

**Prescription Analysis of Outpatients in a Tertiary Care Hospital in Khyber Pakhtunkhwa, Pakistan**Khayal Muhammad<sup>1</sup>, Muhammad U. Amin<sup>2</sup>, Farman U. Khan<sup>1</sup>, Najlaa S. Ismael<sup>3\*</sup>, Sabi-Ur-Rehman<sup>2</sup>, Ali Ahmed<sup>4</sup>, Muhammad Saqlain<sup>5</sup>, Muhammad H. Butt<sup>6</sup>, Muhammad S. Latif<sup>7</sup>, Muhammad Kamran<sup>5</sup><sup>1</sup>Department of Clinical Pharmacy, Faculty of Pharmacy, Near East University, North Cyprus, Turkey<sup>2</sup>Department of Pharmacy, Abasyn University, Peshawar, Pakistan<sup>3</sup>Faculty of Pharmacy, Philadelphia University, Amman, Jordan<sup>4</sup>School of Pharmacy, Monash University, Subang Jaya, Selangor, Malaysia<sup>5</sup>Department of Pharmacy, Quaid-i-Azam University, Islamabad, Pakistan<sup>6</sup>Faculty of Pharmacy, University of Central Punjab, Lahore, Pakistan<sup>7</sup>Faculty of Pharmacy, Gomal University, D.I.Khan, Pakistan

## ARTICLE INFO

## ABSTRACT

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Rational use of therapeutic agents is a vital component of good health outcomes for patients as well as the community. The current study aimed to identify rational use of drugs, prescription errors and polypharmacy in outpatients at a teaching hospital in Khyber Pakhtunkhwa, Pakistan. A prospective cohort research study was conducted for analyzing prescription in the outpatient pharmacy department of Lady Reading Hospital, Khyber Pakhtunkhwa, Pakistan. A total of 326 prescriptions were examined through a random systematic sampling method. World Health Organization (WHO) core drug prescribing indicators and prescription legibility methods were used for prescription analysis. Using SPSS version 22.0, the collected data were recorded and analyzed after manual data verification. Of the total, 1,539 drugs were prescribed with a mean drug per prescription of 4.7 (Optimal value  $\leq 2$ ). Out of these, 65.3% (Optimal value  $< 30\%$ ) prescriptions consisting of antibiotics, Prescriptions with injectable medicines were 52.7% (Optimal value  $< 21.1\%$ ). Percentage of drugs prescribed with generic name was 6.9% and 85.4% were from National essential medicine list/hospital formulary (Optimal value = 100%) and on average each patient was prescribed with almost five drugs. Poor adherence to WHO prescribing indicators and prescribing errors were observed. To identify the root causes of prescription problems in these settings, a comprehensive study needs to be carried out, with this study as a starting point.

**Keywords:** Outpatients, Pakistan, Hospital, Prescription, Polypharmacy, Drug use.

**Introduction**

Prescription or prescribing error is a consequence of a prescribing judgment or prescription writing practice. A written prescription is a legal document, which shows instructions from a prescriber to a dispenser. So, it should be prepared with care and vigilance. Prescription errors lead to irrational use of medicines. Invalid and inappropriate prescribing is dangerous and can cause the ineffectiveness of treatment, distress to the patient, prolongation of disease boost cost.<sup>1</sup> Prescription errors can be classified into two important errors are omission errors and commission errors, the omission errors mean prescription missing essential information while the commission errors involve incorrect written information in the prescription.<sup>2</sup> To avoid such error, some components of the prescription may encourage the rational use of medication therapy. These components are Prescriber information, Patient information,

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Date prescribed, Superscription, Inscription, Subscription, Signa poor instructions given, leading to poor compliance and often improper use of the medication.<sup>3</sup>

Medication errors (ME) are the abnormal events linked to professional practices, health care products, procedures and have the potential to have long-term negative effects on the life of a patient and systems including administration, prescribing, order communication, product labelling, packaging, nomenclature, compounding, dispensing, distribution, education monitoring and usage.<sup>4</sup> ME occurs commonly among inpatients with adverse events occurring in an estimated 3.70% to 16.60% of hospital admissions. In outpatients, neither the magnitude nor the severity of the consequences of ME has been well defined.<sup>5</sup> Healthcare system has no structured mechanism to monitor drug use. Once a prescription has been written; various elements may interfere between the intended prescription and the drug administration resulting in dose changes, changes in the frequency of administration, and even change the identity of the drug.<sup>3</sup> In Pakistan, approximately 30% of the errors in which the majority are prescribing errors occur during patient hospitalization.<sup>5</sup> The adult patients are at high risk of ME and have, therefore, a great tendency for detrimental and inoperable errors.<sup>6</sup> Among the older people, improper dose (26%) and omission (26%) were the most common types of medication errors.<sup>7,8</sup> Thus, the practices of drug prescription in most of the developing countries i.e. Pakistan are often inappropriate and the need for legislation and registration of these patterns is important to promote prescribing standards.<sup>9</sup>

In Pakistan, physicians prescribe medications, and patients purchase them from retail drug stores which are mostly under the supervision of non-qualified and nonprofessional individuals.<sup>8</sup> Furthermore, there is no appropriate guidance about medication management, duration of use, dose adjustment, patient counseling and education. Therefore, we carried out this study to determine the extent of rational use of drugs, prevalence of prescription errors and polypharmacy in the teaching hospital of Pakistan.

## Materials and Methods

### Study Setting

The study was carried out in the outpatient pharmacy departments in Lady Reading Hospital, Khyber Pakhtunkhwa, Pakistan. This hospital provides health care and referral services inside the country and across the border from the neighboring cities and villages of Afghanistan.

### Study Design

A prospective cohort study was carried out in the busy outpatient pharmacy department, from 1st January 2020 to 1st March 2020 (60 days). This hospital pharmacy is very busy, and it receives almost 1357 prescriptions per day. Therefore, random sampling technique was used, every day, about 10-15 prescription images were captured and then evaluated for prescribing pattern, prescription errors and polypharmacy. Patients of different age groups were included. Prescriptions and prescribed medications to each patient were evaluated.

### Ethical approval

Ethical approval was obtained from the ethical committee of Abasyn University Peshawar with reference no: AUP-ECP-130/20. The study was conducted outside wards in the pharmacy department, however, before taking images of prescription, only voluntary informed consent was taken from each patient.

### Drug Prescribing Pattern

Wonté. M<sup>6</sup>, assess the medication related problems among geriatrics individuals but for this study we generalized the tool for assessing prescription of all outpatients department patients.<sup>8</sup> Following WHO (World health organization), prescribing indicators were used to assess the drug prescribing patterns:

1. Drugs per encounter (Avg. No) = (Drugs prescribed (total number) ÷ (encounters evaluated (total number))).
2. Drugs given by generic name (% age) = (No. of drugs given by generic name) ÷ (Total No. of drugs prescribed) x 100.
3. Percentage of encounters with an antibiotic prescribed (PEAP) = (number of patients (Pt) came across for the period of which an antibiotic was given) ÷ (Total No. of encounters surveyed) x 100.
4. Percentage of encounters with an injection given = (No of pt. encounters during which an injection was given) ÷ (Total No. of encounters surveyed) x 100.
5. Percentage of drugs written from essential drug list = (No. of drugs written from essential drug list) ÷ (Total No. of written drugs) x 100.<sup>2</sup>

Similarly, along with WHO Indicators, the legibility of prescriptions was also evaluated for prescribing pattern. Those prescriptions having all aspects clear to read with or without effort were considered legible prescriptions (LP) while prescriptions that were having at least one aspect partially unclear were considered illegible prescription (IP).<sup>4</sup>

The following WHO prescribing indicators were used to evaluate the prescription pattern in the health care facility i.e. average number of drugs per encounter, percentage of drugs prescribed by generic name, and encounters with (i) percentage of encounters with an antibiotic prescribed (ii) an injection prescribed and also percentage of drugs prescribed from essential drugs list.

### Prescribing Errors

First prescriptions were checked for their proper format and essential elements mentioned by Chui<sup>10</sup>, but we point out Superscription; that comprises the date on the prescription, patient demographic profile i.e. name, address, weight, and age etc., and the symbol Rx. Inscription; it

contains the official names and amount or strength of each ingredient to be compounded. Subscription; It includes the instruction to the pharmacist. Transcription; signature (direction to the patients regarding the methods of administration) and signature (of identification of prescriber) both come under transcription. Prescribing errors or prescription errors were determined through the method followed by Sapkota<sup>11</sup> and errors in the prescription writing were classified as;<sup>5</sup>

1. Omission errors (when dose or rate, concentration, dosage form, frequency, duration, route omitted and when the missing signature of the prescriber).
2. Nonstandard and abbreviated drug names or spelling mistakes.
3. Error-prone abbreviations, dose and symbols designations.
4. When existing in more than one strength of the tablet and prescribing one tablet of drug.
5. Writing mg when µg was proposed

### Polypharmacy

The collected prescriptions were assessed for polypharmacy based on the number of drugs and benefit. Based on the number of drugs prescribed by the physician to the patients polypharmacy were categorized into two types, Minor Polypharmacy (Mn.PP); those prescriptions having 2-4 medicines, while Major Polypharmacy (Mj.PP); were those prescriptions having five or more than five medicines prescribed.<sup>10</sup> Similarly On the basis of therapeutic benefit again two types of polypharmacy were identified, Therapeutic Polypharmacy (Th.PP); is the polypharmacy in prescriptions that contains multi drugs for a specific condition to achieve the desired outcomes; for example: for the treatment of a specific disease, combination of drugs are used in order to eliminate the adverse drug reactions (ADRs) of another drug or to increase the therapeutic effect of other drugs, Similarly Contra-Therapeutic Polypharmacy (C-Th.PP); when numerous drugs are often prescribed to the patient without proper monitoring and leading to the patient experiencing ADRs.<sup>7</sup> Prescriptions were evaluated for various other classes of polypharmacy, for example; Same Class Polypharmacy; those prescriptions having polypharmacy belonging to the same class of drug for the management of a clinical condition is perceived as same class polypharmacy prescriptions. Multi-Class Polypharmacy; prescriptions having several drugs from a different class to treat a clinical state as termed as multi-class polypharmacy. Adjunctive Polypharmacy; prescriptions which have one drug from distinct class is given to treat the non-therapeutic condition of another drug is considered as adjunctive polypharmacy. Augmented Polypharmacy; prescriptions having polypharmacy in which one drug in the therapeutic dose and another drug from different class in a dose less than the normal is given to treat a condition is distinguished as augmented polypharmacy.<sup>8</sup>

### Statistical analysis

The following WHO prescribing indicators were used to evaluate the prescription pattern in the health facility, namely, average number of drugs per encounter, % of drugs prescribed by generic name, and encounters with

- (i) An antibiotic prescribed
- (ii) An injection prescribed
- (iii) Percentage of drugs prescribed from essential drugs list.

Prospective enquiries were made as to the availability of a copy of the essential drugs list at the point of prescription. SPSS version 16 (Chicago, IL, USA), where appropriate; were used for descriptive statistics (mean, median, range, proportions and percentages).

## Results and Discussion

A total of 326 patient's prescription were studied. Comprising of 202 (61.96%) male and 124 (38.03%) female patients' prescriptions. The median age was 36 years, while median numbers of prescribed medications were 5. The average number of drugs per encounter in our research is greater than the findings observed in previous studies. Our findings of polypharmacy were higher than the values reported from Yemen 1.5, Uganda 1.9, Sudan 1.4, Tanzania 2.3, 1.44 in

Bangladesh and Nigeria (3.16).<sup>12</sup> However, these results were less than the studies carried out in Ghana (4.8  $\approx$  5), Nigeria (6.1)<sup>13</sup> and Nepal (9.8  $\approx$  10).<sup>14</sup>

#### Drug prescribing pattern

In this study, the prescribers, as expected, were mainly physicians. The average number of drugs per prescription was 4.72 with 1539 drugs were prescribed in 326 prescription. In Table 1 the pattern of WHO core drug use indicators were tableted in detail. In Pakistan, most of the drugs are prescribed by their brand name, and very few are prescribed by generic name.<sup>11</sup> This study found only 6.95% of the drugs, that were prescribed by their generic name, that was less than a reported (23%)<sup>11</sup>, (53.64%)<sup>15</sup> and (84%).<sup>16</sup>

In the current study, 65.33% of encounters had antibiotics prescribed, which is very greater than the reference values mention by WHO for the health facility core prescribing indicators (20.0 – 25.43%).<sup>17</sup> Similarly, 47.5 to 100% of encounters with antibiotic prescriptions were reported by Hogerzeil *et al.* in developing countries.<sup>18</sup> In a similar survey conducted in 2012, reported 18%.<sup>11</sup> In Pakistan, 100% prevalence of antibiotics was reported in a sample of 1843 prescriptions.<sup>19</sup> In our study, the typical parenteral prescribing pattern was found in 52.76% of the prescriptions; in which parenteral encounter ratio was highest among male patients (54.65%). This is low when correlated with results from previous studies carried out in different countries like Nigeria 71.74%, Iran 58%,<sup>20</sup> Ghana 80%.<sup>21</sup> While it is too high when judge against the findings that were reported in India 3.9%,<sup>22</sup> Tanzania 19%,<sup>23</sup> Pakistan 34.27%,<sup>24</sup> and Nigeria 26.9%.<sup>25</sup> Thus, there is a serious need to decrease usage of injection in all health care level and especially in outpatients' settings; where relatively stable patients are seen and followed up routinely for their home medications and treatment; so in this settings need for injections

might be minimal as compared to the accident and emergency department of the hospital.

In such prescribing pattern, the probability of injection-related hazards and infections such as hepatitis, tissue necrosis, HIV and pain may increase.<sup>26</sup> In 2019 in Sindh, Pakistan a number of new pediatrics HIV cases emerged due to irrational usage of syringes as they were not discarded after use.<sup>27</sup> The 85.44% of all drugs prescribed in our study were listed in the WHO Essential Drug List (EDL) issued by the Directorate-General for Health Services KP in 2013 and available on the KP Pakistan HRA website. However, EDL were not available in most of the health facilities of the province. These findings are higher than the studies carried out in Nigeria and Srilanka, which were from the range of 23.6-80% drugs that were prescribed from EDL.<sup>28</sup> Prescribing patterns should, therefore, be promoted and encouraged to make the best use of inadequate economic resources, to have satisfactory safety and to meet the health requirements of the community. Moreover, in our study, most of the prescriptions were written with poor handwriting. In Pakistan, the physician's prescribed medication by manually instead of electronic prescriptions which leads to unclear and unexpressive prescribing patterns that may interfere with effective communication and endangers patient care.<sup>29</sup> In Table 2 the legible and illegible prescription based on gender and age of patients demonstrate that most of the legible prescription was prescribed in 31-50 year old age group prescription.

#### Prescription Errors

Each prescription was checked for its proper format and essential elements mentioned in Table 3. A total of 1,023 prescription writing errors were found among the randomly selected 326 prescriptions. Table 4 indicates types of error observed and their percentage of incidence.

**Table 1:** Pattern of WHO Core Drug Use Indicators (n = 326)

WHO Prescribing Indicators	Male n (%)	Female n (%)	Total n (%)
Average number of drugs per prescription	4.72	4.71	4.72
Total number of drugs prescribed	954 (61.98)	585 (38.01)	1539 (100)
Percentage of drugs prescribed by generic name	81 (8.49)	26 (4.44)	107 (6.95)
Percentage of encounters with an antibiotic	108 (50.70)	105 (49.29)	213 (65.33)
Percentage of encounters with an injection	94 (54.65)	78 (45.34)	172 (52.76)
Drugs prescribed from Essential medicine list	811 (61.67)	504 (38.32)	1315 (85.44)

**Table 2:** Legible and illegible Prescription among Gender and Age wise Patients

Age (years)	Legible Prescription (LP)		Illegible prescription (IP)		(LP + IP) n (%)
	Male n (%)	Female n (%)	Male n (%)	Female n (%)	
<10	6 (54.54)	5 (45.45)	5 (62.50)	3 (37.50)	11 (57.89)
					8 (42.10)
11-30	19 (14.61)	14 (10.76)	15 (71.42)	6 (28.57)	33 (61.11)
					21 (38.88)
31-50	72 (55.38)	34 (43.03)	38 (57.57)	28 (42.42)	106 (61.62)
					66 (38.37)
51-70	30 (23.07)	23 (29.11)	11 (64.70)	6 (35.29)	53 (75.71)
					17 (24.28)
>71	3 (2.30)	3 (3.79)	3 (60.00)	2 (40.00)	6 (54.54)
					5 (45.45)
Total n (%)	130 (64.35)	79 (63.70)	72 (35.64)	45 (36.29)	209 (64.11)
					117 (35.88)

In our study, 35.88% of the prescription were illegible prescription, which was due to the poor handwriting that may lead to dispensing the wrong medications. These results of studies are contrasted with those reported by Al Slamah, Thamer., *et al.* (64.3%),<sup>30</sup> Tobaiqy, M. and Stewart, D. (7.2%)<sup>31</sup> and Nkera-Gutabara, J.G. and Ragaven, L.B., 2020 (15%).<sup>32</sup> Our result somewhat contrasted with the findings of Irshaid *et al.*, Balbaid and Al-Dawood, and Makonnen *et al.*<sup>30, 33, 34</sup> The study has revealed a high propensity to omit required information (like. starting date of a drug, signature of prescribing doctor, dose, dosage form, strength, route, drug spellings etc.) in the prescriptions received in the outpatient pharmacy. Though such frequencies were recorded, such variables were comparable with those reported in the study by Basnet, S., *et al.*<sup>20</sup> If possible, missing information should be avoided. A prescription is suitable only if the physician enters all the necessary essential elements. Any information that may be missing can result in the incidence of more severe errors that may lead to health hazard medication toxicities.

**Polypharmacy**

Rational drug prescribing enforces on the use of a minimum number of drugs to get the best promising outcome in the shortest period with cost-effectiveness. Since WHO has recommended that per prescription, an average number of drugs should be 2.0.<sup>9</sup> This study encountered an average of 4.72 ≈ 5 drugs per prescription; that reflects polypharmacy. We further evaluated the prescription for its various types i.e. Superscriptions, Incriptions, Subscription and Transcription.

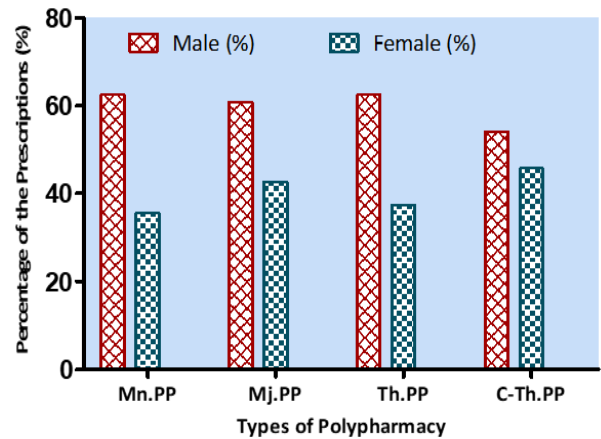
Based on the number of drugs, minor Polypharmacy (Mn.PP) and major Polypharmacy (Mj.PP) types were pinpointed. In male 135 (62.50%) while that in female 77 (35.64%) of prescriptions were that of Mn.PP, while 67 (60.90%) and 47 (42.72%) prescriptions were that of Mj.PP found in male and female, respectively. While based on benefits, the percentage of Th.PP and C-Th.PP types were highest among male 189 (62.58%) patients as compared to female; those were 113 (37.41%). Figure 1; shows the percentage of Mn.PP, Mj.PP, Th.PP and C-Th.PP types present among the selected prescriptions. Similarly, various classes of polypharmacy were shown in Figure 2; among male and female patient’s prescriptions. Same Class PP and adjunctive PP were reported highest among male patients prescription while that of Multi-Class PP were among female patients prescriptions.

**Table 3:** Design and essential elements of prescription

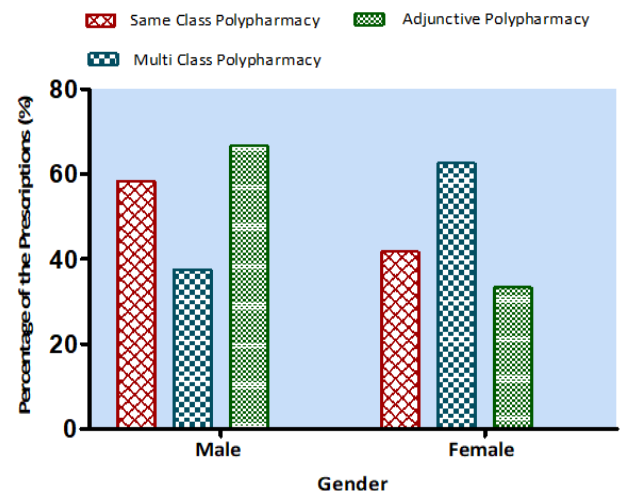
Contents	n (%)
<b>Superscription</b>	
Prescription date	326 (100.0)
Name of patient written	326 (100.0)
Current age of the patient	128 (39.26)
Sex of patients mention	280 (85.88)
Patients address mentioned in prescription	40 (12.26)
Symbol Rx mentioned in prescriptions	298 (91.41)
<b>Inscription</b>	
Name and dosage form of drug prescribed	307 (94.17)
Strength and proper dose present in prescription	301 (92.33)
<b>Subscription</b>	
Written instructions to the Pharmacist	0
<b>Transcription</b>	
Signature i.e. written instructions to the patient.	326 (100.0)
Signature i.e. Prescriber identity in prescription	326 (100.0)

**Table 4:** Errors in prescription writing

Types of errors	Percentage (%) of errors
Rate or dose of drug not stated	25 (2.44)
Dose frequency not stated	13 (1.27)
Initial date not stated	0 (0.00)
Dosage form not stated	29 (2.83)
Route of administration not stated	316 (30.88)
Missing prescriber signature	0 (0.00)
Drug names spelling mistakes(brand name)	273 (26.68)
Nonstandard and abbreviated drug names	41 (4.00)
Error-prone abbreviations, symbols and dose designation	322 (31.47)
Prescribing one tablet of a drug when available in more than one strength of tablet	4 (0.39)
Total	1023 (100.0)



**Figure 1:** Types of Polypharmacy and its Percentages among Male and Female Patients Prescriptions



**Figure 2:** Percentages of Various Classes of Polypharmacy among Male and Female Patients

This study showed the need to consider prescription errors during prescribing practices. Furthermore, information that come out from this study is the requisite to keep the record of prescriptions, the route of drug administration, frequency, date of starting dose and stopping pattern of drug should be carefully monitored. Moreover, drug polypharmacy causes adversarial impact on the therapeutic outcome of patients, increased drug-drug interactions, drug adverse effects, and non-compliance in patients.<sup>34</sup>

#### Strengths and Limitations

Few limitations of the study include that it was carried out in a single hospital; hence the result cannot be generalized. Moreover, we analyzed the general prescription not specific to any ward or disease. Our study includes patients of different age groups and also different parts of prescription from different wards, and different specialties were analyzed, which are the major strengths of our study.

#### Conclusion

This study showed that polypharmacy and the prescription errors in the prescribing practices are high at the grassroots in KP, Pakistan. These serious deficiencies in the existing health care practices suggest the need to establish rational drug therapy. There is a proper need for physician education on appropriate prescription writing and follow-up on the matter and adequate monitoring for a newly qualified physician. Still, many of these were slight and improbable to have had severe consequences; several were of potentially immense significance. Regarding prescription, there are no basic standards for prescription writing in Pakistan. Thus, for an ideal prescription, the essential requirement is that the prescription must be clear and suitable in all aspects that reduce the risk of medication errors and polypharmacy. Further detailed studies on medication error are essential to anticipate the scale of the problem and their economic impact.

#### Conflict of interest

The authors declare no conflict of interest.

#### Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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