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Assessment Of Antibiotic Prescribing Patterns And Antibiotic Resistance In Family Medicine

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Abstract.

Background: *Antibiotics are drugs that have the ability to destroy or inhibit bacterial growth through mechanisms such as selective killing or inhibiting the progression of pathogenic bacteria. Antibiotics are crucial in combating illness and preserving health, especially in developing nations where infectious diseases remain a significant challenge.*
Aim: *To evaluate the prevalence of antibiotic resistance & prescribing patterns in family medicine*
Patients and methods: *A descriptive cross-sectional study design was employed. We gathered & analyzed quantitative data. We assessed the prescribing patterns of antibiotics by family physicians. Antibiotic prescribing patterns involved prescriptions containing antibiotics, the quantity of antibiotics per prescription, the name, form, & method of consumption of each antibiotic, as well as cases of mal prescriptions. The data collection methodology employed in this investigation extended from March 2021 to September 2022.*
Results: *Regarding distribution of antibiotics category, Penicillin was the majority of category prescribed (40%) while Tetracycline[1] was the least category prescribed (5%). Regarding distribution of Common Diagnosis, Gastro-intestinal infection was the majority of Diagnosis (29.7%) associated with antibiotics administration followed by Lower respiratory infection (20%) while sexually transmitted diseases were the least Diagnosis (2.4%) associated with antibiotics administration.*
Conclusion*: We found that Regarding distribution of most Commonly Prescribed Antibiotics, Amoxicillin was the majority of Antibiotics prescribed followed by Ciprofloxacin while Norfloxacin was the least Prescribed Antibiotics. Regarding distribution of antibiotics category, Penicillin was the majority of category prescribed while Tetracycline was the least category prescribed.*

Key words: *Antibiotics, Antibiotic resistance, Prescribing pattern, Prescribing indicators.*

Introduction

Antibiotics are drugs that possess the ability to destroy or inhibit bacterial growth through mechanisms such as selective death or inhibition of disease-causing bacterial development **(1)**. At present, these medications are the most frequently prescribed in hospitals across the globe.

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Antibiotics play an important role in the fight against disease & the preservation of health, particularly in developing nations where infectious diseases remain an important challenge. However, in recent times, the advent of antibiotic resistance has presented great challenges to their continued utility **(2).** At present, a considerable number of microorganisms have developed resistance to the most widely accessible and efficacious first-line agents, primarily as a result of inappropriate prescribing practices **(3–5).** Antibiotic consumption has increased globally, with the majority of the rise occurring in low- & middle-income nations **(6).** Antibiotic prescriptions exhibit significant variations across countries, as demonstrated by the fact that one in every two hospitalized patients in Africa received antibiotics. Polypharmacy, a prevalent practice in several African nations, including Ethiopia, involves the requirement of multiple medications on a single prescription paper. The present study defines polypharmacy as the utilization of five or more medications on a single prescription paper **(7).** 11 035 (36.7%) of the 30,096 prescription documents examined in a study of twenty-six primary care facilities in Cameroon contained at least one antibiotic prescription. Antibiotics included 37.6% of the average number of medications prescribed per prescription, according to another investigation performed in Lesotho, which was 3.8**.(8)** Multiple investigations performed in Ethiopia have similarly indicated that antibiotics constituted one of the most frequently prescribed classes of drugs **(9–11).** Antibiotic resistance is a significant public health concern that crosses developed countries and is a global health crisis **(8).** Inappropriate prescribing practices result in dangerous and ineffective therapy, progression of the illness and worsening, and increased costs related to the necessity for more therapy and the development of complications. Furthermore, inappropriate prescribing results in resource wastage & a decline in the quality of medical care **(11).**

Our research aims to evaluate patterns of prescribing antibiotics and antibiotic resistance in family medicine.

Patients and methods

A cross-sectional descriptive investigation design was utilized. We gathered and analyzed quantitative data. We assessed the prescribing patterns of antibiotics by family physicians. Antibiotic prescribing patterns involved prescriptions containing antibiotics, the quantity of antibiotics per prescription, the name, form, & manner of consumption of each antibiotic, as well as cases of mal prescriptions. The data collection methodology employed in this investigation extended from March 2021 to September 2022.

Inclusion criteria: All prescriptions containing antibiotics were eligible for inclusion, regardless of the dosage form or age of the case. All paper medication prescriptions from family physicians were archived.

Exclusion criteria: Prescriptions for HIV & tuberculosis treatments that were unreadable or contained poor data were excluded from the research at the sampling procedure.

Ethical Consideration: A Research Ethics Committee was in the process of approving the study. Informed consent was obtained from all participants prior to their inclusion in the investigation.

Data source: Information was gathered from outpatient prescriptions, patient folders in clinical areas, & hospital pharmacies.

Sample size Calculation.

Based on the research conducted by **Yimenu et al. (12),** the sample size for this research was determined using Epi Info STATCALC, considering the subsequent assumptions: - level of confidence of 95%, with an 80% power. A 5% margin of error. The antibiotic prescribing pattern yielded a maximal sample size of 625 from the Epi-Info output, which was 70.50% for one antibiotic. As a consequence, the sample size was increased to 750 cases in the event of potential dropout throughout the period of follow-up.

Data collection

Four scientific criteria were used to evaluate incorrect or improper antibiotic prescriptions: a) dose per consumption, b) dose per day, c) duration of therapy, and d) potential interaction with other antibiotics or medications. Inaccurate prescriptions were those in which one or more of the above conditions were not fulfilled. Prescriptions were evaluated by a highly qualified pharmacist (over ten years of experience) who underwent training in the study methodologies; he did not participate in the investigation or analysis of the outcome measure. According to Martindale: The Complete Drug Reference, the evaluation was conducted. The clinician & pharmacist extracted, in order for this, the symptoms & prescribed antibiotics corresponding to the severity of the the illness & the type of diagnosis from the prescriptions & health records. In order to accomplish this, the patient's medical document containing all pertinent information regarding the selected prescriptions was examined and assessed subsequent to their random selection. In order for this, the incorrect prescription was assessed using all of this four standard criteria.

Standard guidelines specify the daily dose, duration of treatment, and potential drug or antibiotic interactions for each disease and drug, considering variables such as gender, age,weight, and illness. Antibiotic prescriptions were evaluated for appropriateness in accordance with the corresponding guideline & the four criteria mentioned inside; wrong prescriptions for each prescription was then determined.

A check list was utilized to gather the information. Furthermore, the fundamental &demographic attributes of family physicians & outpatients should be included with relevant factors and data. These may include the formulation and method of administration of prescribed antibiotics, the quantity and type of drugs consumed per session, the period of the treatment course, the number of times per day that drugs are utilized, the potential for drug interactions, the rate at which combination therapies are carried out, the quantity and overall cost of drug items, and the nature of the physicians' graduation (private or government universities). The classification of government medical universities into three distinct levels is determined by the annual scientific report of the Saudi Arabian Ministry of Health and Medical Education.

Statistical Analysis

SPSS version 22 (Statistical Package for the Social Sciences; SPSS Inc., Chicago, IL, USA) was utilized to perform all statistical calculations. When quantitative data were not normally distributed, they were statistically described using the mean ± standard deviation and median (range). When applicable, qualitative data were statistically described using relative frequencies (percentages) and frequencies (number of cases). The quantitative variables were compared utilizing the Mann Whitney U test for non-normally distributed data and the Student t test for normally distributed data. To compare categorical data, the chi-squared test ($\chi 2$) was applied. The calculation of the level of significance was based on the subsequent probability (P) values: One-half of 0.05 was considered to be statistically significant.

Results

Table (1): Demographic data in the studied group.

		Studied group N=750	
		N	**%**
	<5	63	8.4

Age	5-14	71	9.5
	15-30	354	47.2
	31-44	100	13.3
	45-64	115	15.3
	>65	47	6.3
Gender	male	360	48
	female	390	52

Regarding demographic data, majority of studied group were aged between (15-30) 47.2% and majority of studied group were female 52%.

Table (2): Distribution of number of drugs per encounter in the studied group.

Number of Drugs per Encounter	**Studied group N=750**	
	N	**%**
One drug	427	56.5
Two drugs	200	26.7
Three drugs	120	16
Four drugs	6	0.8

Regarding distribution of number of drugs per encounter, majority of studied group (427 participants) were prescribed with one drug per encounter (56.5%) and only (6 participants) were prescribed with female four drugs per encounter (0.8%).

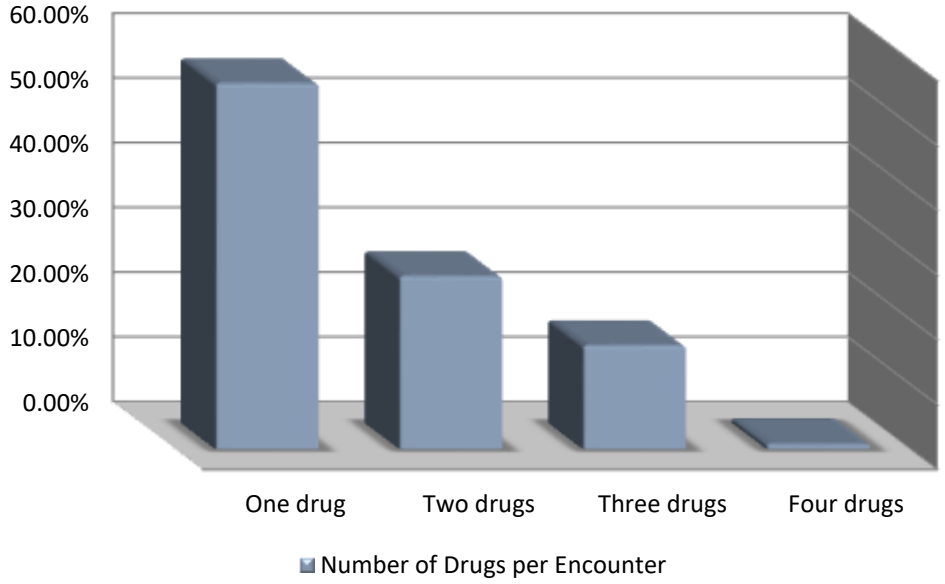

Fig (1): Distribution of number of drugs per encounter in the studied group.

Table (3): Distribution of antibiotics category prescribed in the studied group.

Antibiotics category	**Studied group N=750**	
	N	**%**
Penicillin	300	40
Macrolide	120	16
Fluroquinolones	110	14.7

Miscelaneuos	95	12.3
Cephalosporin	90	12
Tetracycline	35	5

Regarding distribution of antibiotics category, Penicillin was the majority of category prescribed (40%) while Tetracycline was the least category prescribed (5%).

Table (4): Distribution of most commonly prescribed antibiotics in the studied group.

Most Commonly Antibiotics	Studied group N=750	
	N	%
Amoxicillin	225	30
Ciprofloxacin	98	13
Metronidazole	90	12
Azithromycin	85	11.3
Ceftriaxone	40	5.3
Cephalexin	38	5.1
Amoxicillin + clavulanate	30	4
Doxycycline	28	3.7
Cloxacillin	25	3.3
Clarithromycin	23	3.1
Trimethoprim-Sulfamethoxazole	20	2.6
Norfloxacin	18	2.4

Regarding distribution of most commonly prescribed antibiotics, Amoxicillin was the majority of Antibiotics prescribed (30%) followed by Ciprofloxacin (13%) while Norfloxacin was the least Prescribed Antibiotics (2.4%).

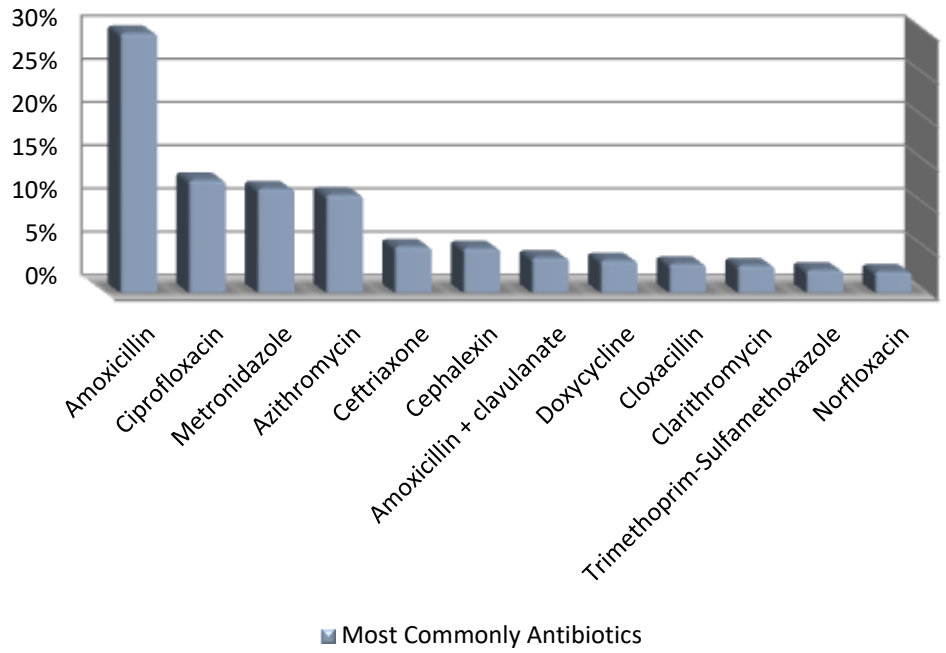

Fig (2): Distribution of most commonly prescribed antibiotics in the studied group.

Table (5): Distribution of common diagnosis in the studied group.

Common Diagnosis	Studied group N=750	
	N	%
Gastro-intestinal infection	223	29.7
Lower respiratory infection	150	20
Sexually transmitted diseases	145	19.3
Upper respiratory infection	140	18.6
Urinary tract infection	108	14.4
Skin and soft tissue infection	38	5.3
Gastro-intestinal infection	28	3.7
Lower respiratory infection	23	3.1
Sexually transmitted diseases	19	2.5

Regarding distribution of Common Diagnosis, Gastro-intestinal infection was the majority of Diagnosis (29.7%) associated with antibiotics administration followed by Lower respiratory infection (20%) while sexually transmitted diseases was the least Diagnosis (2.4%) associated with antibiotics administration.

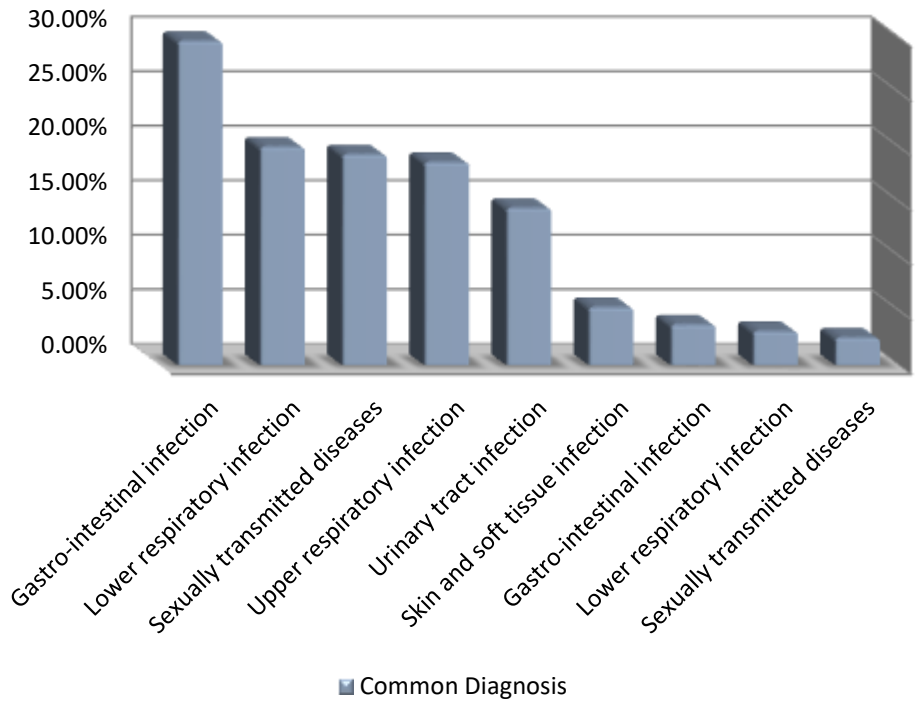

Fig (3): Distribution of common diagnosis in the studied group.

Discussion

A structured, criterion-based, methodological medication evaluation system, medication assessments assist in determining the actual trend for medication use in a given setting. It is a method of gathering data in order to identify problems associated with using drugs and, eventually, take corrective steps. The assessment of medication utilization is of considerable importance in promoting the appropriate use of pharmaceutical substances and efficient prescribing practices **(13).** Reasonable drug use (RDU) involves administration of medications in accordance with prescriptions, patient needs for disease prevention, treatment, & diagnosis. The rational utilization of pharmaceuticals enables cases to get drugs that are relevant to their clinical indication at the most economical price, in dosages that satisfy their specific needs, for a reasonable duration. Insufficient dosing, polypharmacy, improper use of antimicrobial agents, excessive injection usage when oral dosage forms are more suitable, & non-compliance with the standard therapy guideline (STG) constitute common forms of irrational drug use that are observed worldwide **(14).** More than half of all medicines prescribed globally are inappropriately prescribed in developing countries, where monitoring & assessment of medication utilization are in the embryonic stages, according to the World Health Organization (WHO). Further, essential medications are unavailable to approximately one-third of the global population **(15).**

The excessive demand for healthcare services in the community will result from irrational drug use; consequently, medication stock-outs & a decline in patient confidence in the quality of health care will inevitably ensue. Inappropriate use of prescription medications results in treatment that is both ineffective & dangerous, further complicates or extends the patient's condition, and incurs exaggerated costs. If drug prescription practices are deemed inappropriate, it becomes necessary to analyze drug use patterns in order to modify prescribing practices accordingly. A number of recognized survey methodologies have been devised to achieve this objective, with an evaluation relying on WHO drug use indicators being one of them. These indicators have gained international recognition as a standard for evaluating the medication patterns of healthcare facilities **(16, 17).**

Regarding distribution of Common Diagnosis, Gastro-intestinal infection was the majority of Diagnosis (29.7%) associated with antibiotics administration followed by Lower respiratory infection (20%) while sexually transmitted diseases was the least Diagnosis (2.4%) associated with antibiotics administration.

Yimenu et al. (12) who provided evidence that antibiotics were present in 162 of the 212 prescriptions for which the diagnosis was written in total. The most prevalent diagnosis for frequently prescribed antibiotics among the 162 prescriptions was gastrointestinal tract infections (44, 28%), followed by lower respiratory tract infections (30, 19.4%).

Regarding distribution of Frequently Prescribed Antibiotics, Amoxicillin was the majority of Antibiotics prescribed (30%) followed by Ciprofloxacin (13%) while Norfloxacin was the least Prescribed Antibiotics (2.4%).

Regarding distribution of antibiotics category, Penicillin was the majority of category prescribed (40%) while Tetracycline was the least category prescribed (5%).

Yimenu et al. (12) who provided evidence that amoxicillin was the antibiotic most commonly prescribed in terms of specific varieties (162, 28.6%), with ciprofloxacin (66, 12%) and metronidazole (63, 11.1%) following suit. Additionally, they showed that penicillin was the category of antibiotics most commonly prescribed (217, 38.2%), with macrolides following closely behind (84, 15%).

According to the findings of **Wong et al. (18),** the most frequently prescribed medications were nitrofurantoin (28.6%), ciprofloxacin (10.2%), & amoxicillin (39.6%). Antibiotic prescriptions include for an average of 6.86±0.54 days.

The antibiotics most frequently prescribed to outpatients, according to **Biswas et al. (19),** were cephalosporins & macrolides; almost sixty-seven percent of prescriptions contained complete dosage form information.
Antibiotics comprised forty-five percent of prescriptions in outpatient settings in Iran, according to a review study **(20).**
Regarding demographic data, majority of studied group were aged between (15-30) 47.2% and majority of studied group were female 52%. Regarding distribution of number of drugs per Encounter, majority of studied group (427 participants) were prescribed with one drug per Encounter (56.5%) and only (6 participants) were prescribed with female four drugs per Encounter (0.8%
Yimenu et al. (12) who provided evidence that oral route prescriptions contained the majority of antibiotics (476, 84%), followed by parenteral route prescriptions (39, 4%). With respect to the antibiotic dosage form (capsule).
In their study, **Wong et al. (18)** investigated the antibiotic resistance of urinary isolates obtained from symptomatic cases presenting primary care. The researchers also examined the empirical antibiotic prescribing behaviors of primary care physicians & identified factors that are associated with both antibiotic resistance & physician antibiotic prescription. The patients' mean age was 53.8 17.1 years. The majority of patients identified as women.
In their study, **Dong et al. (21)** found to investigate & compare antibiotic prescribing patterns among ten provinces of Western China's rural areas. Antibiotic prescriptions comprised 48.43% of total prescriptions (range: 41.12%–57.47%). In total, forty-nine various kinds of antibiotics were prescribed, with ninety percent of all usage attributed to 17 of them. Antibiotics were administered at a rate of 54.62 per 100 prescriptions (range: 43.78–69.56).

Conclusion

We found that Regarding distribution of most Commonly Prescribed Antibiotics, Amoxicillin was the majority of Antibiotics prescribed followed by Ciprofloxacin while Norfloxacin was the least Prescribed Antibiotics.
Regarding distribution of antibiotics category, Penicillin was the majority of category prescribed while Tetracycline was the least category prescribed.

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