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Adherence to WHO Prescribing Indicators in a Specialist Hospital in North-Central, Nigeria.

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Abstract

Background: Rational use of medicine contributes to a global reduction in morbidity and mortality associated with diseases. Thus, routine assessment of prescriptions written at healthcare facilities is a vital exercise in determining rationality of drug use so as to improve healthcare outcomes in patients receiving treatment and reduce the incidence of drug resistance.The core component of WHO prescribing indicator includes the average number of drug per encounter, the percentage of drug prescribed by generic name, the percentage of encounter with an antibiotic and injection, and the percentage of drugs prescribed from the national essential medicines list

Objective: This study assessed the rational use of medicine by evaluating the adherence to World Health Organization prescribing indicators at the University of Ilorin Teaching Hospital (UITH) in North-central, Nigeria.

Methods: This was a descriptive retrospective study conducted between January and June 2023. All prescriptions written by doctors of various cadres in UITH stored at the main pharmacy of the hospital within the study period were retrieved. Patients less than 18 years were excluded because they frequently receive off-label medications, which can introduce variability and make it difficult to standardize our findings. A validated data capture form was used for the study following the World Health Organization (WHO) prescribing indicator guidelines. The data analysis was done using Statistical Package for the Social Sciences (SPSS) version 27.0 software, and the data generated were presented in simple frequencies, percentages, and average values.

Results: A total of 2500 stored prescriptions were retrieved; 1000 prescriptions were for pediatric patients and were excluded. The average number of drugs per encounter in the facility was 2.83. Generic prescribing and antibiotic prescription were 83.4% and 30.0%, respectively. This percentage of generic prescription showed that the institution is cost-ineffective in procurement and use of drugs, while that of antibiotic prescription showed overuse, which could worsen the menace of antibiotic resistance with increased morbidity and mortality associated with infections. Injections were prescribed in 47.8% of encounters, indicating overuse of injections, while 22.5% and 3.3% of encounters had analgesics and antimalarials prescribed, respectively. A total of 13, 845 errors were encountered, at 9.23 errors per prescription. Errors of omission related to patient (9618; 69.5%) were the most observed, followed by errors of omission related to prescriber (2527; 18.3%), and lastly, errors of omission related to drug (1700; 12.3%).

Conclusion: Prescriptions were mostly incomplete, and the WHO prescribing indicators were not met by most prescribing clinicians. Antibiotics were mostly prescribed with the possibility of worsening the problem of resistance. There is a need for continuing medical education on the rational use of medicines among prescribers with a regular audit of prescription practices. We advised appropriate training of prescribers and policy formation to promote rational prescribing and use of medicines in healthcare facilities.

Keywords: : *Rational Use, Adherence, Medicine, WHO, Nigeria.*

1. Introduction

Rational medicine use ensures optimum benefit of drugs to the patient, by either treating or preventing disease conditions. This requires that patients receive the appropriate drug at the right dose for adequate durations for a particular clinical need and at the lowest possible cost [1]. Rational use of medicine is safe and effective in improving health status, inappropriate use of medicine can lead to waste of resources, reduction in the quality of patients' care and poor treatment outcomes [2]. According to World Health Organization (WHO), a prescription should contain certain detail such as: name, address, telephone and signature or initials of prescriber, date the drug was prescribed, generic name and strength of the drug, dosage form, total amount of drug to be supplied, name, address, and age of patient. Apart from the details to be written on a prescription, it is of importance that a good prescription should be written legibly and with clarity [3]. Inappropriate prescribing has become a global problem and this is because a good drug prescription plays an important role in the management of patients. Thus, a bad prescription can worsen or prolong illness, increase distress and risk of harm to the patient [4] and outright death of patients in some cases. In order to promote rational drug use, some indicators have been made available by the WHO for assessing drug use patterns [5]. These indicators can be used to design and carry out strategies for judicious medication usage. Problems with general prescribing can be identified using the WHO prescribing indicators. The WHO prescribing indicators identify the following: the average number of drugs per encounter (measuring the degree of polypharmacy), the percentage of drugs prescribed by generic name (which measures the cost-effectiveness of health system to procure and use drugs), the percentage of encounters with an antibiotic and injection prescribed (measures the level of use of two important, but commonly overused and costly forms of drug therapy) and the percentage of drugs prescribed from the national essential medicines list [6]. There are many acts, laws, or amendments have been created in order to ensure that drugs that

have been approved for usage in the management of patients are safe and effective. These regulations help to facilitate the positive benefit–risk balance of drugs. Hence, drug safety is a major aspect of medical therapy. It can play a vital role in deciding which drug should be given to a patient in order to protect patients. In as much as it is important that all patients be protected, there are some specific groups of patients who are considered to be vulnerable population. It is required that these groups be given more care and these include pregnant women, children, and the elderly [7, 8].

There are interactions that occur between drugs and other drugs or food that are consumed daily. It thus requires that safety measures be taken to prevent even interactions that may seem simple but can become dangerous. The risks of drug interactions or reactions can be minimized via patient education about drug safety. A good relationship between the medical team and the patient is one of the most important determinants for drug safety [8].

In Nigeria, some previous studies [9-11] that evaluated drug utilization patterns and patient care practices reported inappropriate drug prescribing patterns and patient care practices. This infers that inappropriate prescribing remains a problem in Nigerian tertiary healthcare institutions as it is elsewhere in the world. However, the styles of prescribing drugs have been reported to vary across regions [12]. Studies have shown that most errors encountered during the process of using drugs occurred when prescriptions are being written. It is therefore very important that prescription writing be assessed among the prescribers. This study assessed the rational use of medicine by evaluating the adherence to World Health Organization prescribing indicators at the University of Ilorin Teaching Hospital (UITH) in North-central, Nigeria.

2. Methodology

2.1 Study Setting

The study was carried out at the UITH located in Ilorin East Local Government Area of Kwara State, North-central Nigeria. It is a referral center and serves a diverse population. It is a 750-bed hospital situated in Ilorin, the state capital of Kwara, in Nigeria's North Central geopolitical region. Three Local Government Areas make up Ilorin: Ilorin-South, Ilorin-West, and Ilorin-East. UITH is a tertiary institution and serves as a referral center for patients from Kwara state and the nearby states.

2.2 Study Design and Sampling Procedure

It was a descriptive retrospective study conducted between January to June 2023. It was designed as a retrospective study to allow examination of past medication use patterns and identify trends in prescription like over-utilization and inappropriate prescription, comparison between claimed prescription data and established WHO criteria was also more feasible. All prescription written for adult patients (age $\geq$ 18 years) by doctors of various cadres in UITH stored at the main pharmacy of the hospital within the study period were retrieved. Patients less than 18 years were excluded because they frequently receive off-label medications which can introduce variability and make it difficult to standardize our findings. The WHO prescribing indicator manual was used to produce a data capture form (DCF) for the study which was pre-tested in a secondary healthcare facility. The DCF was used to retrieve relevant data on prescription patterns, practice, errors and legibility of the prescriptions. A simple random sampling method was used to choose the sample of prescriptions to be included in the study for six months. Using a modified envelope method, a list of years from 2014 through 2023 was produced [strips of papers labeled with each year on it]. The year that was chosen at random was 2023. The same process was repeated to get the first (starting) month to be included in the study; this was the month of January. The successive five months following the first month were included since the study was designed for six months. The Data analysis was done using Statistical Package for the Social Sciences (SPSS) version 27.0 software and data generated were presented in simple frequencies, percentages, and average values.

2.3 Prescription errors

Relevant data on prescription errors were documented, categorized, and tabulated. Parameters noted included errors of omission related to prescriber (i.e., patient's name, patient's age, prescription date, prescriber's name, prescriber' signature, institution, and diagnosis), errors of omission related to drugs (i.e., dose, frequency, dosage form, and quantity to supply), and errors of commission (i.e., strength, drug name [not spelling], dosage form, and drug-drug interaction).

2.4 Prescription pattern and Prescribing practice

Medications prescribed were noted and classified according to recommendation by the WHO Centre for Drug Statistics Methodology [13]. Prescribing practice was assessed using selected WHO prescribing indicators [9]. These comprised, (a) average number of drugs prescribed per encounter (i.e., total number of medications prescribed divided by number of encounters recorded); (b) percentage of drugs prescribed by their generic names (i.e., number of medications prescribed by generic name divided by total number of medications prescribed, and multiplied by 100); (c) percentage of encounters with an antibiotic (i.e., number of patient encounters with an antibiotic prescribed divided by total number of encounters, multiplied by 100); (d) percentage of encounters with injections (i.e., number of patient encounters with an injection prescribed divided by total number of encounters, multiplied by 100); and (e) percentage of drugs prescribed from Nigeria Essential Medicines List (EML) [14] (i.e., number of medications prescribed from the EML divided by total number of medications prescribed, multiplied by 100).

2.5 Ethical Approval

Ethical approval was obtained from the Ethics and Research Committee of the University of Ilorin Teaching Hospital with approval number ERC PAN/2022/04/0309. Information obtained from the patients' case file were classified as anonymous and treated with utmost confidentiality.

2.6 Data analysis

Manual verification and cleaning was done, data collected from the data capture forms were analyzed using the statistical software SPSS Version 27.0 [Chicago, IL, USA]. The results were displayed using the arithmetic means, frequencies, and percentages. Results were interpreted by the recommended ideal values by the WHO.

3. Results

A total of 2500 stored prescriptions were retrieved, 1000 prescriptions were for pediatric patients and were excluded. A total of 1500 prescriptions for adult patients were assessed and showed a total of 3566 drugs prescribed in the study period. The number of prescribed drugs per prescription ranged from 1-9. (Table 1)

Table 1: Number of drugs prescribed per prescription (N=1500)

Number of drugs	Frequency	Percentage
1	562	37.47
2	389	25.93
3	240	16.00
4	143	9.53
5	105	7.00
6	28	1.87
7	25	1.67
8	6	0.40
9	2	0.13

The average number of drugs per encounter was 2.38 (WHO ref. value 1.6-1.8). A total number of 2,974 (83.4%; WHO ref. value 100%) drugs were prescribed by their generic name. An antibiotic was prescribed in 1,070 patient encounters (30.0%; WHO ref. value 20.0-26.8), and an injection was prescribed in 1,704 encoun-

ters (47.8%; WHO ref. value 13.4-24.1). A total of 2930 (82.2%; WHO ref. value 100%) of the prescribed drugs were on the EML. (Table 2)

Table 2: Drug Prescribing Practice based on WHO Prescribing Indicators

Prescribing indicators	Number	Average/percentage	WHO Ref. value
Average number of drugs per encounter	3566	2.38	1.6-1.8
Percentage of drugs prescribed by generic	2974	83.4%	100
Percentage of encounter with antibiotics	1070	30.0%	20.0-26.8
Percentage of encounter with injections	1704	47.8%	13.4-24.1
Percentage for drugs from essential drug list	2930	82.2%	100

Among the common prescribed drugs, about 30.0% (n=1,070) were antibiotics and 22.5% (n=801) were analgesics. Other common prescribed drugs are listed in table 3.

Table 3: Frequency distribution of the commonly prescribed drugs

Drug	N (%)
Antibiotics	1070 (30.0)
Antimalaria	119(3.3)
Anti-ulcer/Antacids	110(3.1)
Analgesics	801(22.5)
Antihypertensives	240(6.7)
Antipyretics	41(1.2)
Diuretics	106(3.0)
Iron/multivitamins	387(10.9)
Sedatives	17(0.5)
Antihelmintics	19(0.5)
Antihistamines	57(1.6)
Anticonvulsants	47(1.3)
Eye drops/ointments	47(1.3)
Others	608(17.0)

Errors of omission is characterized by a prescription with missing information that is considered critical. These prescription errors are preventable, yet they have grown in healthcare facilities globally. A total of 12,145 prescription errors related to the prescriber (2,527) and patient (9,618) were noted in 1,500 prescriptions, with average of 1.68 and 6.41 errors per prescription respectively. The most common errors in prescribing related to the prescriber was failure to write the prescriber's name and phone number which was 61.5% (922) and 99% (1,485) respectively. These account for 0.61 and 0.99 average errors per prescription (Table 4).

Table 4: Errors of omission related to prescriber

Types of Errors	Number of errors (%)	Average error per prescription
Name of prescriber not mentioned	922 (61.5)	0.61
Institution of prescriber not mentioned	66 (4.4)	0.04
Phone number of prescriber not mentioned	1485 (99)	0.99
Signature of prescriber not mentioned	54 (3.6)	0.04
Total	**2527**	1.68

Error of omission related to the patient showed that the address, sex, phone number of patients as well as diagnosis made were not mentioned in all the prescriptions assessed. Other errors related to the patient are as shown in table 5.

Table 5: Errors of omission related to patient (N = 1500)

Type of Errors	Number of errors (%)	Average error per prescription
Patient name not mentioned	6 (0.4)	0
Incomplete name of patient mentioned	2 (0.1)	0
Hospital number not mentioned	592 (39.45)	0.39
Date of prescription not mentioned	34 (2.27)	0.03

Type of Errors	Number of errors (%)	Average error per prescription
Age of patient not mentioned	1497 (99.8)	1
Weight of patient not mentioned	1487 (99.1)	0.99
Address of patient not mentioned	1500 (100)	1
Sex of patient not mentioned	1500 (100)	1
Phone number of patient not mentioned	1500 (100)	1
Diagnosis not mentioned	1500 (100)	1
Total	**9618**	6.41

Table 6 shows a total of 1,700 errors of omission related to the drugs per total medicine dispensed. The most common error of omission related to the drug was due to a failure to mention drug strength which was 94.93% (1424) of total drug prescribed.

Table 6: Errors of omission related to drugs (N=1500)

Type of error	Number of errors (%)	Average error per prescription
Strength of drug not mentioned	1424 (94.9)	0.09
Incomplete strength of drugs mentioned	9 (0.6)	0
Dose of drug not mentioned	58 (3.9)	0
Incomplete dose of drug mentioned	9 (0.6)	0
Dosage form of drug not mentioned	9 (0.6)	0
Frequency of drug not mentioned	80 (5.3)	0
Incomplete frequency of drug mentioned	3 (0.2)	0
Duration of drug administration not mentioned	106 (7.1)	0.01
Incomplete duration of drug administration mentioned	2 (0.1)	0
Total	**1700**	**0.11**

Other prescribing indicators assessed were as shown in table 7. A sum of 4 prescriptions were illegible while inaccurate or non-standard abbreviations and decision errors were found in 3 and 1 prescriptions respectively.

Table 7: Other prescribing indicators assessment (N=1500)

Prescribing indicator	Value (%)
Prescriptions without generic name of drugs	105 (7)
Prescriptions with incomplete generic name of drugs	349 (23.27)
Therapeutic duplication	0 (0)
Illegible handwriting	4(0.27)
Inaccurate or non-standard abbreviations	3 (0.2)
Absence of drug information	0 (0)
Decision errors	1(0.07)
Drug interactions	0 (0)
Availability of essential drug list	0(0)
Other identification and labelling information	0 (0)
Requirement for child-proof container	0 (0)
Number of refill period	0 (0)

4 Discussion

All the prescribing indicators assessed in this study were below the standard reference values given by WHO. The average number of drugs per encounter was higher (2.38) compared to the standard value of 1.6–1.8. However, this value is lower than values that are reported by other studies in Nigeria [10,11,15,16]. This finding indicated that high number of drugs were prescribed per patient indicating the practice of polypharmacy [17]. This practice may decrease medication adherence, increase the cost of treatment, enhance the risk of drug interaction, and adverse effects.

The percentage of antibiotics prescribed per encounter was 30% which is higher than the ideal WHO reference value (20.0%-25.4%) [9]. This finding is consistent with that of Ganiyu *et al*. [18] which have previously reported that antibiotics were the most prescribed medications by the medical officers at a General Hospital in Bayelsa state in Nigeria. The result obtained in this study is however lower than that of two previous studies in Nigeria which reported the percentage with antibiotic of 69.1% [19] and 34.4 % [20]. These findings indicated that antibiotics were used irrationally [21,22]. The prevalent nature of infectious diseases in developing countries such as Nigeria may account for the high use of antibiotics which may worsen the problem of antibiotic resistance, and increase morbidity and mortality associated with infectious diseases [17]. Over prescription of antibiotics have been observed to be associated with elongation of duration of disease, increase in severity and complications of diseases, and in some cases even the risk of death [23,24]. By implication, prescribers require training and retraining to inculcate in them the need to embrace rational antibiotic prescribing and implementing antibiotic policy in the

hospital as recommended by WHO [25,26,27,28]. Analgesics were the second most prescribed drug (22.5%). The result obtained in this study was lower than the value (36.2%) reported by Tamuno and Fadare [20] in which analgesics were the most prescribed drug group. Higher values have been reported from other studies [29,30]. This finding may be as are a result of patients' request and the desire to alleviate pain by prescribers. The percentage of encounters with anti-hypertensive drugs prescribed in this study was 6.73%. This value is almost the same with 6% from a study in Warri, Nigeria [31]. It is however lower than 15.2 % from the Ilorin study [10]. Antimalarial drugs were prescribed in 3.3% of patient in this study, this is much lower than the 33% reported by Akande *et al* [10], and 67% by Erah *et al* [31]. This finding could be positive result of the various strategies of the Roll back malaria program instituted in Kwara state and Nigeria as a whole. However, the result observed in this study could be that patients with uncomplicated malaria might not present frequently at the study center because of its status as a tertiary center, most of them would have received treatment at various primary or secondary care centers. The percentage of encounter with injection per prescription was 47.8%, this was greater than the upper limit of normal of WHO reference range of 24.1%. The high rate of injections recorded in this study may be due to the consideration that injections are important formulation in certain emergency situations due to their fast onset of action, when other alternatives are not feasible. However, they have their own drawbacks including the risk of transmission of blood-borne infection among others. Therefore, it is important that over prescription of injections be discouraged among the prescribers to protect patients from the adverse effects. The percentage of drugs prescribed by generic name was recorded to be 83.4%. Though this value was lower than the WHO standard of 100%, it is higher that the values of 47.9% and 70.2% reported by two previous studies in Nigeria [19,32]. This percentage of generic prescription showed that the institution is cost-ineffective in procurement and use of drugs. The percentage of drug prescribed from EML was 82.16% which was below the WHO standard value of 100%. The value from this study is lower than the values reported in previous studies in Kano [20] and Bayelsa [19] who reported the values of 94 % and 97.9% respectively. Prescribing drugs from the essential medicine list is known to promote availability, accessibility, affordability, quality, and rational use of medicine [33,34]. All of these have been noted to improve overall quality of prescribing and enhance improved treatment outcome. Several prescription errors were encountered in this study, and it was observed that omissions related to the patient were the most encountered of all prescription errors recorded. These were followed by those related to prescribers, and errors related to drugs. Similar trends in occurrence of prescription errors have been previously reported in Nigeria [19] and in Nepal [35]. Among the errors of omission related to drug, missing information on the strengths of drug prescribed was the most noticeable, compared to the others such as dose, frequency, and dosage form of drugs. On the contrary, Ganiyu *et al*. [19] in their own study reported that missing information related to drug were notably quantities of drugs to be supplied to patients, followed by dose, frequency of drug use and dosage form of drugs ordered for patients. These results indicate that there are variations in the occurrence of errors of omission related to drugs prescribed for patients. These variations could be as a result of lack of guideline for rational use of medicine or low adherence to these guidelines. Concerning errors of omission related to prescriber, prescriber's phone number was missing in most of the prescriptions issued to patients. The absence of prescriber's phone number could hinder the communication between the prescriber, the dispenser and the patient. This may also hinder timely report of adverse drug reactions when they occurred. The findings regarding other forms of errors of omission related to prescriber in terms of not indicating prescriber's name and signature were substantial in extent of occurrences, and somewhat similar to those reported in a previous study by Shrestha and Prajapati [35]. There was no record of the occurrence of drug-drug interactions in this study. It is contrary to the findings of other studies that reported the prevalence of drug-drug interactions to be 17.4% [19] and 10.2% [35].

5. Recommendation

We advised appropriate training of prescribers, regular prescription audit and policy formation to promote rational prescribing and use of medicines in healthcare facilities. Electronic prescribing systems can also be employed to reduce errors of omission, prescription duplication among others.

6. Conclusion

Prescriptions were mostly incomplete and the WHO prescribing indicators were not met by most prescribing clinician. Antibiotics were mostly prescribed with possibility of worsening the problem of antibiotic resistance in this setting. There is need for continuing medical education on the rational use of medicines among prescribers with a regular audit of prescription practices to reduce the menace of irrational prescribing and improve compliance with WHO guideline.

Limitation of the study

This study relied on retrospective data and excluded pediatric prescriptions. It was also conducted in one tertiary healthcare facility in North-central, and as such the findings cannot represent the prescription practice in other healthcare centers in other regions of the country.

Future Research

We suggest that future research should focus on interventions to improve adherence to WHO prescription guideline and all-encompassing study that will include pediatric prescriptions.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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