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Original Research

Prescribing pattern of antimicrobials in the internal medicine ward at Hawassa University Comprehensive Specialized Hospital, Hawassa, Ethiopia: A Retrospective study

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Abstract

Background: Antimicrobials are frequently prescribed therapeutic medications in hospitals and their resistance arises from the inappropriate use pattern of them that can cause diseases that are fatal. This study assessed the internal medicine department of Hawassa University Comprehensive Specialized Hospital in Hawassa, Ethiopia.

Methods: An institution-based retrospective study was conducted using the World Health Organization indicators for antimicrobial use in the hospital by reviewing records in the internal medicine department from June 8, 2021 to July 7, 2022.

Result: From a total of 252 medical records analyzed, 203 (80.55%) patients had at least one antimicrobial medication administered to them. Antimicrobials were prescribed to patients on average (2.15±1.2). The average duration of the antimicrobial therapy was (4.3±2.9) days. Antimicrobials prescribed by generic name were 331 (75.74%) and 98.63% of antimicrobials were prescribed from essential medication list. A total of 437 antimicrobials were prescribed for patients, with ceftriaxone and metronidazole being the most often prescribed with 130 (29.75%) and 94 (21.51%), respectively. Antimicrobial amount provided was significantly associated to the length of hospital stay (P <0.001) and the type of diagnosis (P = 0.03).

Conclusion: The present study finding showed that the internal medicine department uses antimicrobials frequently in a pattern that is above recommended use standard. It is necessary to implement multifaceted strategies to encourage reasonable antimicrobial prescription.

Key words: Antimicrobials, internal medicine, hospital, rational drug use, drug resistance

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1. Introduction

Antimicrobials are medicines that are currently used worldwide to treat bacterial infections in both humans and animals. They work by killing bacteria or making it difficult for bacteria to proliferate and flourish[1,2]. They are a type of antimicrobial agent that is commonly used to treat and prevent bacterial infections [3, 4]. Every week, a new antimicrobial is released onto the market, giving doctors little time to become fully acquainted with new products while also providing ample opportunities for microorganisms to develop various means of resistance to ensure their survival[5]. Antimicrobials can be lifesaving in the treatment of bacterial infections and are the most commonly prescribed drugs among all medications. Their indiscriminate use increases the risk of antimicrobial resistance, necessitating more cautious prescribing for the treatment of bacterial infections[6, 7].

Over the past few years, there have been numerous reports of antimicrobial medication abuse, and it has been discovered that about half of all antimicrobial medicine prescriptions were improperly chosen[8]. This is particularly true in the general wards of tertiary hospitals, where prescription, administration, and delivery errors are frequent. Since many different medications are recommended in these situations, the likelihood of drug interactions and adverse drug reactions is significant[9]. Furthermore, the resistance of microbial to the routinely prescribed antimicrobials might result from the incorrect and unreasonable use of antimicrobials[10, 11]. This, in turn, can contribute to the use of newer, more costly antimicrobials to fight the crisis of microbial resistance[12]. This is an issue of great concern to a developing country like Ethiopia.

Given the rising expense of healthcare, an analysis of drug prescription procedures is of special importance. Through the examination of clinical data in a medical care facility, the prescribing pattern can be assessed retroactively[13]. Prescription patterns are typically examined as part of a medical audit, which looks for evaluation and, if necessary, change in order to provide sensible and financially advantageous medical care[14]. When creating infection control plans for hospitals, an analysis of the antimicrobial agents used there and knowledge of the different strains of bacteria and their sensitivity patterns are useful[13].

The transmission of these bacteria to other patients admitted to the same ward might occur as a result of the development of resistant microorganisms brought on by the incorrect use of antimicrobials[10]. Therefore, it is essential for infection control plans in hospitals to prevent the

incorrect use of antimicrobials. The most commonly administered medications in both outpatient and inpatient settings are antimicrobials[15, 16]. While the rate of antimicrobial use is roughly 30% in industrialized countries[17], it ranges from 35% to 60% in developing countries[18]. One of the main causes of death in underdeveloped nations is infectious diseases[19, 20]. Several factors contribute to the irrational use of medications, including polypharmacy, improper indications, the use of unduly expensive medications, and the incorrect use of antimicrobials[21]. When drug information, prescribing training, and medical audit are focused on a specific list of medications, the adoption of a "essential medicines list" (EML) is a cornerstone of the rational use of medicines that aids in promoting the cost-effective use of drugs[22] and improving the quality of prescribing[23].

The use of generic names is another crucial component of rational prescribing since it supports safe prescribing and dispensing[24] and guarantees the release of precise and unambiguous medication prescriptions[25], as well as the control of prescription drug costs. This is because generic medications cost substantially less than brand-name medications[26, 27]. Globally, the issue of antimicrobial resistance poses a threat to public health by raising rates of morbidity and mortality[28]. The expense of treatment has gone up along with the increased morbidity and mortality in many patients due to the rising resistance[29, 30]. The ability of the underprivileged population to access contemporary healthcare will unquestionably be compromised by rising healthcare costs. Furthermore, most hospitals in developing countries had a higher than 30% rate of improper antimicrobial use[31].

Overuse of antimicrobials contributes to the development of antimicrobial resistance. This is noticed with the positive correlation between antimicrobials resistance and consumption of antimicrobials[32]. The highest consumption of antimicrobials at the hospital level is associated with the highest rate of resistance[33]. Information on antimicrobial prescribing trends is crucial for ensuring the optimal and sensible use of antimicrobials since it aids in the suggestion of actions and interventions that enhance antimicrobial prescribing practice[34].

Findings indicate that antimicrobial use and resistance are positively correlated[35]. The highest rate of resistance is correlated with the largest consumption of antimicrobials at the hospital level[32, 36]. Information regarding antimicrobial prescribing patterns is crucial for ensuring the optimal and sensible use of antimicrobials since it aids in the suggestion of actions and interventions that enhance antimicrobial prescribing practice. The purpose of this study was to

assess prescribing patterns of antimicrobials in the internal medicine department of Hawassa University Comprehensive Specialized Hospital in Hawassa, Ethiopia.

2. Methods

2.1. Study design, setting and period

An institution based retrospective study was conducted from August 1 to August 31, 2022 in Hawassa University Comprehensive Specialized Hospital, a teaching hospital for Hawassa University located in Hawassa town, 273 km (170 mile) to the south of Ethiopia's capital, Addis Ababa. The town serves as the capital of the Sidama Region. It has a latitude and longitude of 7°3′N 38°28′E coordinates: 7°3′N 38°28′E and an elevation of 1,708 meters (5,604 ft.) above sea level. The hospital is now the primary teaching and comprehensive specialized hospital in the Sidama region. Internal medicine, gynecology, obstetrics, pediatrics, surgery, dentistry, antenatal care, ophthalmology, hospital pharmacy, dermatology, and an antiretroviral therapy clinic are among the services provided by the hospital[37].

2.2. Study participants

The study source was all patient records at Hawassa University Comprehensive Specialized Hospital and study population includes all records in the internal medicine department of the hospital from June 8, 2021 to July 7, 2022.

2.3. Eligibility criteria

The study included medical records of individuals admitted to the Internal Medicine Department during study period (June 8, 2021 to July 7, 2022) and who were prescribed at least one antimicrobial medicine. Patients who were solely given topical antimicrobials or who were hospitalized for less than 48 hours were excluded from the study.

2.4. Sample size determination and sampling technique

To obtain the largest possible minimum sample size, the sample size for this study was calculated using the single population proportion formula, assuming a 95% confidence interval, 5% margin of error, and a prevalence of 50% and calculated with following formula[38–40]:

$$n = \frac{(Z_{1-\alpha/2})^2 P(1-P)}{d^2} = \frac{(1.96)^2(0.5)\,(0.5)}{(0.5)^2} = 384$$

Where:

- ✓ n = Sample size

- ✓ $Z_{1-\alpha/2}$= Standard normal variable at (1-α) % confidence level and α (level of significance) was taken to be 5% (95% confidence level is used = 1.96)
- ✓ P = Prevalence rate estimate for the population (50%)
- ✓ d = Margin of the tolerated sampling error (0.5)

The number of medical cards (population size, N) of patients who were treated for at the department within study period was 2,986. Since the population was less than 10,000 (N = 2,986), a reduction formula was utilized by using STAT CALC of Epi Info software and the actual sample size was found to be 252. A systematic sampling technique was used to identify the patient charts. The sampling interval was determined by dividing the total number of patient charts by the sample size, yielding the interval (k = 12), and every 12th chart was selected. The first patient chart was chosen by lottery from the first to the eleventh patient chart, based on the time order of the records.

2.5. Study variables

Explanatory variables included gender, age, duration, type of therapy and diagnosis, duration of stay, prescribers' profession and laboratory tests of stool characteristics while the dependent variable was antimicrobial prescribing pattern. The WHO indicators used were the indicators of prescribing practices that assess health care practitioners' performance in various critical parameters connected to the appropriate use of medications. It includes, the percentage of antimicrobials per total prescription, average number of antimicrobials per prescription, prescription in line with standard treatment guideline (STG) and percentage of prescription with generic name.

2.6. Data collection tools and procedures

The tools where adapted from WHO prescribing indicators in hospitals[41, 42]. Data were collected using data abstraction format that included sociodemographic and clinical characteristics of the patients, as well as patterns of antimicrobial use during the study period. The patient chart, laboratory results, and prescriptions on the chart, as well as the prescriber profile, were used. The data collection format includes key points that can address major drug use issues during antimicrobial use quantitatively. Every pertinent fact was documented in the format of the patient medication records.

2.7. Data quality control

A pretest was performed at the surgery to determine whether the data collection format was valid and reliable, and the completeness of the data collection format was checked prior to the actual data collection. On a daily basis, data clearing was also performed.

2.8. Data processing and analysis

IBM SPSS Statistics version 27 was used to process and analyze the collected data. To provide the frequency and percentage distributions of the variables included in the study, descriptive statistics were used. The outcome was presented in the form of narratives, tables, and figures.

2.9. Ethical consideration

The National Research Ethical Review Guidelines of Ethiopia state that a study is exempt from ethical review if its goal is to examine government initiatives that are intended to benefit the general public and if the investigator has collected data in a way that makes it impossible to identify study participants[43–45] and additionally the National Research Ethical Review Guidelines permit verbal informed consent because there is little to no danger to study participants[43].

3. Results

3.1. Sociodemographic and patients' characteristics

There were 2,986 patients that were treated at internal medicine department within study periods (June 8, 2021 to July 7, 2022). A total of 252 patient records were reviewed. A total of 203 (80.55%) out of 252 medical records examined were enrolled in the study in which at least one antimicrobial drug was prescribed. The mean age was 51.5±23.5 years with the age group ≥65 represents 30.54%. Among the 203 patients, males represented 54.68%. The median length of hospital stay was six days. Around half of the patients, 103 (50.74%), were from Hawassa city, and there were 12 (5.91%) missed address data on the patient cards (Table 1).

Table 1: Demographic and clinical characteristics of patients in the internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021 to July 7, 2022 (N = 203)

Patient characteristics		Frequency	Percentage
Age	(Mean + SD) - 51.5±23.5		
≤20 years		16	7.88%
20-34 years		29	14.29%
35-49 years		47	23.15%
50-64 years		49	24.14%
≥65 years		62	30.54%
Gender (N %)			
Male		111	54.68%
Female		92	45.32%
Comorbidity (N %)			
Absent		121	59.61%
Present		82	40.39%
Residence (N %)			
In Hawassa		103	50.74%
Outside Hawassa		88	43.35%
Missed data		12	5.91%
Length of hospital stay	(Median, IQR) - 6 (3-11)		
≤6 days		114	56.16%
>6 days		89	43.84%

N – Number of Patients, SD – Standard Deviation, IQR – Interquartile Range

3.2. Final status of the patient and type of diagnosis

From 203 patients prescribed antimicrobials at internal medicine ward; 147 (71.42%) were discharged and the card indicates 28 (13.79%) of them were died. Infectious and parasitic diseases 69 (33.99%), diseases of the circulatory system 46 (22.66%), and diseases of the digestive system 23 (11.33%) were the most common medical conditions for patients who were prescribed antimicrobials (Table 2).

Table 2: Status of the patient and type of diagnosis in the internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021 to July 7, 2022 (N = 203)

Patient and disease characteristics	Frequency	Percentage
Final Status of Patient (N %)		
Discharged	147	72.41%
Referred	8	3.94%
Left Against Medical Advice	6	2.96%
Escaped	14	6.90%
Died	28	13.79%
International Classification of Disease (ICD) diagnosis (N %)		
Infectious & parasite diseases	69	33.99%
Disease of circulatory system	46	22.66%
Disease of digestive system	23	11.33%
Disease of respiratory system	11	5.42%

Disease of blood	14	6.90%
Neoplasms	11	5.42%
Disease of nervous system	6	2.96%
Endocrine and metabolic disease	6	2.96%
Multiple diagnosis (Noninfectious)	8	3.94%
Missed	3	1.48%
Others	6	2.96%

ICD – International Classification of Disease, N – Number of Patients

3.3. Antimicrobial prescribing pattern indicators

The antimicrobial was prescribed for majority of 203 (80.55%) out of 252 patient cards evaluated. Antimicrobials were prescribed with an average number of 2.15±1.2 antimicrobials per patient. Of the all patients who received antimicrobials, 54 (26.60%) received three or more antimicrobials. The generic name was used for 331 (75.74%) antimicrobials and almost all 431 (98.63%) were prescribed from National Essential Medicine List (Table 3).

The patient cards with each antimicrobial prescribed of 437, indicators assessment shows that the route of administration was not documented in 153 (35.01%) and 109 (53.69%) of the indications were omitted for antimicrobial in the medical records (Table 4).

Table 3: Antimicrobials prescribing indicators result in internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021, to July 7, 2022

Description of indicators	Values
Antimicrobials per patient (N = 252)	
Percentage of patients with at least one antimicrobial prescribed	203 (80.55%)
Average number of antimicrobials prescribed (Mean ± SD)	2.15±1.2
Percentage of patients received one antimicrobial	62 (30.54%)
Percentage of patients received two antimicrobials	87 (42.86%)
Percentage of patients received three and more antimicrobials	54 (26.60%)
Antimicrobials per prescription (N = 437)	
Average duration of prescribed antimicrobials in days (Mean ± SD)	4.3±2.9
Percentage of antimicrobials prescribed by generic name	331 (75.74%)
Percentage of antimicrobials prescribed consistent with EML	431 (98.63%)

EML – Essential Drug List, SD – Standard Deviation

Table 4: Antimicrobials documentation indicators in the internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021 to July 7, 2022

Description of indicators	Documented		Not Documented	
	N	%	N	%
Antimicrobial per patient (N = 252)				
Indication for antimicrobial in medical records	94	46.31%	109	53.69%
Antimicrobials per prescription (N = 437)				
Dose of each medication	401	91.76%	36	8.24%
Route of administration for each drug	284	64.99%	153	35.01%
Frequency of administration for each drug	428	97.94%	9	2.06%

N – Number of patient cards/medications

3.4. Type and class of antimicrobials prescribed

The antimicrobials class mostly prescribed in the ward were; cephalosporins 156 (35.70%), nitroimidazoles 59 (13.50%), sulphonamides 53 (12.13%) and fluoroquinolones 47 (10.76%). By specific drugs, ceftriaxone, 130 (29.75%) and metronidazole, 94 (21.51%) were the most frequently prescribed antimicrobial drugs in the internal medicine ward (Figure 1).

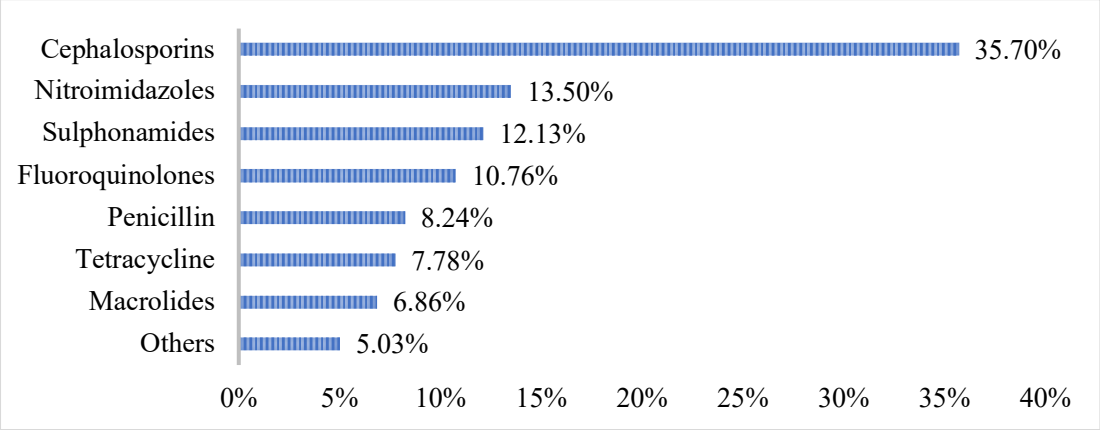

Figure 1: Class of antimicrobial drugs prescribed for the study patients in the internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021 to July 7, 2022 (N = 203)

3.5. Pattern of disease treated in the ward

The most common infectious disease for which antimicrobials were prescribed was pneumonia, 49 (24.13%) followed urinary tract infection (UTI) with 32 (15.76%), Sepsis 25 (12.31%) and Meningoencephalitis with 21 (10.34%). Other indicated diseases were fungal and viral cases treated within the ward of internal medicine (Figure 2).

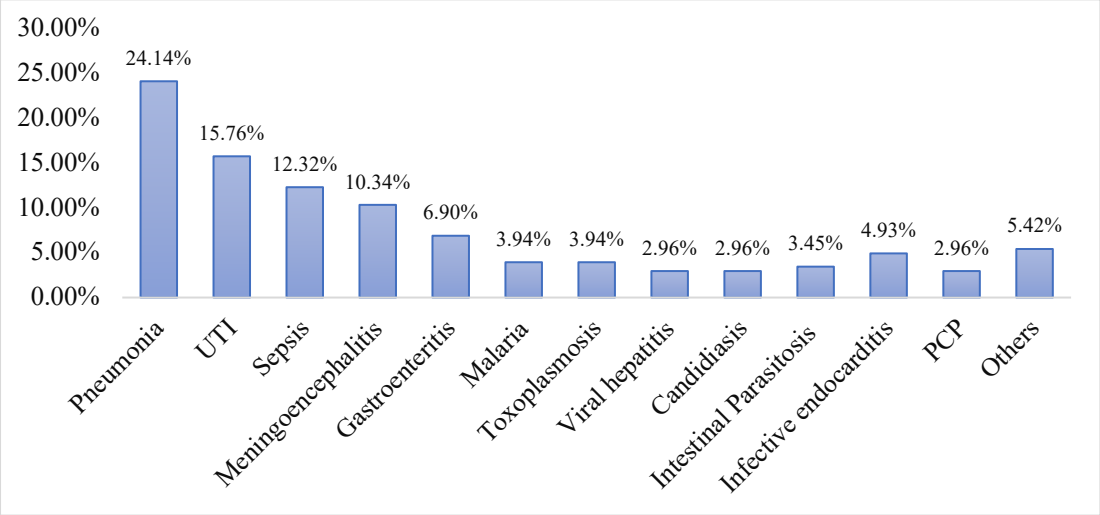

Figure 2: Indications for which antimicrobials were prescribed in the internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021 to July 7, 2022 (N = 203)

3.6. Type of therapy for diagnosis

Majority, 147 (72.41%) of the therapy was done empirically. Culture was requested in only 14 (6.9%) out of the all-medical records evaluated, with only six results documented for the definitive therapy and 42 (20.69%) accounts prophylactic treatment (Figure 3).

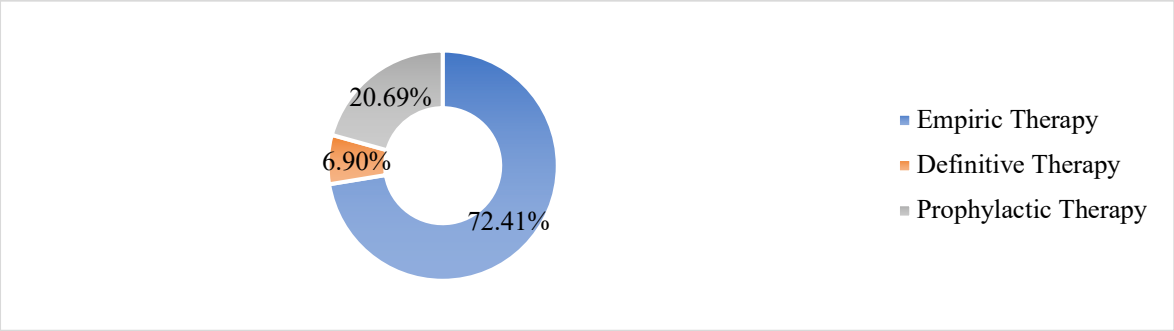

Figure 3: Types of therapy done per diagnosis in the internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021 to July 7, 2022 (N = 203)

3.7. Prescriber profile at internal medicine wards

Most of the patients in internal medicine ward were treated by Medical Interns 122 (60.10%), General practitioners 31 (15.27%) and nurses 29 (14.29%). About 14 (6.90%) patient records had no name of prescribers. The better proportion of antimicrobial prescription in line with Standard Treatment Guideline (STG) was among senior physicians 5/7 (71.43%) and General practitioners 19/31 (61.29%); while nurses 14/29 (48.28%) and medical interns 79/122 (64.75%) prescriptions were not in line with National Standard Treatment Guideline (STG) recommendations (*see table 5*).

Table 5: Antimicrobial prescriber's profile in the internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021 to July 7, 2022 (N = 203)

Prescriber's profession	Frequency	Percent	In line with STG		Not in line with STG	
			Frequency	%	Frequency	%
Specialists (MD)	7	3.45%	5	71.43%	2	28.57%
General practitioners (GP)	31	15.27%	19	61.29%	12	38.71%
Medical interns (MD)	122	60.10%	43	35.25%	79	64.75%
Nurses	29	14.29%	15	51.72%	14	48.28%
Unknown	14	6.90%	2	14.29%	12	85.71%
Total	203		84	41.38%	119	58.62%

MD – Medical Doctor, GP – General Practitioner, STG – Standard Treatment Guideline

3.8. Antimicrobial prescribing predictors

Under the chi-square test done for >2 or ≤2 antimicrobials prescribed per patient, the length of hospital stays with ($p < 0.001$) and the type of diagnosis with ($p = 0.03$) were associated with the number of antimicrobial drugs prescribed while age and presence of comorbidity were not associated with antimicrobial drugs prescribed in internal medicine ward (*see table 6*).

Table 6: Chi- square test of predictors of the prescribed antimicrobials in the internal medicine ward of Hawassa University Comprehensive Hospital; June 8, 2021 to July 7, 2022 (N = 203)

Variables	Number of patients				P. Value
	>2 drugs (N = 54)		≤ 2 drugs (N = 149)		
	N	%	N	%	
Age					
≤65 years	24	24.24%	75	75.76%	0.53
>65 years	30	28.85%	74	71.15%	
Comorbidity					
Present	25	30.12%	58	69.88%	0.47
Absent	39	30.00%	91	70.00%	
Length of hospital stay					
>6 days	38	44.19%	48	55.81%	<0.001
≤6 days	15	12.93%	101	87.07%	
Diagnosis					
Infectious and parasitic disease	28	40.58%	41	59.42%	0.03
Disease of circulatory system	6	13.04%	40	86.96%	
Disease of digestive system	9	39.13%	14	60.87%	
Disease of respiratory system	2	18.18%	9	81.82%	
Disease of blood	3	21.43%	11	78.57%	

N – Number of Patients, % - Percentage, *p < 0.05 was considered significant

4. Discussion

The present study has investigated the pattern of antimicrobial use in the internal medicine ward of Hawassa University Comprehensive Hospital, Hawassa, Ethiopia. In the study, 203 (80.55%) of patients have received at least one antimicrobial drug. There were more than 62 (30.54%) of elders over 65 who prescribed antimicrobials. This may explain why there is a high percentage of comorbidities among the study patients as patient cards are implicated. This result is comparable to studies done in different parts of the world, such as in Sudan, which reported 82%[20] and Uganda, which reported 79%[46]. It is lower than the results of a study in Pakistan (91%)[47], but by far higher than those reported in Nepal, with 29.5%[48], Nigeria, with 40.0%[49], and another study conducted in Sudan, with 58.5%[50].

Although there is no standard value for the indicator, the current result of 80.55% is alarming because the development of antimicrobial resistance will increase as the use of antimicrobials increases[51]. The average number of antimicrobials administered per patient was 2.15, which was comparable to study done in Khartoum, Sudan, with 2.1[20], in Nepal with 2.12[52], but higher than study done in El Obeid, Sudan, with 1.6[50], and in India with 1.7[53]. This value should be kept as low as feasible in the absence of standard values for prescribing indicators, which should be devised based on local illness patterns, regulations, and treatment guidelines. However, in hospital settings where the cases of patients are more complicated, it may be regarded acceptable.

During hospital stay, 62 (30.54%) patients received one antimicrobial, 87 (42.86%) received two antimicrobials and 54 (26.6%) patients received three or more antimicrobials, which was greater than the result observed in Nepalese study with 15% of patients received three or more antimicrobials[48], but lower than the finding in an Indian study with 50.5% of patients received three or more antimicrobials[53]. The length or duration of hospital stay was found to be significantly associated to the quantity of antimicrobials prescribed ($p < 0.001$). Hence, patients who stayed in the hospital for more than six days received more antimicrobials than those who stayed for less than six days. This outcome is similar with research conducted in India[54] and Sudan[20]. Another significant link was discovered between the number of antimicrobials used and the kind of diagnosis ($p = 0.03$). Patients with an infectious disease or a disorder of the digestive system were more likely to get more than two antimicrobials than patients with other diseases. As a result, additional attention is required for these types of patient populations concerning the prescribing of antimicrobials.

Antimicrobial therapy must be adjusted based on the findings of culture and sensitivity tests in order to optimize the course of treatment and reduce selection of drugs pressure by utilizing antimicrobials with a narrower spectrum[55]. The majority, 147 (72.41%) of prescriptions, were given empirically. Only 14 (6.90%) patients had their specimens for culture requested, implying that the frequent prescribing of antimicrobials (three or more) was not due to a change in regimen based on the sensitivity test result, but rather to frequent, and unjustified regimen modifications. The duration of antimicrobials treatment lasted for an average of 4.3 days. Clinical recommendations should guide the duration of antimicrobial therapy to minimize the development of antimicrobial resistance[24].

From a total 437 antimicrobials prescribed; the documentation of the dose and frequency of antimicrobials administration was reported in 401 (91.76%) and 428 (97.94%) of the prescriptions respectively. However, the route of administration was not well documented, occurring in just 284 (64.99%) of all antimicrobial regimens administered. This paperwork is critical for optimizing patient care since it ensures the release of a clear medicine order while avoiding inaccurate dose, mode of administration, and dose frequency.

The generic name of antimicrobials were used in 331 (75.74%) of prescribed antimicrobials, which is higher than the results of two studies done in Sudan[20, 50], which were 37% and 35.6%, respectively, as well as in Nigeria with 62%[49] and in Nepal with 57.5%[52]. However, this result clearly falls short of the WHO's recommended standard value of 100%. Although generic medications on the market in Ethiopia are comparable to brand-name drugs, the use of the generic name in prescribing should be promoted to avoid dispensing errors and treatment duplication. Almost all of the antimicrobials 431 (98.63%) were prescribed from the national essential medicine (EML) list.

One of the most important principles for good practice, which reduces incorrect antimicrobial administration, is documentation of indication[56, 57]. Only 94 (46.31%) of the 203 reviewed medical records had the indication documented. In the remaining 109 (53.69%) cases, there is a possibility of concomitant infectious disease that was not documented in the patient record in addition to the primary diagnosis on admission. However, this low percentage of documentation questions the rationale behind prescribing the antimicrobials[58].

Cephalosporins were the most commonly prescribed class of antimicrobials in the current study, accounting for 156 (35.70%) of all antimicrobial courses prescribed. This is largely comparable with studies conducted in Sudan with 49.1%[20], in Canada with 76%[59], in Nigeria

with 40.4%[49] and in Uganda with 21% [46] of all given antimicrobials being cephalosporins. This will be because of their broad spectrum and safety, cephalosporins are still among the most commonly administered antibiotics in hospitals[60]. Ceftriaxone and metronidazole were the most commonly given antimicrobials. They were most likely utilized to treat aspiration pneumonia, which is one of the sequelae of a cerebrovascular accident and the most common disorder among circulatory system diseases.

Furthermore, to halt and reduce antimicrobial resistance, hospital structures such as the Drug and Therapeutic Committee (DTC) and other management committees, which can play a leading role in the promotion of rational medication and represent the hospital's commitment to high-quality patient care, can help to prevent antimicrobial overuse and should be improved in function. The fact that the results of this study cannot be generalized to other hospitals in Ethiopia is one of the present study limitations. Additionally, the study did not evaluate whether antimicrobial use was appropriate, which is something that should be covered in future investigations.

5. Conclusion

This study revealed that there was high overuse of antimicrobials at internal medicine ward of Hawassa University Comprehensive Specialized Hospital. The most common antimicrobials prescribed were cephalosporins, nitroimidazoles and sulphonamides. The proportion of patient card containing an antibiotic was 80.55%, which is by far much higher than WHO recommended standard which is between 20% and 26.2%. Similarly, the average number of prescriptions per patient fell just above WHO recommendations, and adherence to the Standard Treatment Guideline (STG) was also inadequate especially in Medical Interns prescriptions. The amount of antimicrobial medications provided was found significantly associated to the length of hospital stay and the type of diagnosis. Several measures and techniques are required to enhance reasonable antimicrobial prescribing. Continuous supervision and feedback, as well as the adoption of an antimicrobial stewardship program and continuous instructional programs for prescribers on rational antimicrobial prescribing, are essential.

Abbreviations

AMR: Antimicrobial Resistance, ICD: International Classification of Disease, DTC: Drug and Therapeutic Committee, EML: Essential Medicines List, STG: Standard Treatment Guideline, UTI: Urinary Tract Infection, WHO: World Health Organization

Authors contribution

The authors equally contributed and participated in the preparation, conceptualization, searching and selection, data extraction and data analysis, writing the manuscript and approving the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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Availability of data and material

On reasonable request, the data used and analyzed during this study can be obtained from the corresponding author.

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