Community Medicine

Original Research | Journal Of Medical Research And Clinical Evidence

Assessment of Prescribing Patterns Using WHO Prescribing Indicators in a Rural Hospital

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ABSTRACT

Background:
Irrational drug use is a major challenge in resource-limited healthcare systems. WHO prescribing indicators provide a validated framework for measuring prescribing quality at the facility level. Data from rural outpatient settings in developing countries remain limited.

Methods:
A cross-sectional observational study was conducted among 100 consecutive outpatient prescription encounters at a rural hospital in a resource-limited setting. The five WHO core prescribing indicators were assessed: average number of drugs per prescription, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic, percentage of encounters with an injection, and percentage of drugs from the essential medicines list (EML). Patient care indicators — consultation time, dispensing time, drug availability, drug labelling, and patient knowledge of dosage — were also evaluated.

Results:
The average number of drugs per prescription was 3.8 (WHO benchmark: ≤2.0). Generic name prescribing was 56.3%, antibiotic prescribing 58.0%, injection prescribing 32.0%, and EML-based prescribing 74.5%. All five core indicators deviated from WHO benchmarks. Average consultation time was 4.2 minutes and dispensing time 62 seconds. Only 54.0% of patients could correctly state their dosage regimen.

Conclusion:
Prescribing at this rural hospital deviated from WHO standards across all five core indicators. Polypharmacy, excessive antibiotic and injection use, suboptimal generic prescribing, and incomplete EML adherence were the primary findings. Targeted educational interventions, formulary enforcement, and regular prescribing audits are needed to promote rational drug use in this setting.

Keywords: WHO prescribing indicators; rational drug use; prescribing patterns; outpatient; resource-limited setting; essential medicines

INTRODUCTION

Rational drug use requires that patients receive medicines suited to their clinical needs, in doses meeting individual requirements, for an adequate duration, and at the lowest cost to them and their community. The WHO defines irrational use as failure to meet one or more of these criteria. Globally, more than half of all medicines are prescribed, dispensed, or used irrationally — a pattern that wastes limited healthcare resources, exposes patients to avoidable adverse drug reactions, and, in the case of antibiotics, accelerates the emergence of resistance. In resource-limited settings, these consequences are amplified by constrained drug budgets, limited clinical infrastructure, and the absence of systematic prescribing oversight.[1]

To provide a standardized means of measuring prescribing quality, the WHO — in collaboration with the International Network for Rational Use of Drugs — validated a set of core prescribing indicators tested across twelve developing countries and published in 1993.[2] These indicators require no detailed pharmacological data and can be computed from a sample of outpatient prescriptions. They measure five key dimensions: the average number of drugs per encounter, the percentage of drugs prescribed by generic name, the percentage of encounters with an antibiotic, the percentage of encounters with an injection, and the percentage of drugs from the national essential medicines list.

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Polypharmacy — the concurrent prescription of multiple drugs in a single encounter — is one of the most consistently identified problems in outpatient settings across sub-Saharan Africa, South Asia, and the Middle East. The WHO benchmark for average drugs per prescription is ≤2.0. Exceeding this figure raises the risk of drug–drug interactions, adverse drug reactions, dispensing errors, and patient non-adherence to complex regimens. In facilities with high patient loads and limited dispensary staff, polypharmacy also creates stock pressure and reduces time available for counselling patients on their medications. The financial burden of unnecessary drug items is particularly acute in health systems that depend on fixed essential medicines budgets.[3]

Antibiotic overuse in outpatient settings is a principal driver of antimicrobial resistance — a growing threat that already accounts for over one million deaths annually worldwide. In developing-country outpatient departments, antibiotic prescribing rates of 40–75% have been reported, far above the WHO benchmark of ≤30%.[4] Empirical prescribing of antibiotics without diagnostic confirmation is common in rural health facilities where laboratory testing is unavailable, and this practice selects for resistant organisms while generating avoidable costs and adverse effects. Antibiotic prescribing also contributes to polypharmacy when added to treatment regimens without clear clinical indication.

Prescribing by generic name and selecting from the national essential medicines list (EML) are markers of cost-conscious, evidence-based practice. The WHO benchmark for both is 100%. Generic formulations are bioequivalent to branded counterparts but cost substantially less, and prescribing by generic name preserves procurement flexibility. An audit of essential medicine utilisation across ten developing countries identified persistent gaps between national EML policy and actual prescribing, attributed to prescriber habit, pharmaceutical promotion, and weak formulary enforcement.[5] In rural facilities, non-EML prescribing carries a direct operational consequence: procurement follows the national EML, and items not on the list are commonly absent from stock, so the prescription may not be filled.

Beyond the five core prescribing indicators, WHO patient care indicators — including average consultation time, average dispensing time, drug availability, drug labelling, and patient knowledge of dosage — reflect the quality of the clinical encounter and the dispensing process. The WHO-recommended minimum consultation time is 10 minutes and the recommended minimum dispensing time is 3 minutes. Short encounters leave inadequate time for history-taking, clinical assessment, and counselling. Low dispensing times reduce the opportunity to verify that the patient understands the dose and timing of their medicines. In high-volume rural outpatient settings, these structural constraints frequently push both indicators well below recommended thresholds.

Rural hospitals in resource-limited settings face a particular set of pressures that promote irrational prescribing: high patient-to-prescriber ratios, limited diagnostic access, frequent drug stock-outs, absence of clinical pharmacy services, inadequate prescribing guidelines, and no regular audit or feedback to clinicians. These factors create conditions in which WHO indicator values are likely to deviate substantially from benchmarks. Despite the broad adoption of WHO prescribing indicators as an assessment tool in low- and middle-income countries, studies that assess all five core indicators together with patient care indicators specifically in rural outpatient settings remain relatively limited, restricting the evidence available to guide facility-level quality improvement programmes.

This study aimed to assess prescribing patterns at the outpatient department of a rural hospital in a resource-limited setting using the WHO core prescribing and patient care indicators, and to compare the observed values against established WHO benchmarks. The secondary objective was to identify specific areas of deviation from rational drug use to provide a data-driven basis for targeted quality improvement at this facility.

METHODS

Study design and setting

A cross-sectional observational study was conducted at the outpatient department (OPD) of a rural hospital in a resource-limited setting. Institutional ethics approval was obtained prior to data collection and the study was conducted in accordance with the Declaration of Helsinki.

Sample and data collection

One hundred consecutive OPD prescriptions were collected during the study period. For each prescription, the following were recorded: patient age and sex, total number of drug items prescribed, whether each drug was written by generic or brand name, presence of at least one antibiotic, presence of at least one injectable drug, and whether each drug appeared on the national essential medicines list.

Patient care indicators

Consultation time was measured by direct observation from the patient entering the consultation room to leaving. Dispensing time was measured from the patient presenting the prescription at the dispensary to receiving the dispensed items. Drug availability was recorded as the proportion of prescribed items actually dispensed. Drug labelling was assessed by checking whether each dispensed item carried the patient name, drug name, dose, frequency, and route. Patient knowledge was assessed at exit by asking each patient to state the dose and timing of each dispensed medicine.

WHO indicator computation

The five WHO core prescribing indicators were computed per standard definitions: (1) average number of drugs per prescription = total drug items divided by total prescriptions; (2) percentage of drugs by generic name = drugs prescribed generically divided by total drugs × 100; (3) percentage of encounters with antibiotic = prescriptions containing at least one antibiotic divided by total prescriptions × 100; (4) percentage of encounters with injection = prescriptions containing at least one injectable divided by total prescriptions × 100; (5) percentage of drugs from EML = drug items on the national EML divided by total drug items × 100.

Statistical analysis

Data were entered and analysed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean ± standard deviation. Categorical variables are expressed as frequencies and percentages. Observed indicator values were compared descriptively against WHO benchmark values. No inferential statistical testing was applied to the indicator comparisons, as this is a single-group descriptive study.

RESULTS

One hundred OPD prescriptions were reviewed, representing 100 unique patient encounters. A total of 380 drug items were identified across all prescriptions.

The study population comprised 56 males (56.0%) and 44 females (44.0%). The largest age group was 31–40 years, accounting for 30.0% of patients. The mean age of the study population was 39.1 ± 13.2 years (Table 1).

Age group (years)	Male n (%)	Female n (%)	Total n (%)
18–30	16 (28.6%)	12 (27.3%)	28 (28.0%)
31–40	17 (30.4%)	13 (29.5%)	30 (30.0%)
41–50	12 (21.4%)	10 (22.7%)	22 (22.0%)
51–60	8 (14.3%)	6 (13.6%)	14 (14.0%)
>60	3 (5.4%)	3 (6.8%)	6 (6.0%)
Total	**56 (56.0%)**	**44 (44.0%)**	**100 (100%)**
Mean age (years)	38.8 ± 12.9	39.4 ± 13.6	39.1 ± 13.2

Table 1: Age and gender distribution of the study population (n = 100). Data presented as n (%) or mean ± SD.

The five WHO core prescribing indicators are summarised in Table 2. All five observed values deviated from their respective WHO benchmarks.

WHO Prescribing Indicator	Observed Value	WHO Benchmark
Average number of drugs per prescription	3.8	≤2.0
% drugs prescribed by generic name	56.3%	100%
% encounters with an antibiotic prescribed	58.0%	≤30%
% encounters with an injection prescribed	32.0%	≤20%
% drugs prescribed from the EML	74.5%	100%

Table 2: WHO core prescribing indicators — observed values versus WHO benchmarks (n = 100 prescriptions; 380 total drug items). EML: essential medicines list.

The majority of prescriptions contained three or more drugs. Prescriptions with ≥6 drug items accounted for 10.0% of the total (Table 3).

Number of drugs per prescription	Number of prescriptions n (%)
1	4 (4.0%)
2	14 (14.0%)
3	25 (25.0%)
4	28 (28.0%)
5	19 (19.0%)
≥6	10 (10.0%)
Total	**100 (100%)**

Table 3: Distribution of number of drugs per prescription (n = 100). The ≥6 category had a mean of 6.6 drugs per prescription. Total drug items across all prescriptions = 380; average = 3.8.

Among the 58 encounters in which at least one antibiotic was prescribed, a total of 61 antibiotic items were recorded, as three encounters included two antibiotics co-prescribed simultaneously. Amoxicillin was the most frequently prescribed antibiotic, accounting for 36.1% of antibiotic items (Table 4).

Antibiotic	Frequency (n)	% of antibiotic items
Amoxicillin	22	36.1%
Metronidazole	14	23.0%
Ciprofloxacin	10	16.4%
Amoxicillin-clavulanate	8	13.1%
Doxycycline	4	6.6%
Cotrimoxazole	3	4.9%
Total	**61**	**100%**

Table 4: Pattern of antibiotic prescribing (n = 58 encounters with at least one antibiotic; 61 total antibiotic items). Three encounters included two co-prescribed antibiotics. Percentages are of total antibiotic items. Antibiotics listed in descending order of frequency.

Among the 32 encounters with at least one injectable, a total of 36 injectable items were recorded, as four encounters included two injectable drugs simultaneously. Intravenous fluids were the most frequently prescribed injectable, accounting for 38.9% of injection items (Table 5).

Injectable drug / fluid	Frequency (n)	% of injectable items
Intravenous fluids (NS / D5W)	14	38.9%
Diclofenac injection	9	25.0%
Gentamicin injection	7	19.4%
Tramadol injection	4	11.1%
Other injectables	2	5.6%
Total	**36**	**100%**

Table 5: Pattern of injectable drug prescribing (n = 32 encounters with at least one injectable; 36 total injectable items). Four encounters included two injectable drugs. Percentages are of total injectable items. NS: normal saline; D5W: 5% dextrose in water.

Of 380 total drug items prescribed, 214 (56.3%) were written by generic name and 166 (43.7%) were prescribed by brand name (Table 6).

Prescribing pattern	Drug items (n)	Percentage (%)
Generic name	214	56.3%
Brand name	166	43.7%
Total	**380**	**100%**

Table 6: Generic versus brand name prescribing (n = 380 total drug items).

Of 380 total drug items prescribed, 283 (74.5%) were from the national essential medicines list and 97 (25.5%) were not (Table 7).

Drug category	Drug items (n)	Percentage (%)
Prescribed from EML	283	74.5%
Not prescribed from EML	97	25.5%
Total	**380**	**100%**

Table 7: Essential medicines list (EML) compliance in drug prescribing (n = 380 total drug items).

Patient care indicators are presented in Table 8. Average consultation time was 4.2 ± 1.6 minutes and average dispensing time was 62 ± 18 seconds, both below WHO-recommended minimums. Only 54.0% of patients could correctly state the dose and timing of all their dispensed medicines.

Patient care indicator	Observed value	WHO standard
Average consultation time (min)	4.2 ± 1.6	≥10
Average dispensing time (sec)	62 ± 18	≥180
% drugs actually dispensed	82.1%	100%
% drugs adequately labelled	68.4%	100%
% patients with correct dosage knowledge	54.0%	100%

Table 8: Patient care indicators observed at the OPD versus WHO reference standards (n = 100 encounters). Consultation and dispensing times presented as mean ± SD.

DISCUSSION

All five WHO core prescribing indicators in this study deviated from established benchmarks. The average number of drugs per prescription exceeded the WHO threshold of ≤2.0. Antibiotic and injection prescribing rates were above the recommended upper limits, while generic name and essential medicines list prescribing were below the 100% target. Patient care indicators similarly fell short of WHO standards. Together, these findings indicate a pattern of suboptimal rational drug use across multiple dimensions of prescribing practice at this rural outpatient facility.

The average number of drugs per prescription of 3.8 exceeded the WHO benchmark of ≤2.0, indicating polypharmacy at this facility. Desalegn[6] reported a mean of 1.9 drugs per prescription at a teaching hospital in southern Ethiopia — below the WHO threshold and notably lower than the present study's value. This difference likely reflects the stronger formulary control and structured clinical supervision typical of an academic facility compared with a rural OPD. Summoro et al.[7] evaluated four hospitals in southern Ethiopia and found a pooled mean of 2.08 drugs per prescription, ranging from 1.82 to 2.28 across facilities. Both findings suggest that facilities with greater institutional oversight achieve drug counts closer to the WHO benchmark than community-level rural settings.

The antibiotic prescribing rate of 58.0% substantially exceeded the WHO benchmark of ≤30%. A cross-sectional study across general hospitals in the Tigray region of Ethiopia[8] found antibiotic prescribing rates ranging from 25.6% to 85% across facilities, with most sites above the WHO threshold — a pattern consistent with the present findings. Atif et al.[9] recorded a rate of 52.4% in an emergency department in Pakistan, where acute undifferentiated presentations and limited diagnostic access drive empirical antibiotic use; our OPD rate of 58.0% is higher, which reflects the absence of laboratory services at this rural facility. In settings without

rapid diagnostics, prescribers treating fever, diarrhoea, or cough frequently default to antibiotics for conditions that may be self-limiting or viral, resulting in use without adequate clinical justification.

The injection prescribing rate of 32.0% exceeded the WHO benchmark of ≤20%. Mamo and Alemu[10] reported an injection rate of 13.8% at a referral hospital in northeast Ethiopia — within the WHO-recommended range — suggesting that institutional guidelines and prescriber awareness can contain injection use even in resource-limited settings. Aravamuthan et al.[11] assessed prescribing in rural community pharmacies in southern India and found higher injection rates consistent with community-level prescribing culture, where a perceived superior efficacy of injections over oral formulations contributes to overuse. Unnecessary injection prescribing carries risks beyond cost: needle-stick injury, bloodborne pathogen transmission, and local complications at injection sites are preventable consequences of avoidable parenteral treatment.

Generic name prescribing of 56.3% was below the WHO benchmark of 100%. Meena et al.[12] reported variable generic prescribing across public health facilities in South India, with rural sites performing below urban facilities, and identified pharmaceutical promotion as a primary driver of brand-name prescribing. Galappatthy et al.[13] found generic prescribing of 90.1% at a tertiary hospital in Sri Lanka — below the 100% target but considerably higher than the present study's figure — likely reflecting the more structured formulary systems of a university-affiliated institution. The gap between the current figure and the WHO benchmark points to habitual brand-name prescribing and the need for enforced generic prescribing policies supported by regular education.

Essential medicines list prescribing of 74.5% was below the 100% WHO target. Ag Ahmed et al.[14] reported EML compliance of only 54% in five health districts in Mauritania — the lowest figure among recent comparable studies — attributed to an outdated national formulary and structural gaps in drug availability. The present study's figure of 74.5%, though higher than this, still represents a meaningful proportion of drug items outside the EML. Where multiple WHO indicators simultaneously deviate from benchmarks, the pattern reflects a prescribing culture issue rather than isolated individual decisions. Mudenda et al.[15] examined antibiotic prescribing in Zambian hospitals using WHO indicators and found persistent exceedance of benchmarks even after the COVID-19 pandemic period, confirming that irrational prescribing does not self-correct and requires active, sustained stewardship programmes to reverse.

Patient care indicators in this study fell below WHO standards. Average consultation time of 4.2 minutes and dispensing time of 62 seconds were well short of the WHO-recommended minimums of 10 minutes and 3 minutes respectively. Only 54.0% of patients could correctly state the dose and timing of all their dispensed medicines.

These findings provide a facility-level baseline for targeted intervention. Prescriber education on rational drug use principles, a local antibiotic stewardship programme aligned with the prevalent disease burden, formulary-based prescribing guidelines, and quarterly prescription audits with structured feedback to clinicians are the interventions most consistently supported by evidence from comparable settings. Limitations of this study include the cross-sectional design, which captures practice at a single point in time, the sample of 100 prescriptions from a single facility, and potential seasonal variation in disease pattern and prescribing behaviour that a single-period study cannot fully capture.

CONCLUSION

Prescribing patterns at this rural outpatient department deviated from WHO benchmarks across all five core indicators. Polypharmacy, excessive antibiotic and injection prescribing, suboptimal generic name prescribing, and incomplete essential medicines list adherence were the primary concerns. Patient care indicators — including consultation time, dispensing time, and patient medication knowledge — fell below WHO-recommended standards. Targeted prescribing education, formulary-based guidelines, a local antibiotic stewardship programme, and regular prescription audits with structured feedback to clinicians are needed to improve rational drug use at this facility.

DECLARATIONS

Source of funding: None
Conflict of interest: None
Consent: Obtained

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Author Contribution: SM - contributed to patient management, data collection, and manuscript drafting; participated in data interpretation, literature review, and manuscript editing;

Received: 25-05-2026 Accepted: 18-06-2026 Published: 01-07-2026