

RESEARCH ARTICLE

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Evaluating prescription errors and prescribing indicators in the outpatient department of a tertiary care hospital quetta, Pakistan

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Abstract

Objectives This study aimed to evaluate prescription patterns, in healthcare settings, particularly in the outpatient department of Sandeman Provincial Hospital in Quetta, Pakistan, is essential for optimizing patient care, promoting rational drug use, and addressing public health challenges.

Methods A cross sectional prospective study was conducted in outpatient department of Sandeman Provincial Hospital, Quetta Pakistan. Nine hundred and sixty prescription were evaluated during the time period September and October 2022 and the world health organization prescribing indicators were used as standard. The data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 software. Descriptive statistics were employed to summarize the prescription patterns, including frequencies, percentages, means, and standard deviations.

Results The average drugs per prescription were 3.6 and prescription with antibiotics were 58.3%. Prescription by generic were 10.7%, prescription with injection were 21.9% and prescription with drugs from essential drug list were 61.04%. The most prevalent commission error was the duration of therapy not mentioned 63.4%, followed by frequency not mentioned 27.2%. Other significant errors included dose strength not being specified (25.5%), dose not mentioned 17.0% and dosage form not mentioned 12.6%.

Conclusion The study reveals irrational prescribing practices within the study setting, with the observed values for prescribing indicators deviating from established norms. However, the percentage of encounters involving the prescription of injections fell within the optimal range.

Key words drug interactions, outpatient, prescription errors, prescribing indicators

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Introduction

Drug therapy is the first option to treat a disease conditions and improve patient's health related quality of life. Appropriate medicines play a very vital role in the drug therapy to achieve the defined outcomes. Appropriate use of medicines is crucial for providing optimal medical care to the patients. Prescriptions serve as the primary means through which healthcare providers communicate treatment plans and medication recommendations to patients. Prescription patterns in healthcare settings play a crucial role in shaping patient outcomes, healthcare costs, and the overall effectiveness of healthcare delivery systems [1]. The world health organization (WHO) provides detailed guidance for writing prescriptions to ensure safety, accuracy, and clarity. Prescriptions should include comprehensive patient information, such as full name, age, weight, and address, and must be dated to prevent misuse. Medications should be prescribed using their generic names with specified strength, dosage form, and quantity, along with clear dosage instructions and any specific usage instructions. The prescriber's name, signature, contact information, and professional identification number should be included for validation. Additionally, WHO advises against using abbreviations and emphasizes the importance of legibility to avoid dispensing errors, while also checking for patient allergies to ensure safety. Improper prescriptions not according to WHO standards can lead to prescription errors [2]. Prescription errors significantly contribute to the inappropriate use of medications, posing risks to patient safety and increasing healthcare costs. Incorrect prescribing can result in ineffective treatment, worsening of the disease, patient distress, and higher medication expenses [3]. These errors often stem from inadequate communication with patients, transcription mistakes, or failure to consider the patient's clinical condition during prescription writing. Shockingly, preventable errors, including prescription mistakes, rank as the third leading cause of mortality after heart disease and cancer, leading to the deaths of 210,000 to 440,000 patients annually in American hospitals [4]. Similar statistics are observed in the United Kingdom, where prescription errors account for 1.5% of incidents in hospitals [3].

During the 1990s, the WHO, in partnership with the

International Network for Rational Use of Drugs (INRUD), established a set of metrics to assess the performance of healthcare facilities concerning drug utilization [1]. Similarly, the World Health Organization (WHO) established indicators, and including omission and commission errors, to assess prescriptions [5]. Unfortunately, in Pakistan, regulatory bodies have limited or no supervision over prescriptions issued by private and public sector healthcare providers. Consequently, this lack of regulation leads to the inappropriate use of medications, ultimately impacting the well-being of patients [6, 7].

Many studies have been conducted in Pakistan to evaluate, prescription patterns in outpatient settings, due to concerns about inappropriate prescribing practices, medication errors, and patient safety. A similar study was conducted in Karachi which found that high rates of polypharmacy, missing of name gender age patient and prescriber related information on prescriptions, and irrational use of antibiotics [8]. While another similar study was conducted in Quetta which found that a significant proportion of prescriptions lacked essential information, such as patient demographics and diagnosis [9].

This article aimed to explore the importance of prescription patterns, in healthcare settings, particularly in the outpatient department (OPD) of Sandeman Provincial Hospital (SPH) in Quetta, Pakistan. SPH, as a tertiary care hospital, has a critical role in providing specialized care to patients with complex conditions, ensuring responsible drug use, and addressing key public health concerns. By analyzing and understanding prescription practices, healthcare stakeholders can identify areas for improvement, implement evidence-based interventions, and enhance the overall quality and safety of healthcare delivery. This includes optimizing medication management, reducing adverse drug events, and promoting rational drug use.

Methodology

Study design and settings

The present study employed a retrospective cross-sectional design to assess the prescription patterns within the OPD of SPH in Quetta, Pakistan. SPH, is a prominent public tertiary care teaching hospital situated in the capital of Balochistan province (Quetta city), delivers healthcare services to approximately 2.2 million residents of Quetta. Furthermore, as the primary public tertiary care teaching hospital in Balochistan, it serves a broad catchment area encompassing the entire province and the adjacent border regions of Afghanistan and Iran. With an impressive capacity of 800 beds, SPH attends to a staggering 8,000 to 10,000 patients daily. The OPD patients receive check-ups and prescriptions from qualified medical professionals, such as physicians, surgeons, pediatric specialists, ophthalmologists, dermatologists, psychiatrists, gastroenterologists, chest physicians, general practitioners, and various other specialists.

Study duration and sample size

The study duration spanned two months, specifically September and October 2022. During this period, a total of 1042 prescriptions were randomly selected from the OPD of SPH irrespective of age and gender. However inpatient prescription patients discharge charts and blank prescriptions were excluded from the study as in figure one. The sample size of 960 prescriptions was supposed sufficient to provide a representative sample of prescription patterns during the study period.

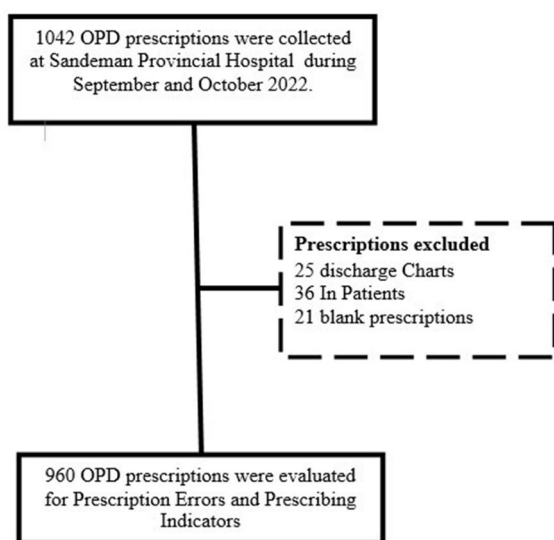


Figure 1. Study duration and flow chart.

Prescription selection and data collection

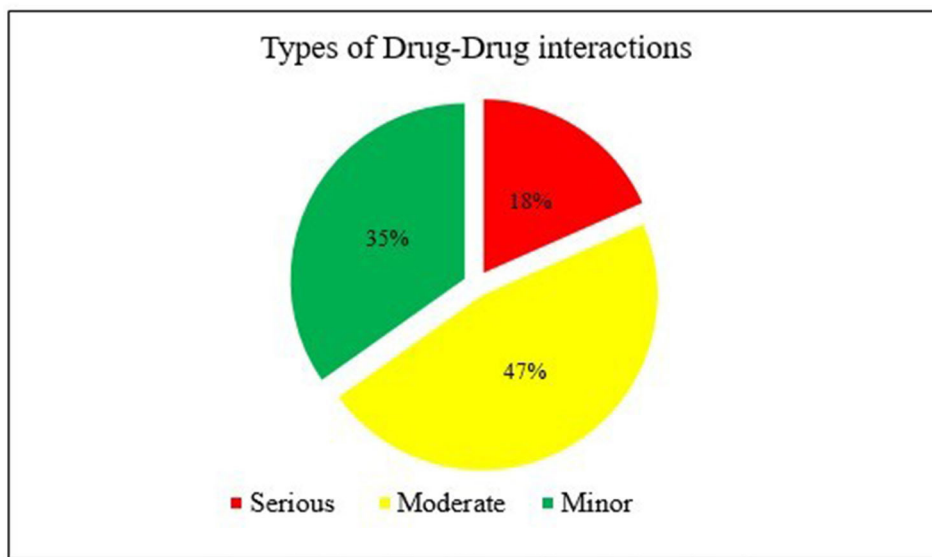


Figure 2. Severity of Drug-Drug interactions.

In the current study trained pharmacy personnel consisting of one assistant pharmacist and one pharmacist from the same hospital retrospectively collected the data on prescribing indicators and errors. The parameters recorded included patient information (e.g., demographics), prescriber details, patient complaints, investigation records, diagnosis notes, and medication details. The study focused on prescriptions from outpatient departments, excluding those of discharged and admitted patients. The tools used in the study underwent rigorous pre-testing to ensure accuracy, reliability, and validity. A multi-step process was employed, involving expert review for content accuracy and clarity, cognitive testing to identify confusing questions, item analysis for accuracy and reliability were performed.

Statistical analysis

The data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 software. Descriptive statistics were employed to summarize the prescription patterns, including frequencies, percentages, means, and standard deviations and z test with level of significant p value 0.05.

Prescribing indicators

The World health organization (WHO) prescribing indicators with their optimal values as shown in **Table 1** were used in the current study.

Prescription errors

In our study, prescription errors were categorized into two main types: omission errors and commission errors. Omission errors included omission related to patient information (such as name, age, gender, weight, and diagnosis) and prescriber details (including name, address, phone number, qualification, and date). Commission errors, on the other hand, related to inaccuracies in dosage, dosage form, strength, frequency, and treatment duration. Additionally, we examined drug interactions (DIs), classifying them as serious, moderate, and minor. The drug interaction were checked by using www.drugs.com and the book Drug Interaction Facts (2015 edition). It's important to note that the reported drug-drug interactions focused solely on potential harm, without assessing whether actual harm occurred in exposed patients.

Results

In the current study a total of 960 out of 1042 prescriptions were included in the study, randomly selected from the outpatient

Table 1. Prescription indicator and WHO standard values.

Prescription Indicator	WHO standard Values
Average Drugs per Prescription	1.6-1.8
Prescriptions with Antibiotics	20.0-26.8 %
Prescription with Generic	100 %
Prescription with Injection	13.4-24.1%
Drug from Essential drug list	100 %

Table 2. The Prescribing indicators with WHO standard values.

Prescription Indicator	Total	Value	WHO standard Values	P-value
Average Drugs per Prescription	3.6	3.6±1.4	1.6-1.8	<0.001
Prescriptions with Antibiotics	560	58.3 %	20.0-26.8 %	<0.001
Prescription with Generic	103	10.7 %	100 %	<0.001
Prescription with Injection	210	21.9 %	13.4-24.1%	0.123
Drug from Essential drug list	586	61.04%	100 %	<0.001

department of SPH in Quetta, Pakistan as shown in **Figure 1**. The average drugs per prescription were 3.6 (p-value=<0.001) and prescription with antibiotics were 58.3% (p-value=<0.001). Prescription by generic were 10.7% (p-value=<0.001), prescription with injection were 21.9% (p-value=<0.123) and prescription with drugs from essential drug list were 61.04% (p-value=<0.001) as shown in **Table 2**.

Prescription errors

Omission errors: The **Table 1** presents the distribution of prescription parameters and their corresponding frequencies and percentages, among the prescription parameters, the lack of patient demographics, including name, age, gender, weight, and diagnosis was observed in 2.6%, 59.9%, 80.0%, 91.7% and 47.9% of prescriptions, respectively were highly significant with a p-value=<0.001. In terms of prescriber details, incomplete information, particularly the absence of prescriber name, qualification, address/ phone number and date was noted in 29.5%, 45.6%, 48.0 and 31.3% of prescriptions, respectively were highly significant with a p-value=<0.001 as shown in **Table 3**.

Commission errors: The most prevalent commission error was the duration of therapy not mentioned 63.4%, (p-value=<0.05) followed by frequency not mentioned 27.2% (p-value=<0.001).

Other significant errors included dose strength not being specified (25.5%) (p-value =<0.05), dose not mentioned 17.0% (p-value=<0.05) and dosage form not mentioned 12.6% (p-value=<0.05) as shown in **Table 4**.

Errors related to drug-drug interactions: In current study total 871 drug-drug interaction were identified in 960 prescriptions. Among them serious interactions were 16.7%, followed by moderate interactions 42.5%, and minor interactions 31.6% as shown in **Table 5** and **Figure 2**.

Discussion

Irrational prescribing practices are prevalent globally and can result in adverse outcomes for patients. In the current study, prescription errors and healthcare providers' drug utilization practices were evaluated against WHO established standards. Due to limited publications from Pakistan, our results could be as foundational data for policymakers to continuously monitor drug therapy and enhance processes. Moreover, our findings may attract the interest of healthcare providers in other countries with comparable drug utilization practices.

The current study found that mean of 3.6 drugs were advised per prescription exceeding the acceptable range (1.6-1.8) drugs per prescription. However lower values were observed in a study

Table 3. Prescriptions with omission errors.

Prescription Parameter N=960	Number of Prescriptions	Percentage (%)	p-value	
Patient Demographics not mentioned	Name	25	2.6	<0.001
	Age	572	59.9	<0.001
	Gender	768	80.0	<0.001
	Weight	880	91.7	<0.001
	Diagnosis	460	47.9	<0.001
Prescriber Details not mentioned	Prescriber Name	280	29.1	<0.001
	Prescriber Qualification	438	45.6	<0.001
	Address/ Phone number	461	48.0	<0.001
	Date	205	31.3	<0.001

Table 4. Prescriptions with commission errors.

Medication Errors	No of Prescription	Percentage (%)	p-value
Dosage form not Mentioned	121	12.6	<0.05
Dose strength not Mentioned	245	25.5	<0.001
Dose not Mentioned	163	17.0	<0.001
Frequency not Mentioned	261	27.2	<0.001
Duration of therapy not Mentioned	608	63.4	<0.001

conducted in Malawi (1.8) [10] and Zimbabwe (1.3) [11]. On the other hand, studies conducted in India and Nigeria reported (5.6) and (5.2) respectively [12, 13]. Several factors can lead to an increased number of drugs in a prescription. These may include inexperienced physicians, absence of evidence-based practices, incentives for prescribers, insufficient ongoing medical education, and a scarcity of suitable medications. Polypharmacy can negatively impact treatment outcomes as it increases the likelihood of non-compliance and adverse events. Additionally, unnecessary medications can have detrimental effects on healthcare budgets.

The current study found that only 10.7% of prescriptions were written using generic names, far below the optimal value of 100% by WHO. Alarming low rates of generic prescribing have also been reported in other countries such as Andorra (6%) [14] and Lebanon (2.9%) [15]. On the other hand, some countries have achieved near-optimal levels of generic prescribing, with rates as high as 92% in Timor-Leste [16] and 98.7% in Ethiopia [12].

Our findings indicate that 58.3% of prescriptions included antibiotics, falling outside the optimal range of 20.0-26.8%. This percentage was comparatively lower in many developing countries, such as Bangladesh (25%) [17] and Brazil (28.8%) [18]. On the other hand, some countries such as Kenya, Timor-Leste and Sudan have higher rates 73.4%, 70%, 70.4% of antibiotic prescribing respectively [17, 18]. Unnecessary antibiotic prescriptions can exacerbate antibiotic resistance, trigger adverse drug reactions (ADRs), and lead to frequent hospitalizations. In our study, 21.9% of prescriptions contained injections, falling within the optimal range of 13.4-24.1%. While this is encouraging, research conducted in Nepal (5.2%) [19] and Angola (4.6%) [18] reported even lower percentages. It's crucial to restrict the use of injections to emergency scenarios, given their higher cost compared to oral medications. Excessive use of injections can also elevate the risk of blood-borne diseases [2].

In our study rate of prescribing drugs from the Essential Drugs List (EDL), at 61.04%, falls below that reported in the Lao People's Democratic Republic and Bangladesh 86.2% and 85% respectively

[17, 18]. Rational prescribing requires choosing medications from the EDL, as these drugs are proven, reliable, and frequently more economical than branded options [9]. A prescription mirrors the prescriber's treatment approach and the healthcare system's dynamics within the community [5].

None of the 960 prescriptions analyzed in our study met all the standard prescription criteria. It is crucial to include comprehensive patient information on prescriptions to facilitate accurate dispensing by pharmacists. Patient name is a key identifier on a prescription, while the patient's weight and age are vital for calculating precise doses. Omitting age and weight can hinder pharmacists from reviewing and adjusting treatment regimens. Additionally, specifying gender is essential as certain medications may be effective for one gender but contraindicated for the other. Including the diagnosis in prescriptions, as recommended by WHO, aids pharmacists in interpreting illegible handwriting and ensuring accurate drug dispensing [5]. Remarkably, our study revealed that approximately 91.7% of prescriptions did not include the patient's weight information. Similarly, over 50% and 80% of prescriptions lacked the patient's age and gender, respectively. A study conducted in Saudi Arabia discovered that patients' names, age, gender, and diagnosis were absent in 14.5%, 10%, 4.1%, and 6.8% of prescriptions, respectively. Another study from India indicated that patient age was missing in 11% of prescriptions, gender in 10%, and weight in 100% [20].

Providing comprehensive information about the prescriber is essential in a prescription, as it allows pharmacists and other healthcare professionals to contact the prescriber for clarification or discussion regarding the prescribed medications. The World Health Organization (WHO) advises that each prescription should include thorough details about the prescribers, including their names, addresses, telephone numbers, qualifications, and registration numbers [5].

Ensuring comprehensive information regarding prescribed medications is vital for promoting the rational use of medicines and minimizing prescription errors. Insufficient details about

Table 5. Prescription errors related to drug-drug interactions.

Types of DD interactions	No of Prescription	Percentage (%)
Serious	160	16.7
Moderate	408	42.5
Minor	303	31.6

prescribed medicines can lead to under- or over-dosing. Additionally, incomplete treatment regimens may worsen morbidity, while unnecessarily prolonged treatment courses can result in adverse effects, potentially leading to catastrophic outcomes for patients and their families.

The results of this study underscore commission errors present in nearly all prescriptions, with a significant concern being the absence of the duration of therapy in almost 64% of the prescriptions. A study conducted in Bahrain revealed that the duration of treatment was missing in 18.5% of all prescriptions, and frequency information was absent in 3.7% [21]. Similarly, a study from Saudi Arabia indicated that the frequency and number of doses were omitted in 6.9% and 7.6% of total prescriptions, respectively. In an Indian study, it was found that the strength of prescribed medications was not specified in 26.8% of total prescriptions, the number of doses in 35.1%, and the duration of treatment in 26.2% [2].

While medicines play a vital role in healthcare delivery, they also carry inherent risks to patients, including preventable medication errors and unavoidable adverse drug effects (ADEs). Numerous studies have emphasized the impact of ADEs on patient hospitalizations [22, 23]. The risk of ADRs, such as interactions, is often linked to polypharmacy, defined as the simultaneous use of five or more drugs [24]. In this study, the average number of drugs per patient encounter was nearly 4, heightening the likelihood of potential drug interactions (DIs) and ADEs. Approximately 16% of the analyzed prescriptions included major potential drug-drug interactions. Preventing medication errors related to DIs is crucial to mitigate ADEs, as these errors contribute significantly to hospital admissions (3-23%), resulting in increased morbidity and mortality, imposing a considerable financial burden, and presenting a significant public health challenge [25, 26].

This study has some limitations. Firstly, it did not encompass prescriptions originating from private sector hospitals. The Private sector hospitals typically more information to promote the hospital and doctors to have large number of patients. Another constraint of this study pertains to its relatively to single hospital attributed to challenges in obtaining consent for data collection from pharmacy managers/owners or patients who were reluctant to share their prescriptions for various reasons.

Conclusion

The study uncovers irrational prescribing practices within the study setting, as evidenced by the observed values for prescribing indicators deviating from established WHO standards. However, it is worth noting that the percentage of encounters involving the prescription of injections fell within the optimal range. Despite this, a majority of the prescriptions failed to adhere to standard prescription writing protocols, with some prescriptions containing significant drug-drug interactions, which is a concerning finding. Based on these outcomes, it is recommended to prioritize continuous education and training for physicians regarding the rational prescribing of medications. It is essential to ensure the presence of pharmacists to accurately dispense medicines and provide patient counseling. Implementation of appropriate error reduction strategies, such as an error reporting system and computerized prescription system, can help mitigate preventable medication errors. Monitoring prescribers' prescription trends is advisable to facilitate ongoing enhancements. One of the study's key limitations is its limited generalizability, as it was conducted in a specific setting and may not be representative of other contexts and populations. Furthermore, additional research initiatives are encouraged to explain the factors contributing to the irrational use of drugs.

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Ethics approval

The ethical committee of Faculty of Pharmacy and Health Sciences University of Balochistan ethically approved the study.

Data availability

The data will be available upon request.

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Authors' contribution

Abdul Wahid conceptualized and supervised the study, while Shahbaz Babul, Ghulam Dastagir, M Pervaiz, Shoaib Ahmed collected Munir Ahmed, Shazia Bano, Mahtab Imam entered the data. Abdul Ghafar analyzed the data, and critically reviewed it.

Competing interests

The authors have diligently stated that they have no conflicts of interest to report.

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