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ASSESSMENT OF PRESCRIPTION COMPLETENESS AND DRUG USE PATTERN USING WORLD HEALTH ORGANIZATION (WHO) PRESCRIBING INDICATORS IN PRIVATE AND GOVERNMENT HOSPITAL PHARMACIES IN THE TWIN CITIES OF PAKISTAN

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Abstract

Objective. *The study uses the WHO core drug use indicator to assess the hospital's prescription completeness and drug use pattern.*

Method. *From November 2023 to March 2024, 250 prescriptions were randomly selected. For each given day, a minimum of 5 was carefully included in the research sample from a combination of prescription review, observation, and retrospective cross-sectional. Data was analysed by using SPSS version 20 and an Excel spreadsheet.*

Results. *The current study showed that 409 drugs were prescribed in government hospitals out of 125 prescriptions, with an average of 3.3 drugs per prescription, with 49%% generic names, 100% from the essential drug list, and 21.6% and 42.2% containing injections and antibiotics, respectively. In a private hospital, 527 pharmaceuticals were prescribed out of 125 prescriptions. The average number of drugs per prescription was 4.2, with generic names accounting for 37%, the essential drug list accounting for 100%, and injections and antibiotics accounting for 41.2% and 51.2%, respectively.*

Conclusion: *The study's findings showed that the prescribing and prescription completion indicators differed from the WHO guidelines. As a result, an effective intervention program, such as training, was proposed to encourage safe medication practices while improving drug prescribing patterns and prescription quality. Pharmacists might also assist patients in better understanding their prescriptions, which would enhance drug adherence and usage.*

INTRODUCTION

Drugs are crucial to healthcare service provisions [1]. The drug improves a patient's condition. When introduced into the body, it can cause physiological and psychological effects [2]. These effects can be therapeutic, or they can be recreational or abusive, leading to altered consciousness or mood. Multiple drug exposure is linked to an increased risk of adverse drug reactions [3]. The World Health Organization (WHO) has developed standardized core prescription and patient care indicators to assess drug usage trends in healthcare institutions' outpatient settings [4]. Prescribing indicators, as

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defined by the World Health Organization (WHO), are a set of core metrics and guidelines designed to evaluate the prescribing practices of health professionals and the rational use of medicines within healthcare systems [5]. The concept of rational medicine use dates back to 300 B.C., when the Greek physician Herophilus stated that "medicines are nothing in themselves, but are the very hand of God if used with reason and prudence" [6]. The term "rational use of drugs" refers to the judicious application of drugs, recognizing the need for caution, due diligence, and responsibility in the administration of drugs [7]. Rational use includes proper prescribing, patient selection, dosage adjustments, monitoring for side effects, and prompt reporting of adverse drug reactions [8]. Irrational drug use refers to the use of drugs in a way that fails to adhere to the above definition, and it involves the indiscriminate prescribing of drugs, sometimes in an attempt to satisfy the patient or due to a lack of proper clinical knowledge of diagnosis and prescription [9]. The use of pharmaceuticals excessively for non-medical purposes, polypharmacy, low prescription rates for generic drugs and those on the National Essential Drug List (EDL), prescribing injections when oral medication would be more suitable, and generally writing prescriptions that don't follow guidelines are all examples of irrational medicine use [10]. The elevated rate of morbidity and mortality in infections and chronic diseases, especially in children, has also been linked to irrational drug use [11]. Globally, more than 50% of all medicines are prescribed, dispensed, or sold inappropriately, while 50% of patients don't use them correctly [12]. Moreover, about one-third of the world's population does not have access to basic medicines [13]. Prescription writing is a skill as it demonstrates the physician's instructions to the patients [14]. The study of prescription patterns is a research and analytical approach in healthcare and pharmaceutical sciences that involves the assessment of various aspects of medical prescription [15]. Prescribers should fill out all the relevant information in the prescription since insufficient information might result in a poor treatment outcome. A growing body of evidence shows that using the WHO drug use indicators has become an essential assessment tool in many countries, particularly developing ones, to assess rational drug use patterns [16]. Five prescribing indicators are included in the core drug use indicators, and they are intended to highlight specific prescription features relating to polypharmacy, antibiotics usage, injectable use, generic prescribing, and adherence to the essential medication list [17]. These indicators can be used in both public and private sector dispensaries, healthcare centers, and hospitals [18]. These studies aim to gain insights into how healthcare providers, such as physicians or nurse practitioners, prescribe medications for patients. The analysis of prescription patterns can provide valuable information regarding the use of drugs in clinical practice and can be used for several purposes, including quality of care assessment drug utilization review, cost-effectiveness analysis, monitoring and surveillance, pharmacovigilance, patient outcomes, epidemiology research, and health policy and planning [19]. The study aims to detect flaws in prescription patterns to raise awareness about drug lapses by providing feedback to prescribers. Unfortunately, in Pakistan, law enforcement organizations conduct limited or no inspections of prescriptions written by government and private sector healthcare providers. As a result, drugs are administered incorrectly, and patients suffer the most.

Research Methodology

Study Design & time framework

The study was conducted within Pakistan's twin cities from November 2023 to March 2024.

These hospitals provide data on outpatient, inpatient, and emergency patients who visited during the study period. The study comprises only prescriptions for pharmaceuticals or drugs, in addition to healthcare products supplied to outpatients. The World Health Organization recommends a cross-sectional study of at least 600 interactions to assess current prescribing practices, with a larger sample size if possible.

Inclusion criteria

Patients aged 18 and older, as well as those who visited the outpatient pharmacy and consented to participate.

Frontier in Medical & Health Research

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Exclusion criteria

Patients below the age of 18, all severe chronic disease patients, those who refuse to participate, and all difficult-to-decipher drugs.

Data collection tool

Every third prescription was selected from the set of prescriptions. For each given day, a minimum of 5 was carefully included in the research sample. Sex, age, and prescribing indicators, such as drug name, brand or generic, number of drugs per encounter, dosage form, therapeutic class, and the number of drugs prescribed from the Essential Drug List (EDL), number of injections are among the data entered into the data collection sheet.

Statistical analysis

Data analysis

The WHO prescribing indicators were used as the basis for the analysis of the data collected. SPSS version 20 was used to drive the quantitative data, calculating the frequencies and percentages, subsequently interpreted using the WHO prescribing indicators' standard values. After data entry, Prescription indicators were calculated using a method from the WHO's prescribing indicators evaluation guide.

-The use of indicators as the primary endpoint, which includes:

1. Average number of drugs per encounter (Calculated by dividing the total no. of different medicines prescribed. WHO recommended value, 1.6 – 1.8)
2. % of medicines prescribed by generic name (Calculated by dividing the no. of medicines prescribed by generic name by the total no. of medicines prescribed and multiplying the result by100. WHO recommended value, 100%)
3. % of encounters with an antibiotic prescribed (Calculated by dividing the no. of encounters in which an antibiotic was prescribed by the total no. of encounters surveyed and multiplying the result by 100. WHO recommended value, 20-26.8%)
4. % of encounters with an injection prescribed (Calculated by dividing the no. of encounters in which an injection was prescribed by the total no. of encounters surveyed and multiplying the result by 100. WHO recommended value, 13.4-24.1%)
5. % of medicines prescribed from as essential drug list (EDL) or formulary (Calculated by dividing no. of medicines prescribed that are in the essential medicine list by the total no. of medicines prescribed and multiplying the result by 100. WHO recommended value, 100%)

The prescribing indicators listed above will be compared to WHO-recommended optimal values.

Statistical analysis

The statistical package for social sciences (IBM SPSS STATISTICS V20) was used to analyze the data. Data are presented using descriptive statistics such as frequencies, percentages, averages, and standard deviations (SD).

Dependent variable

Rational drug use based on WHO metrics.

Independent variable

Socio-economic Variables: Age, gender, level of education, marital status, ethnicity, religion, employment, and economic standing.

Prescribing indicators: Average amount of medications used during a meeting; % of medications administered under their generic names; percentage of contacts having a prescription antibiotic; percentage of contacts when an injection is recommended; percentage of medications administered that come from the formulary or essential medicine list.

Ethical approval

A support letter was obtained from the ethical review board (ERB) of the University before commencing the study. The ethical guidelines or principles were confidentially maintained throughout the research period and the information was used only for the research purpose.

Results

250 data points were collected and analysed using WHO core drug indicators to evaluate the situations

Frontier in Medical & Health Research

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of drug use in government and private hospitals of the twin cities of Pakistan.

The socio-demographic characteristics of patients are shown in **Table 1.**

Table 1 Patient demographics

	Government Hospital = 125		Private Hospital = 125	
Patient characteristics	**Frequency**	**Percentage (%)**	**Frequency**	**Percentage (%)**
Age				
18-28	35	28.0	43	34.4
29-39	22	17.6	24	19.2
40-50	26	20.8	33	26.4
Above 50	42	33.6	25	20.0
Gender				
Male	56	44.8	54	43.2
Female	69	55.2	71	56.8
Weight				
Yes	16	12.8	20	16.0
No	109	87.2	105	84.0
Comorbidities				
Yes	20	16.0	33	26.4
No	105	84.0	92	73.6

Core indicators of prescription

Throughout the study, 409 drugs were prescribed in the government hospital, with an average number of drugs prescribed per encounter was 3.272. Only 49% of prescriptions were written with generic names. 42.2% encounter an antibiotic, whereas 22% encounter an injection. 100% of the drugs were prescribed by the Pakistan EDL. While private hospitals showed different results compared to government hospitals. A total of 527 drugs were prescribed, with an average number of drugs prescribed per encounter was 4.216, which is much higher than the government hospital. 37% of the drugs were prescribed with a generic name. 51% of the drugs encountered with antibiotics, whereas 41.2% were prescribed with injections. All 527 drugs were prescribed from the Pakistan EDL, respectively **(Table 2).**

Table 2 Core indicators

Core indicators	**Government Hospital = 125**	**Private Hospital = 125**	**WHO standard**
Average no. of drug encounter	3.272	4.216	< 2
% of drugs by generic name	49%	36.8%	100%
% of encounters with an injection	21.6%	41.2%	< 20%
% of encounters with antibiotic-prescribed	42.2%	51.2%	< 30%
% of drugs prescribed by EDL	100%	100%	100%

Volume 3, Issue 4, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Indicating the degree of polypharmacy

Out of all prescriptions, in a government hospital, 16% (20) of them had one drug per prescription. While 22% (27) of prescriptions enclosed more than 4 drugs. Whereas in private hospitals, 8% (10) of the prescriptions had one drug and about 46% (57) had more than 4 drugs per prescription (Table 3).

Table 3 Indicating degree of polypharmacy

	Government Hospital = 125		Private Hospital = 125	
No. of drugs	**Frequency**	**Percent (%)**	**Frequency**	**Percent (%)**
One	20	16.0	10	8.0
Two	23	18.4	14	11.2
Three	21	16.8	23	18.4
Four	34	27.2	21	16.8
More than 4	27	21.6	57	45.6

Route of administration of the prescribed antibiotic

Out of 250 prescriptions, most of antibiotics were prescribed orally in both hospitals, as illustrated in Figure 1 and fig 2.

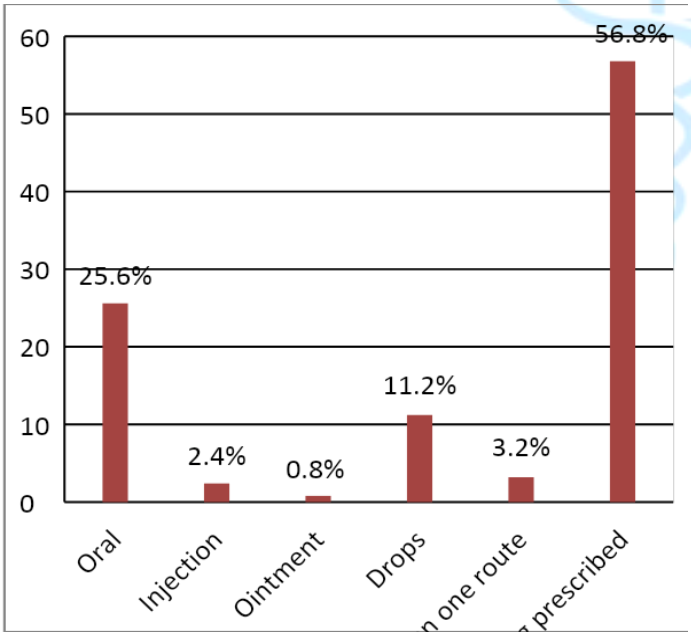

Figure 1 Route of antibiotic prescribed in private hospital.

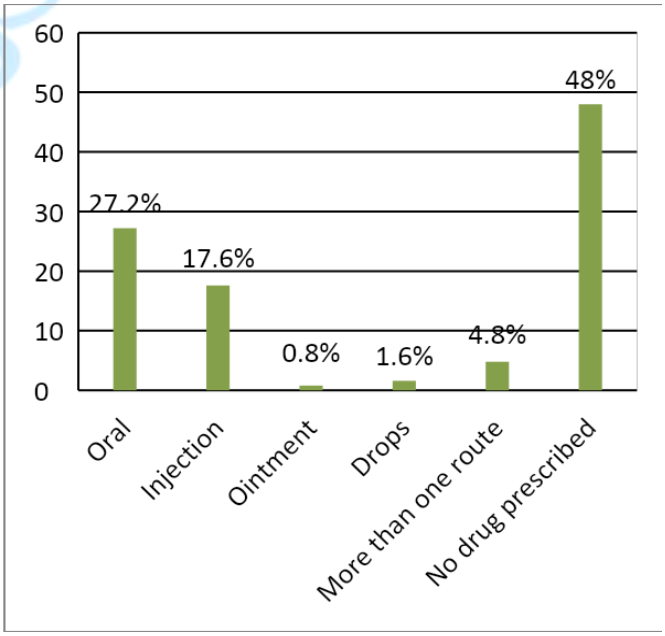

Figure 2 Route of antibiotic prescribed in government hospital.

Commonly prescribed antibiotic

The most commonly prescribed antibiotic in government hospital was 0.3% cefixime and in private hospital was 9.6% ceftriaxone.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Table 4 Commonly prescribed antibiotics

	Government Hospital = 125		Private Hospital = 125	
Commonly prescribed antibiotics	**Frequency**	**Percent (%)**	**Frequency**	**Percent (%)**
Amoxicillin + Clavulanic Acid	8	6.4	5	4.0
Moxifloxain	0	0	1	0.8
Tobramyin + Dexamethasone 0.3%	13	10.4	2	1.6
Azithromycin	2	1.6	5	4.0
Clarithromycin	2	1.6	1	0.8
Ciprofloxacin HCl	3	2.4	0	0
Cefixime	13	10.4	8	6.4
Metronidazole	3	2.4	5	4.0
Ceftriaxone	0	0	12	9.6
Bacitraxin Zinc-Polymyxin B Sulfate	1	0.8	1	0.8
Combination	8	6.4	23	18.4
Rifaximin	1	0.8	2	1.6
No drug prescribed	71	56.8	60	48.0

Commonly combined antibiotic

According to results, the most commonly combined antibiotics were 2.4% metronidazole + ciprofloxacin and moxifloxacin + tobramycin in the government hospital, whereas 5.6% metronidazole + ciprofloxacin and 4% moxifloxacin + ceftriaxone in the private hospital, respectively.

Table 5: Commonly Prescribed Antibiotics

	Government Hospital = 125		Private Hospital = 125	
Commonly prescribed antibiotics	**Frequency**	**Percent (%)**	**Frequency**	**Percent (%)**
Amoxicillin + Clavulanic Acid	8	6.4	5	4.0
Moxifloxain	0	0	1	0.8
Tobramyin + Dexamethasone 0.3%	13	10.4	2	1.6
Azithromycin	2	1.6	5	4.0
Clarithromycin	2	1.6	1	0.8
Ciprofloxacin HCl	3	2.4	0	0
Cefixime	13	10.4	8	6.4
Metronidazole	3	2.4	5	4.0
Ceftriaxone	0	0	12	9.6
Bacitraxin Zinc-Polymyxin B Sulfate	1	0.8	1	0.8
Combination	8	6.4	23	18.4
Rifaximin	1	0.8	2	1.6
No drug prescribed	71	56.8	60	48.0

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Prescription completeness

Other components analyzed in both hospitals for the completeness of prescriptions included patient name, age, sex, diagnosis, card number, and contact number, which were present in all the prescriptions (100%). While patient complaints were 76%(95) in a government hospital and 95.2%(119) in a private hospital. Results about prescription completeness are shown in Table 6.

Table 6: Prescription completeness

	Government Hospital = 125		Private Hospital = 125	
	Frequency	Percent (%)	Frequency	Percent (%)
	Patient information parameters			
Name	125	100.0	125	100.0
Sex	125	100.0	125	100.0
Age	125	100.0	125	100.0
Diagnosis	125	100.0	125	100.0
Card number	125	100.0	125	100.0
Contact number	125	100.0	125	100.0
Patient complains	95	76.0	119	95.2
	Drug information parameters			
Name and strength	125	100.0	125	100.0
Dose	125	100.0	125	100.0
Frequency	125	100.0	125	100.0
Dosage form	125	100.0	125	100.0
Instruction	100	80.0	120	96.0
	Prescriber information			
Name	125	100.0	125	100.0
Date	125	100.0	125	100.0
Signature	125	100.0	120	96.0
Qualification	125	100.0	125	100.0

Discussion

The study revealed the results of a WHO core prescription assessment of the prescribing practices and prescription completeness of government and private hospitals in twin cities of Pakistan. Prescription writing reflects the doctor's standpoint to safe prescription and serves as a crucial therapeutic intervention. Complacency in prescribing leads to errors, which can even have adverse impacts. Prescription audits can help detect these errors [20]. Polypharmacy occurs when a treatment regimen contains at least one unneeded medicine. This problem is exacerbated by patient features such as increasing age, multiple medical problems, therapy expectations, and self-treatment decisions; physician factors such as over-prescribing; and system concerns such as multiple providers and a lack of a coordinating provider. If polypharmacy is present, it is one of the most important markers of potential drug interactions, the risk of lethal side effects from combination or synergistic medications, medication non-adherence, and consequently poor treatment outcomes, which may even result in death [21].

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

A total 409 drugs in government and 527 drugs in the private hospital were prescribed. As a measure of polypharmacy, the average number of drug per prescription overall came out to be 3.272 in government hospital and 4.22 in private hospital, indicating over prescription in both hospitals. According to WHO guidelines, the recommended limit is less than 2 [22]. Furthermore, the value exceeded the 1.74 calculated from the West Shoa zone [23]. Only 49% in government hospital and 37% in private hospital prescriptions used generic names, which is lower than previous reports rates from south (98.7%) and south west (92%) Ethiopia [12]. Due to the influence of pharmaceutical companies, doctors who choose brand-name drugs may see a double-digit increase in cost and profit margin. 100% of the drugs were prescribed from Pakistan EDL in both hospitals. In our audit, the percentage of antibiotic prescriptions were 42.2% in government and 51.2% in private hospital, exceeding the WHO's 30% threshold and distant from comparable research in Saudi Arabia 2% [24]. Antibiotic usage in both hospitals exceeded the standard value of 30%. Among the total drugs, about 22% in government and 41.2% in private hospitals were encounter with injection. Debremarkos Referral Hospital reported a 71.36% rate [3].

In our study, polypharmacy was heavily represented. In both hospitals, more than four medications were included in the majority of prescriptions. Acute diseases, GIT infections, and allergic reactions were the main reasons for patients' clinic visits. When comparing the hospital prescriptions, the majority of patients were female: 55.2% (69) of patients older than 50 in the government hospital and 56.8% (71) of patients between the ages of 18 and 28 in the private hospital. Comorbidity is the term used to describe a situation in which a person having one index condition (like cardiovascular disease) also has one or more other diseases. Comorbidity is more common in the elderly population [25]. According to our research, the government hospital had a comorbidity rate of 16% (20), whereas the private hospital had a substantially greater rate of 26.4% (33).

Out of 53 prescriptions containing antibiotics, 10.4% (13) cefixime and tobramycin + dexamethsone 0.3% was the most common in the government hospital. On the other hand out of 64 about 9.6% (12) ceftrixone was the most common prescribed antibiotic in private hospital. Antibiotic combinations were used in 6.4% prescriptions in government hospital and the most commonly combined antibiotic was 2.4% (3) metronidazole + co- amoxiclav and moxifloxacin + tobramycin. On the other hand about 18.4% prescriptions were prescribed in combination in private hospital and the commonly prescribed antibiotic combinations were 5.6% (7) metronidazole + ciprofloxacin respectively. Clinic administrators and outpatient physicians may establish rules and initiatives into place to support appropriate antibiotic prescription practices.

Conclusion

The current study revealed that various indicators, such as antibiotic use, injectable prescriptions, generic prescriptions, and a high level of polypharmacy, deviated from WHO guidelines. Prescriptions lack adequate patient information, medication information, and prescriber information. This may be due to a lack of highly skilled physicians and pharmacists to focus on targeted therapy. Antibiotics and injections were overprescribed in both government and public hospitals due to the lack of established guidelines for their prescribing.

Irrational prescribing and patient use of drugs can result in excessive costs for patients. Some prescribing trends raise concerns and require attention. This study can serve as a framework for further prescription audit research, focusing on educational interventions and improving prescribing patterns. Prescription audits enhance patient care quality.

Limitation and future recommendation

Although the current study included a small sample size, limited time, and fewer resources, larger studies could be carried out by collaborating with other institutions or researchers on data and resources, which can significantly improve the study's consistency and scope while reducing resource constraints. Fewer participants were selected and limited to Pakistan's twin cities; it might be expanded to include participants from all over Pakistan.

Frontier in Medical & Health Research

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Conflicts of Interest

The authors declare they have no conflicts of interest.

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Authors' Contribution

Nida Khalid and Kashif Shaukat prepared, reviewed the questionnaire, and collected the data. Ayesha Sana and Najam Us Sahar analysed the data and wrote the manuscript with the help of Dr Kashif Iqbal. All authors participated in reading and critically revising the manuscript and approving the final version. All authors agreed to be accountable regarding all aspects of the study.

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