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PRESCRIBING TRENDS AND DRUG-RELATED PROBLEMS AT TERTIARY HEALTHCARE FACILITY: A DESCRIPTIVE CROSS-SECTIONAL STUDY FROM PAKISTAN

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2. ABSTRACT:

Objective: Irrational drug use is a key factor in therapeutic failure, high treatment costs, antibiotic resistance, and increased adverse effects, negatively impacting patient quality of life. This study aimed to evaluate the WHO/INRUD core drug use indicators and drug problems at Fauji Foundation Hospital, Rawalpindi, Pakistan.

Material & Method: Data was collected from individual patient records in IPD and OPD using a structured form. Information from prescriptions between 1st March and 21st May 2024 was gathered retrospectively. Medication errors like drug-drug interactions, dosing errors, and contradictions were identified using Medscape (Interaction Checker) and pharmacopeia applications. Data analysis was done using SPSS.

Results: The study reviewed 3570 medicines across 600 prescription encounters, with an average of 5.95 drugs per prescription (SD 2.52), and only 3.36% prescribed by generic names. Antibiotics and injectables accounted for 12.9% and 33.7% of prescriptions, respectively, with 88.0% of drugs from the essential list. While 59% of patient consultations met WHO standards, 60% of dispensing times were shorter than recommended, and only 14% of patients had correct knowledge of dosages. Multimorbidity and older patients received more medications per prescription. Drug interactions and contradictions were found in 42% and 43% of prescriptions, respectively. Some prescriptions lacked essential drug and patient information.

Conclusion: The study highlighted significant gaps in patient knowledge and prescribing practices. High medication counts per prescription, low generic prescribing rates, frequent use of injectables, and prescribing errors contributed to drug interactions, contradictions, higher treatment costs, longer hospital stays, and more adverse effects. Improvements in prescribing practices and patient education are necessary for better outcomes and rational drug use.

3. Keywords: Irrationality, Antibiotics, Adverse effects, Patient care indicators, Prescriptions

4. INTRODUCTION:

4.1 Contextual Background:

In developing countries, including Pakistan, irrational drug use remains a pressing issue, compromising the safety, quality, and efficacy of medical treatments. Improper prescribing is prevalent in approximately 60% of public hospitals and 70% of private hospitals, leading to poor treatment outcomes, increased healthcare costs, and wastage of resources (1). Despite the introduction of the Essential Medicine Program in Pakistan during the 1970s, irrational medication use continues to be a major concern. Addressing these issues through nationwide drug prescription analysis is critical to formulating effective policies, and clinical guidelines, and improving patient awareness (2).

The WHO defines rational drug use as prescribing medications appropriate for the patient's clinical needs, in correct doses, for the necessary duration, and at the lowest possible cost to both patients and the community (3). Medicines must be used very carefully and with proper counselling as it has side effects also along with the benefits (4). However, studies indicate that over 50% of medications are prescribed or sold incorrectly, particularly due to polypharmacy, misuse of antibiotics, and injectables, with adverse consequences for patient outcomes (5). Polypharmacy, defined as the use of more than five drugs per patient, is notably high among elderly patients and those with chronic conditions, increasing the risk of adverse drug reactions (ADRs) and treatment failures (6).

The WHO/INRUD core drug use indicators provide a framework for evaluating prescribing practices. These indicators include the average number of drugs per prescription, the percentage of generic prescribing, and the use of antibiotics, injectables, and essential medicines (7). In a study from Lahore, antibiotics were prescribed in 41% of cases, injectables in 19%, and only 28.4% of prescriptions adhered to the Essential Medicines List (8). Regular monitoring of these indicators is crucial for improving prescribing practices and reducing the risks associated with polypharmacy (9).

In Pakistan, self-medication, poor adherence to clinical guidelines, and overuse of antibiotics and injectables are prevalent, contributing to irrational drug use (10). The healthcare system, particularly in underdeveloped regions, faces a range of issues, including poor patient knowledge, inadequate documentation, and insufficient regulation (11). These challenges are compounded by the influence of pharmaceutical companies, healthcare providers' profit motives, and a lack of awareness about rational drug use (12). As a result, unsafe and ineffective treatments, prolonged illnesses, and increased antibiotic resistance are widespread (13).

Drug-drug interactions (DDIs) pose significant risks, especially in polypharmacy cases. These interactions can alter the efficacy and safety of medications, leading to severe side effects or treatment failures (14). For instance, antacids can reduce the absorption of tetracyclines, and combining certain cardiovascular drugs may result in hazardous outcomes like bradycardia or hypotension (11, 15). Oncology patients are particularly vulnerable to DDIs due to their complex treatment regimens, often leading to adverse effects that compromise therapy (16). Monitoring and adjusting drug therapy based on potential interactions are essential to ensure patient safety and treatment efficacy. With that drug individualization is important (17).

WHO patient care and facility indicators assess the quality of healthcare delivery by evaluating consultation and dispensing times, patient knowledge of correct dosages, and the availability of essential medicines (18).. Inappropriate use of medicines due to short consultation times and inadequate patient education contributes to poor treatment outcomes. In Pakistan, dispensing times are often shorter than recommended, and patient knowledge of correct dosages remains low (19). Ensuring that essential medicines and clinical guidelines are readily accessible is also vital for improving healthcare services and patient outcomes (20).

This study identifies critical issues in rational drug use in tertiary care hospitals in Rawalpindi, focusing on polypharmacy and WHO indicators. Drug interactions involving antibiotics, cardiovascular, antihypertensive, anticancer, NSAIDs, and renal medications highlight concerns about adverse drug reactions (ADRs) due to irrational use. Improper dosages and drug combinations can lead to significant complications. Strict adherence to WHO guidelines is essential for improving

patient safety, optimizing treatment outcomes, and minimizing healthcare costs. This evaluation serves as a foundation for future research and policy reforms to promote rational drug use and enhance healthcare quality in Pakistan.

5. MATERIALS & METHODS:

5.1 Introduction:

Analysis of all the prescriptions collected retrospectively using an observational study design was done using SPSS by applying different statistical methods. The prescriptions were selected using inclusion and exclusion criteria, and interaction data was collected from the interaction checker. All the data was summed up on an Excel sheet. WHO core indicators and other rational prescribing guidelines were used as standards.

5.2 Study Design:

The observational cross-sectional study design was selected as through this we can analyze our all variables at one time.

5.3 Study setting:

Fauji Foundation Hospital (FFH), a leading tertiary care facility in Rawalpindi, serves over a million people from Rawalpindi and Islamabad. With 837 beds and an average of 1,562 daily OPD patients, FFH offers a wide range of medical specialties, including cardiology, oncology, pediatrics, and surgery. The OPD operates 24/7, staffed by specialists, while the hospital pharmacy dispenses medications. FFH also functions as a teaching hospital and is equipped with modern labs and round-the-clock emergency services. Comprehensive prescription records are maintained for thorough evaluation of prescribing patterns.

5.4 Sampling technique

A convenience sampling approach was employed to select 600 prescriptions issued to patients. Data about medication errors, such as drug-drug interactions, dosing errors, and contradictions, was collected using Medscape (Interaction Checker) and pharmacopeia applications.

5.5 Data Collection:

Data was collected retrospectively from the inpatient and outpatient departments of the hospital. Performa was used to collect the data from prescriptions. Performa was made on Microsoft Word and later on, the Excel sheet was made using the data on Performa that we collected in 1 month.

5.5.1 Inclusion and Exclusion Criteria:

Patients aged 1 year and above were included, while records from antenatal and post-natal clinics, as well as purely surgical cases where medications were not typically prescribed, were excluded. Illegible prescriptions and those featuring non-standard abbreviations were also excluded to ensure data integrity. Dermatological prescriptions, pulmonary ward patients, and patients receiving ophthalmic and topical medications were also excluded.

5.5.2 Data Skimming:

Microsoft Excel 2019 was utilized to organize the data according to different variables and then the data skimming was done to focus on all the gaps and issues which are of concern to public health.

5.6 Data Analysis:

Prescription patterns were evaluated using WHO prescribing indicators, including the average number of drugs per encounter (1.6-1.8), the percentage of drugs prescribed by generic name (100%), the incidence of antibiotics (20-26.8%), and injections prescribed (13.4-24.1%). Additionally, the percentage of drugs prescribed from the essential drug list or formulary (100%) was assessed.

Dispensing indicators like average consultation time (greater or equal to 10 minutes), average dispensing time (less or equal to 90 seconds), percentage of drugs dispensed (100%), percentage of drugs adequately labeled (100%), and patient knowledge of correct dosage (100%) was also examined. Facility indicators were also analyzed like availability of essential medical list (100%) and availability of key medicines (100%). Data were analyzed using SPSS version 20, with one-way ANOVA, Man Whitney, Kruskal Wallis, and descriptive statistics (mean, frequency, and percentages) employed to present the findings.

5.7 Ethical Consideration:

Ethical approval for the study protocol was obtained from the Ethical Committee of Capital University of Science and Technology, Islamabad before commencement.
All the participants gave informed consent before the study. The research is approved by The Research Ethics Committee (REC)

6. RESULTS:

6.1 Demographic Characteristics of Respondents:

Of the total 1026 prescriptions retrospectively collected, 426 were excluded due to poor legibility, and data were recorded from the remaining 600 prescriptions. Age-wise distribution of the patients reveals that 23% (n=138) of patients were between the ages of 0-20 years, 6 % (n=36) were from age 21-40 years, 34% (n=204) were from age 41-60 years and 37% (n=222) were >60 years. Of the total 600 patients, 39% (n=234) were males and 61% (n=366) were females. Of the total 600 prescriptions, 45% of diagnoses were from cardiology, 11% from oncology, 7% from neurology, 8% from infectious diseases, and 29% from other diseases. 49% of patients didn't have any comorbidity, 26% of patients had 1 comorbidity, 17% had 2 comorbidities and 4% had 3 and 4 comorbidities each. Out of 600 prescriptions, 76% of patients were insured by the army, 4% were insured by the Navy, 4% were self-paid and 16% of patients were paid by other insurance. Of the 600 patients, 26% were from the medical ward, 11% from oncology, 28% from cardiology, 14% from pediatric, 2% from nephrology, and 19% from OPD (**Table 1**).

Table 1: Demographics of patients (n=600)

Group		n (%)
Age in year	0-20	138 (23)
	21-40	36 (6)
	41-60	204 (34)
	>60	222 (37)
Gender	Male	234 (39)
	Female	366 (61)
Diagnosis	Cardiology	276 (45)
	Oncology	66 (11)
	Neurology	42 (7)
	Infectious Disease	48 (8)
	Other	174 (29)
Comorbidity	0	294 (49)
	1	156 (26)
	2	102 (17)
	3	24 (4)
	4	24 (4)
Payment	Army	456 (76)
	Navy	24 (4)
	Self	24 (4)
	Insurance	96 (16)
Wards	Medical	156 (26)
	Oncology	66 (11)
	Cardiology	168 (28)
	Pediatric	84 (14)
	Nephrology	12 (2)

OPD	114 (19)

6.2 Prescribing Indicators

A total of 3,570 medicine products were prescribed in 600 prescription encounters as analyzed in this study. The average number of drugs per prescription was 5.95 with a (S. D= ±2.52), and the maximum number of drugs in a single prescription was 13. There was not a single prescription where no drug was prescribed. Brand names were used dominantly in prescribing patterns and only 3.36% out of 3,570 prescribed drugs were prescribed by generic names. Antibiotics constituted 12.9% of total drugs prescribed while injectables were prescribed 33.7%. Of the total drugs prescribed 88.0% were found in the National Essential Medicine List (NEML). Details of the WHO prescribing indicators as recorded by this study are given in (**Table 2**).

Table 2: Prescribing indicators

Indicator	Total Encounters/Drugs	Mean, SD, %	WHO Standard
Drugs prescribed per patient	3,570	5.95, (2.52)	1.6-1.8
Drugs prescribed by generic names	120	3.36%	100%
Encounter with antibiotics	459	12.9%	20.0-26.8%
Encounter with injections	1205	33.7%	13.4-24.1%
Drugs from the essential medicine list	3141	88.0%	100%

6.3 Patient care and facility indicators

The percentage of patients with consultation time >10 minutes was 59% and <10 minutes was 41%. The WHO standard for average consultation time is >10 minutes. Of the 600 prescriptions dispensed 40% were dispensed with dispensing time >90 seconds and 60% were dispensed in <90 seconds while the WHO standard for dispensing time is >90 seconds. **(Table 3).**

Table 3: Patient care and facility indicators

Patient care indicators	Percentage%	WHO Standard
% of consultation time >10 in minutes	59%	>10 min
% of dispensing time >90 in seconds	40%	>90s

6.4 Comorbidities

Out of 600 prescriptions, 28% of prescriptions had hypertension as a comorbid condition 25% had diabetes mellitus, 9% had IHD and 7% had CVD, while other comorbid conditions were less than 5%. Of the total 600 prescriptions, 49% of patients had no comorbid condition at all (**Figure 2**).

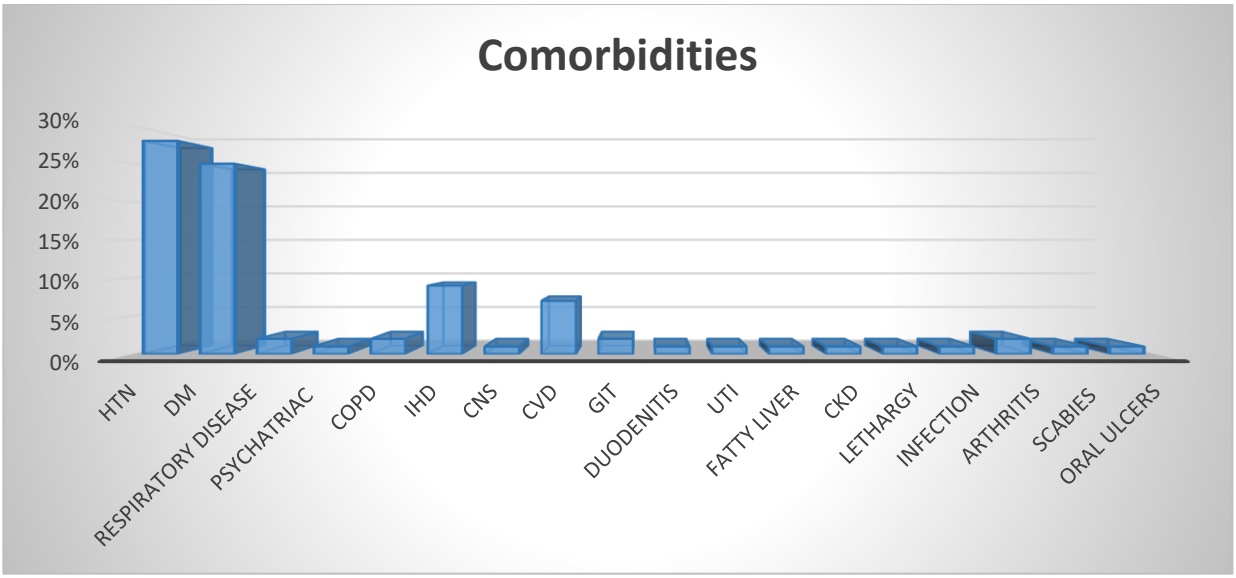

Figure 1: Comorbidities

Out of a total of 600 prescriptions, 43% of prescriptions had contraindications, and 57% of prescriptions were deprived of contraindications. The results are illustrated in the pie chart.

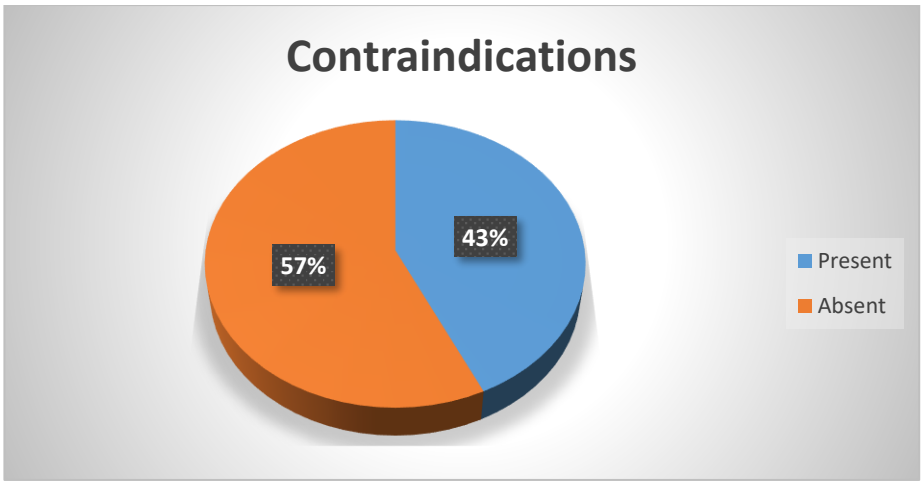

Figure 3: Contraindications

6.5 Association of Demographics with WHO Prescribing Indicators

A total of 3,570 medicine products were prescribed with which the average number of drugs per prescription was 5.95 (S. D= ±2.52), with the maximum number of drugs prescribed in a single prescription being 13. A significant difference ($p \geq 0.05$) was observed with the average number of drugs prescribed per prescription (DPPP) varying across different age groups, with the <20 years' age group averaging 35.37 drugs per prescription. The 21–40 year age group averaged 52.08, the 41–60 year age group averaged 54.24, and the > 60-year age group averaged 56.22.

No significant difference ($p \geq 0.05$) was observed in analysis by gender where it was revealed that males had an average DPPP of 44.14, while females had an average of 54.57 (P = .077). In terms of payment methods, those in the Army had an average DPPP of 51.99, Navy personnel of 52.88, self-paying patients 22.63, and those with insurance 49.81 (P = .261). No significant association was observed in payment methods for DPPP.

The antibiotics prescribed per prescription (APPP) also showed A significant difference ($p \geq 0.05$). The <20 years age group had an APPP of 69.54. The 21–40 year' age group had 32.17, the 41–60-year age group had 39.32, and the >60-year age group had 51.91 (P = .00), showing a strong association. Males had an APPP of 54.65 and females 47.84 (P = .213), indicating no significant difference ($p \geq 0.05$). A significant difference ($p \geq 0.05$) was observed in the analysis where the Army had an APPP of 46.66, the Navy at 41.00, self-paying patients at 68.88, and those with other insurance at 66.50.

The average injections per prescription (IPPP) followed a similar trend. The <20 years age group had an IPPP of 60.48, the 21–40 year' age group had 48.75, the 41–60 year' age group had 41.32, and the > 60-year age group had 53.01 (P = .08). Males had an IPPP of 51.18 and females 50.07, (P = .848) indicating no significant difference ($p \geq 0.05$). The Army had an IPPP of 46.27, the Navy 60.88, self-paying patients 52.25, and those with insurance 67.56 (P = .045) which shows a significant difference ($p \geq 0.05$).

A significant difference ($p \geq 0.05$) was observed in terms of drug prescribing by generic name (DPBG), the <20 years age group had a DPBG of 48.83. The 21–40 year' age group had 42.50, the 41–60 year' age group had 45.62, and the >60 year' age group had 57.32 (P = .033). Males had a DPBG of 53.69 and females 48.46 (P = .167), indicating no significant association ($p \geq 0.05$). The Army had a DPBG of 50.26, the Navy 42.50, self-paying patients 54.63, and those with insurance 52.63 (P = .749). This shows no association ($p \geq 0.05$).

The percentage of drugs prescribed from the Essential Medicines List (DEML) also varied. The < 20-year age group had a DEML of 32.39. The 21–40-year age group had 64.17, the 41–60-year age group had 59.43, and the >60-year age group had 51.34 (P = .003), indicating a significant association ($p \geq 0.05$). Males had a DEML of 37.49, and females 58.82 (P = .000), showing a strong association ($p \geq 0.05$). The Army had a DEML of 48.91, the Navy 64.25, self-paying patients 28.00, and those with insurance 60.22 (P = .142), which indicates no significant association ($p \geq 0.05$). Details of the WHO prescribing indicators as recorded by this study are given in (**Table 4**).

able 4: Association of demographics with WHO prescribing indicators

Group		DPPP		APPP		IPPP		DPBG		DEML	
		Mean	P value	Mean	P value	Mean	P value	Mean	P value	Mean	P value
Age	**0-20y**	35.37		69.54		60.48		48.83		32.39	
	21-40y	52.08	.038	32.17	.000	48.75	.088	42.50	.033	64.17	**.003**
	41-60y	54.24		39.32		41.32		45.62		59.43	
	>60y	56.22		51.91		53.01		57.32		51.34	
Gender	**Male**	44.14	.077	54.65	.213	51.18	.848	53.69	.167	37.49	**.000**
	Female	54.57		47.84		50.07		48.46		58.82	
Payment	**Army**	51.99		46.66		46.27		50.26		48.91	
	Navy	52.88	.261	41.00	.021	60.88	.045	42.50	.749	64.25	.142
	Self	22.63		68.88		52.25		54.63		28.00	
	Insurance	49.81		66.50		67.56		52.63		60.22	
Wards	**Medical**	47.79		61.54		64.56		44.37		57.56	
	Oncology	54.18		54.18		74.45		46.91		61.95	
	Cardiology	52.71	.262	41.36	.000	41.34	.000	60.09	.000	38.11	**.000**
	Pediatric	35.32		69.00		57.11		49.43		25.21	
	Nephrology	65.50		82.75		71.75		99.25		74.00	
	OPD	58.42		29.71		23.79		42.50		68.63	

6.6 Association of Demographics with WHO Patient Care Indicators

No significant difference ($p \geq 0.05$) was observed with consultation time. The average consultation time varied across different age groups. The < 20-year age group had an average consultation time of 44.91 minutes (P = .478), the 21–40-year age group had 46.00 minutes, the 41–60-year age group had 50.41 minutes, and the > 60-year age group had 54.78 minutes. When analyzing the data by gender, males had an average consultation time of 49.21 minutes (P = .675), while females had 51.33 minutes, showing no significant association ($p \geq 0.05$). In terms of payment methods, the Army Personnel had an average consultation time of 53.24 minutes (P = .99), Navy personnel 58.50 minutes, self-paying patients 33.50 minutes, and those with insurance 39.75 minutes. No significant association ($p \geq 0.05$) was observed in payment methods for consultation time.

The average dispensing time showed a significant association ($p \geq 0.05$). The < 20-year age group had an average dispensing time of 39.20 minutes. The 21–40-year age group had 55.50 minutes, the 41–60-year age group had 46.68 minutes, and the > 60-year age group had 60.23 minutes (P = .008), showing a significant association. Analysis by gender revealed that males had an average dispensing time of 44.60 minutes (P = .055), while females had 54.27 minutes, indicating a borderline significant association ($p \geq 0.05$). Army personnel had an average dispensing time of 49.58 minutes (P = .143), Navy personnel 68.00 minutes, self-paying patients 30.50 minutes, and those with insurance 55.50 minutes. No significant association ($p \geq 0.05$) was observed in payment methods for dispensing time. The average consultation time across different wards varied. The Medical ward had an average consultation time of 44.08 minutes (P = .608), the Oncology ward 57.36 minutes, the Cardiology ward 54.93 minutes, the Paediatric ward 49.57 minutes, the Nephrology ward 46.00 minutes, and the OPD ward 49.95 minutes, indicating no significant association ($p \geq 0.05$). The average dispensing time also varied across wards. The Medical ward had an average dispensing time of 55.50 minutes (P = .348), the Oncology ward 48.68 minutes, the Cardiology ward 53.71 minutes, the Pediatric ward 37.64 minutes, the Nephrology ward 55.50 minutes, and the OPD ward 48.92 minutes, showing no significant association ($p \geq 0.05$). All details are clarified in (**Table 5**).

Table 5: Association of demographics with WHO patient care indicators

Group		Consultation time		Dispensing time	
		Mean	P value	Mean	P value
Age	**0-20y**	44.91	.478	39.20	**.008**
	21-40y	46.00		55.50	
	41-60y	50.41		46.68	
	>60y	54.78		60.23	
Gender	**Male**	49.21	.675	44.60	.055
	Female	51.33		54.27	
Payment	**Army**	53.24	.99	49.58	.143
	Navy	58.50		68.00	
	Self	33.50		30.50	
	Insurance	39.75		55.50	
Wards	**Medical**	44.08	.608	55.50	.348
	Oncology	57.36		48.68	
	Cardiology	54.93		53.71	
	Pediatric	49.57		37.64	
	Nephrology	46.00		55.50	
	OPD	49.95		48.92	

6.7 Association of Demographics with Drug Problems

The average drug-drug interaction (DDI) varied across different age groups. The < 20-year age group had an average DDI of 58.46, the 21–40-year age group had 46.50, the 41–60-year age group had 50.91, and the > 60-year age group had 45.82 (P = .278), indicating no significant association ($p \geq 0.05$). When analyzing the nature of the interaction (NOI) by age, the <20-year age group had an average NOI of 55.33, the 21–40-year age group had 40.00, the 41–60-year age group had 52.18, and the >60-year age group had 47.66 (P = .488), showing no significant association ($p \geq 0.05$). The severity of interaction (SOI) also varied by age, with the <20-year age group averaging 57.70, the 21–40-year age group 50.42, the 41–60-year age group 51.21, and the >60-year age group 45.39 (P = .346), indicating no significant association ($p \geq 0.05$). Gender analysis revealed that males had an average DDI of 49.71, while females had 51.01 (P = .798), showing no significant association ($p \geq 0.05$). The NOI for males was 51.46 and for females 49.89 (P = .764), indicating no significant association. The SOI was 47.42 for males and 52.47 for females (P = .337), showing no significant association ($p \geq 0.05$).

In payment methods, those in the Army had an average DDI of 48.47, Navy personnel 71.50, self-paying patients 71.50, and those with insurance 49.63 (P = .100). A non-significant association ($p \geq 0.05$) was observed in the payment methods. The NOI for Army personnel was 49.53, for Navy 67.00, for self-paying patients 67.00, and insurance 46.84 (P = .288), showing no significant association ($p \geq 0.05$). The SOI for the Army was 48.22, Navy 71.50, for self-paying patients 71.50, and for insurance 50.81 (P = .112), indicating no significant association ($p \geq 0.05$). The average DDI across different wards varied. The Medical ward had an average DDI of 56.12, the Oncology ward 53.32, the Cardiology ward 44.71, the Paediatric ward 60.79, the Nephrology ward 46.50, and the OPD ward 42.55 (P = .192), indicating no significant association ($p \geq 0.05$). The NOI also varied across wards, with the medical ward averaging 53.23, the Oncology ward 52.41, the Cardiology ward 52.21, the Paediatric ward 55.43, the Nephrology ward 40.00, and the OPD ward 40.61 (P = .523), showing no significant association ($p \geq 0.05$). The SOI for the Medical ward was 57.42, the Oncology ward 56.23,

the Cardiology ward 42.00, the Paediatric ward 59.39, the Nephrology ward 54.00, and the OPD ward 43.32 (P = .119), indicating no significant association ($p \geq 0.05$). All the details are shown in (**Table 6**).

Table 6: Association of demographics with drug-related problems

Group		DDI		NOI		SOI	
		Mean	P value	Mean	P value	Mean	P value
Age	0-20y	58.46	.278	55.33	.488	57.70	.346
	21-40y	46.50		40.00		50.42	
	41-60y	50.91		52.18		51.21	
	>60y	45.82		47.66		45.39	
Gender	Male	49.71	.798	51.46	.764	47.42	.337
	Female	51.01		49.89		52.47	
Payment	Army	48.47	.100	49.53	.288	48.22	.112
	Navy	71.50		67.00		71.50	
	Self	71.50		67.00		71.50	
	Insurance	49.63		46.84		50.81	
Wards	Medical	56.12	.192	53.23	.523	57.42	.119
	Oncology	53.32		52.41		56.23	
	Cardiology	44.71		52.21		42.00	
	Pediatric	60.79		55.43		59.39	
	Nephrology	46.50		40.00		54.00	
	OPD	42.55		40.61		43.32	

7. DISCUSSION:

The evaluation of rational drug use and WHO indicators in tertiary care hospitals in Rawalpindi highlights critical areas requiring improvement to ensure patient safety and enhance therapeutic outcomes. Inappropriate prescribing practices, characterized by polypharmacy and irrational medication use, contribute significantly to adverse drug reactions and treatment inefficacies. Issues such as drug overprescription, misuse, branding, drug-drug interactions, and contraindications are common. These are further compounded by inadequate consultation and dispensing times, noncompliance with WHO guidelines, and insufficient patient education. Implementing evidence-based prescribing practices, improving patient and provider education, and adhering to WHO recommendations can help Pakistan's healthcare system achieve cost-effectiveness, reduce morbidity and mortality, and optimize resource utilization. This study provides a crucial foundation for further research and policy initiatives aimed at promoting responsible drug use and improving healthcare quality in Pakistan.

The average number of prescription drugs detected in the study was 5.95. It is clearly above the WHO's suggested range of 1.6 to 1.8 drugs per encounter (21). Similar trends were observed in the Bahawalpur hospitals where an average of 2.8 medications were prescribed (22), while In Islamabad hospitals, the average was 4.6 (23). A study n 2 of Lahore's hospitals reported an average of 3.26 drugs per prescription (5).

Branding or Brand name prescription instead of generic prescribing was mostly used (96.64%), while WHO advises a 100% use of generic names for cost-effectiveness and accessibility (21). In Bahawalpur, 56.6% of drugs were prescribed generically (22). In Islamabad hospitals, 19.6% were

generic prescriptions (23). Contrary to this no generic prescribing was observed in 2 hospitals of Lahore (5).

Antibiotics constituted 12.9% of prescriptions, within WHO's optimal range of 20-26.8%, but injectables were used in 33.7% of cases, higher than the recommended range of 13.4-24.1% (21). In Bahawalpur hospitals, 51.5% of prescriptions included antibiotics, and none contained injectables (22). In Islamabad hospitals, 58.3% of antibiotics per encounter and 56.6% of injectables were prescriptions (23). In 2 Lahore's hospitals prescriptions contain 76.4% antibiotic encounters and 8.25% injectables (5).

Only 88% of prescribed drugs were on the National Essential Medicine List (NEML), but according to WHO, it must be 100% (21). Bahawalpur hospitals reported a higher adherence of 98.8% to the Essential Drugs List (22), while Islamabad hospitals matched the Rawalpindi study with 88% adherence (23). In Lahore, 97.8% of drugs were prescribed according to the EDL (5), showing a general but incomplete alignment with national guidelines.

Consultation times varied, with 59% of consultations lasting more than 10 minutes, aligning with WHO standards. 41% of consultations were under 10 minutes, potentially compromising the quality of patient-provider interactions (24). Similarly in Rwanda's District Hospitals, the average consultation time exceeded the WHO target of at least 10 minutes, measuring 10.1 minutes (25). In the Hospital of Ethiopia, the average consultation time was 4.6 minutes (26). Also in Eritrea's regional and national referral hospitals, the average consultation time was 5.46 minutes (18).

Dispensing times also fell short of WHO standards, with only 40% of prescriptions being dispensed in over 90 seconds (24). In the Hospital of Ethiopia, the average dispensing time was 61.12 seconds (26). In Hospital and community pharmacies in Sudan, the average dispensing time was 1.75 minutes (27). In Eritrea’s Hospitals dispensing took 36.49 seconds (18). In Rwanda's District Hospitals, the average dispensing time also surpassed the WHO target of greater than 180 seconds, totaling 222.2 seconds (25).

Overall, 43% of prescriptions contained contraindications, with some containing prescriptions having multiple contraindicated drugs. In India only 0.2% of prescriptions contained contraindicated drug combinations (28). At the Royal Liverpool Hospital, 3.2% of prescriptions contained contraindicated or adversely interacting drugs, affecting 23.7% of elderly patients admitted (29). Assessment in Khyber Teaching Hospital Peshawar showed the presence of 13.9% contraindications out of 416 patients (30).

In our study, Hypertension (28%) and diabetes mellitus (25%) were the most common comorbidities. Similarly, in Riyadh, diabetes mellitus (39.51%), hypertension (33.91%), and asthma (9.45%) were prevalent comorbidities (31). Multiple comorbidities complicate treatment regimens, as seen in Denmark, where multimorbidity affected 21.6% of the population, with higher rates among older adults and those with lower education (32). Hypertension and diabetes are consistently prevalent across regions, with patterns influenced by age and education.

Older adults and males generally had a higher average number of drugs per prescription (DPPP). Similarly, in Belgian health interview survey, 8% of patients aged 65 and older experienced polypharmacy, linked to chronic conditions (33). The number of prescribed drugs increased with age and it was due to long-lasting chronic conditions (33). Gender has no association with polypharmacy but comorbidity and disease conditions have a great influence (34). Consultation times showed no significant demographic associations, while dispensing times varied, with similar findings in Malaysia. It is more associated with diseases like psychiatric patients requiring more time (35).

Drug-drug interactions (DDIs) were not significantly linked to demographics, though age-related associations were reported in studies from Nigeria, India, and Italy (36-38) . Chronic kidney disease (CKD) was associated with minor DDIs, consistent with findings from Nigeria (36). Comorbid conditions like diabetes and chronic obstructive pulmonary disease (COPD) were significantly associated with polypharmacy, as seen in Greece (39) and Saudi Arabia, where polypharmacy was prevalent in 78% of adults with diabetes, particularly women and older adults (40). Consultation and dispensing times were consistent across comorbidities, though disease-specific variations were

observed (35). No significant associations were found between drug-related problems and gender or age. DDI rates were similar across genders, consistent with findings from Iran (41). In contrast, studies in Germany and Saudi Arabia reported DDI associations with polypharmacy, particularly in older adults (42, 43).

8. CONCLUSION:

The assessment of rational drug use and adherence to WHO guidelines in tertiary care hospitals in Rawalpindi highlights several critical issues. Key problems include poor prescribing practices, such as polypharmacy, over-prescription, brand-name drug preference, drug interactions, and high contraindication rates. WHO standards on consultation time, dispensing time, and patient education were not fully followed. Improving adherence to WHO recommendations can enhance therapeutic outcomes. Regular reviews, audits, monitoring, and feedback are essential to maintaining compliance. Educating healthcare professionals and patients, particularly those with chronic diseases or comorbidities, is crucial in reducing irrational drug use and polypharmacy. Control-release drugs should be prescribed to improve compliance, and digital systems can aid in monitoring drug interactions and patient histories.

Encouraging generic prescribing, optimizing workflow, and enforcing evidence-based practices will lead to better resource utilization, reduce morbidity and mortality, and enhance healthcare quality. This study provides a foundation for future research and policy changes aimed at improving rational drug use in Pakistan.

Abbreviations:

Essential Medicines List **(EML)**, Essential Drug List **(EDL)**, World Health Organization **(WHO)**, Azad Jammu and Kashmir **(AJK)**, National Essential Medicine List **(NEML)**, Outpatient department **(OPD)**, Drug-drug interactions **(DDIs)**, Potential Drug-drug Interactions **(pDDIs)**, Nonsteroidal anti-inflammatory drugs **(NSAIDs)**, Pharmacokinetic **(PK)**, Absorption, Distribution, Metabolism, or Excretion **(ADME)**, Pharmacodynamic **(PD)**, Hypertension **(HTN)**, Diabetes Mellitus **(DM)**, Angiotensin-converting enzyme inhibitors **(ACE inhibitors)**, Adverse drug reactions **(ADRs)**, Fauji Foundation Hospital **(FFH)**, Standard deviation **(S.D)**, Antibiotics prescribed per prescription **(APPP)**, Drugs prescribed per prescription **(DPPP)**, Injections per prescription **(IPP)**, Drug prescribing by generic name **(DPBG)**, Drugs from the Essential Medicines List **(DEML)**, Nature of interaction **(NOI)**, Severity of interaction **(SOI)**, Ischemic Heart Disease **(IHD)**, Chronic obstructive pulmonary disease **(COPD)**, Central Nervous system **(CNS)**, Urinary tract infection **(UTI)**, Cardiovascular disease **(CVD)**, Gastrointestinal tract **(GIT)**, Chronic kidney disease **(CKD)**

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