date version of the WHO PPS tool, we can overcome limitations in data reporting and ensure that crucial analyses, such as the use of antimicrobials

in healthcare-associated and community-associated infections, when setting short- and medium-term goals.

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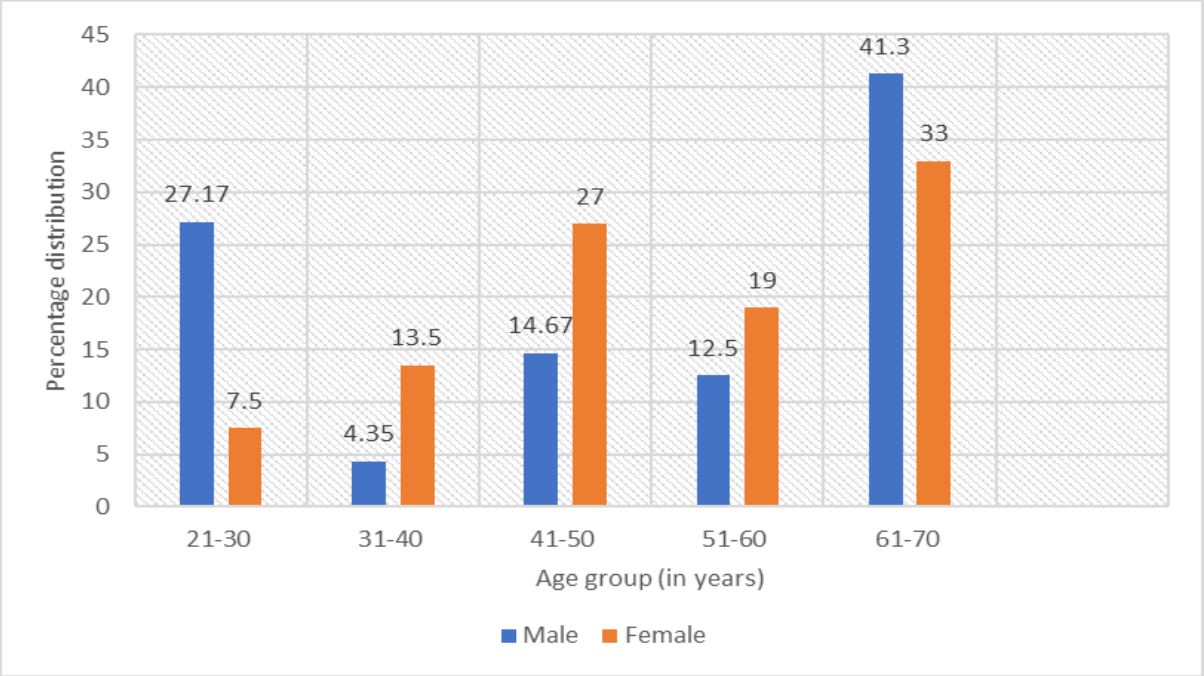

Figure (1) Demographic characteristics of the study patients.

Table (1) WHO prescribing indicators

Indicators of drug use	Observed value	WHO optimal values
Average number of medicines per prescription	6.82	1.6-1.8
Average number of antibiotics per prescription	1.62	1.6-1.8
Percentage of prescriptions with generic name	58%	100%
Percentage of encounter with drugs prescribed from essential drugs list of hospital	100%	100%
Number of encounters with an injection prescribed	0	13.4%-24.1%
Percentage of encounters with one or more antibiotics	23.76%	20%-26.8%

Table (2) Antibiotics prescribed to study participant

Class	Antibiotic (n=622)	ATC code	N	%
Beta-lactamase inhibitor	Piperacillin/Tazobactum	J01CR05	46	7.4
Imidazoles	Metronidazole	J01XD01	35	5.63
Macrolides	Azithromycin	J01FA10	86	13.83
Glycopeptides	Vancomycin	J01XA01	10	1.61
Fluoroquinolones	Ciprofloxacin	J01MA02	25	4.02
Tetracyclines	Doxycycline	J01AA02	35	5.63
Lincosamides	Clindamycin	J01FF01	30	4.82
Penicillins	Amoxicillin/Clavulanic acid	J01CR02	92	14.8
Aminoglycosides	Amikacin	J01GB06	25	4.02
Cephalosporins	Cefazolin	J01DB04	10	1.61
	Cefixime	J01DD08	10	1.61
	Ceftriaxone	J01DD04	218	35.05

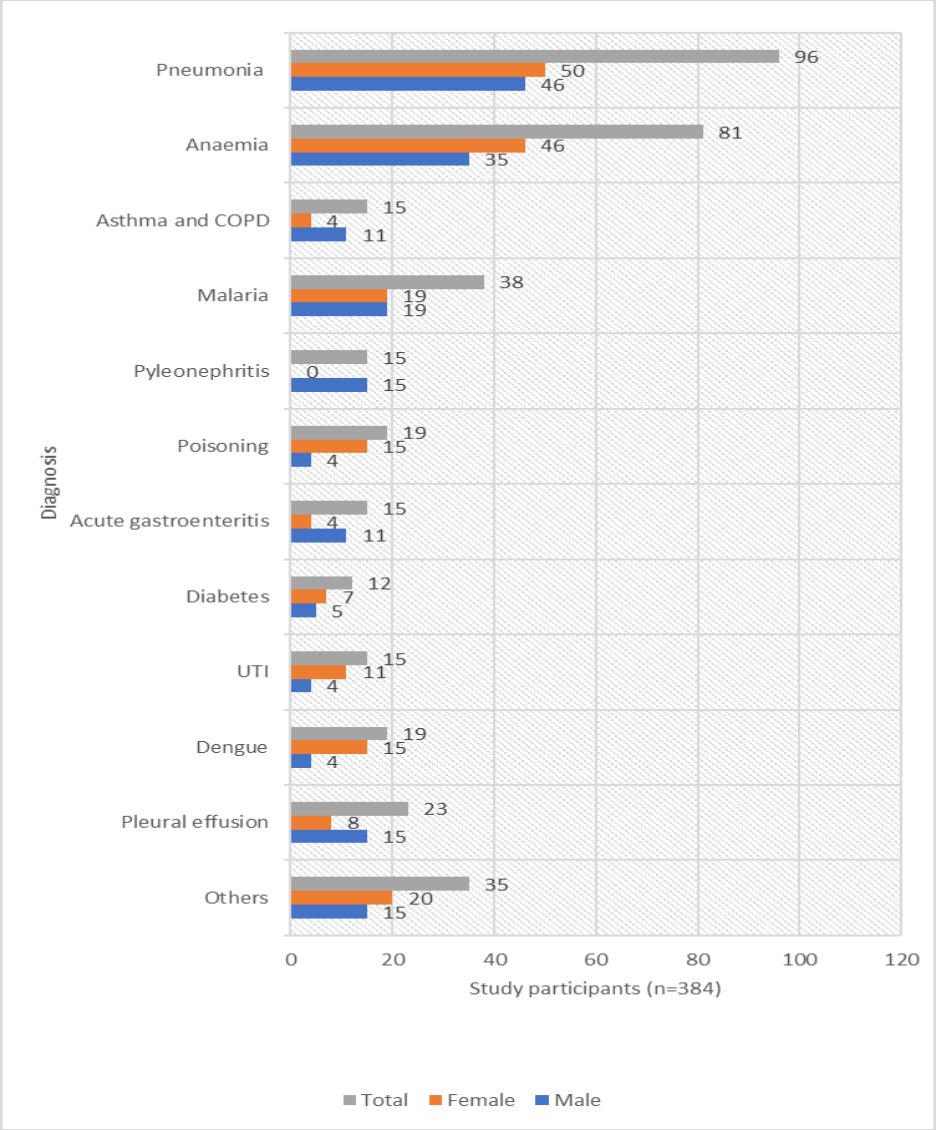

Figure (2) Distribution of diagnosis

Table (3) Classification of the antibiotics as per the WHO AWaRe 2021

AWaRe classification			Not recommended
Access n (%)	Watch n (%)	Reserve n (%)	
227 (36.5%)	385 (62%)	0	10 (1.61%)

Table (4) Frequency of antibiotic prescribing according to WHO AWaRe 2021

WHO AWaRe category	Antibiotics (n=622)	n	%	Total n (%)
Access	Metronidazole	35	5.63	227 (36.5)
	Doxycycline	35	5.63	
	Clindamycin	30	4.82	
	Amoxicillin/Clavulanic acid	92	14.8	
	Amikacin	25	4.02	
	Cefazolin	10	1.61	
Watch	Piperacillin/Tazobactum	46	7.4	385 (62)
	Azithromycin	86	13.83	

	Vancomycin	10	1.61	
	Ceftriaxone	218	35.05	
	Ciprofloxacin	25	4.02	
Not recommended	Cefixime	10	1.61	10 (1.61)