Assessment of Prescribing Pattern and Consumption of Selected Drugs at the Lagos University Teaching Hospital (LUTH)

Joda AE, Ekpo EA
Department of Clinical Pharmacy and Biopharmacy, Faculty of Pharmacy, University of Lagos, Idi-Araba Campus, Lagos, Nigeria.

Corresponding Author
AE Joda
Department of Clinical Pharmacy and Biopharmacy, Faculty of Pharmacy, University of Lagos, Idi-Araba Campus, Lagos, Nigeria. Email: arinolaj@gmail.com; Tel.: +2348023073233

ABSTRACT

Background: Assessing the existing prescribing practices in a health facility is important as it helps to identify specific medicine use problems to be corrected for enhanced rational use of medicines.

Objectives: The study aimed to describe current treatment practices using the World Health Organizations (WHO) core and other indicators, as well as document the consumption of analgesics, antibiotics and antihypertensive drugs at the Lagos University Teaching Hospital (LUTH), Lagos, Nigeria.

Methods: The study was a descriptive, retrospective study of prescriptions filed in the out-patient Pharmacy Department from January to December 2015. Data was collected using an adapted WHO/INRUD (International Network on Rational Use of Drugs) prescribing indicator proforma and descriptive and inferential analyses were carried out as necessary using SPSS version 20.0. P-values of ≤ 0.05 were considered significant.

Results: A total of 198 prescriptions and 676 drugs were assessed. The average number of drugs per prescription was 3.41, generic prescribing was 62% and proportion of prescribed drugs actually dispensed was 45%. Antihypertensives, analgesics and antibiotics made up 42%, 14% and 14% respectively of the 676 drugs prescribed.

Conclusion: The prescribing pattern in the Lagos University Teaching Hospital is not in accordance with the required WHO/INRUD standard with polypharmacy, low generic prescribing and low proportion of drugs actually dispensed. An urgent need exists for interventions to improve rational drug use in the facility.

Keywords: Analgesics, antibiotics, antihypertensive drugs, generic prescribing, hospital pharmacy, LUTH prescribing pattern.

INTRODUCTION

The five important criteria for rational drug use are accurate diagnosis, proper prescribing, correct dispensing, suitable packing and patient adherence (1). Physicians, who constitute the highest percentage of prescribers, are expected to apply their knowledge of therapeutics to select most appropriate drug(s) for their patients and prescribe these for the right condition, in correct doses and for the right duration. The goal of rational drug use is to optimise the benefit to the patient and this should happen in each therapeutic interaction. In Nigeria and many developing countries, it is common to find pharmacists, nurses, community health extension workers, community health officers, paramedics and drug sellers prescribing medicines (2). The danger in this practice is that some of these may have received little or no training in the rational use or prescription of medicines (2). Rational use of drugs requires patients receiving medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, at the lowest cost to them and their community (3). This is simply put as the five rights – the right drug at the right dose by the right route at the right time for the right patient (4–6). Globally, inappropriate prescribing has posed a major problem to healthcare delivery (7–9). For instance, in a study in two healthcare facilities in Benin, Edo State, polypharmacy, overuse of antibiotics and low rate of generic prescribing was documented while in a study on prescription patterns of analgesics in a community hospital in Nsukka, polypharmacy and low generic prescribing were documented (8, 9).

Factors underlying irrational drugs use are broadly categorized into: the health system, the prescriber, the dispenser/pharmacist and the patient/community (10). Assessing existing prescribing practices in a health facility is important as it helps to identify the specific drug use problem (DUP) which needs to be understood before meaningful interventions towards attaining rational drug use and positive treatment outcomes (9).

The indicators defined by WHO (11) following the partnership with the International Network for the Rational Use of Drugs (INRUD) and the WHO Essential Drugs and Medicines policy department (WHO – EDM) provides a standardized technique for collecting objective and reproducible measures of the effectiveness and efficiency of drug use (12–14). Although most of the studies carried out in

Nigeria were in public secondary and tertiary care facilities, these indicators can be applied to a variety of healthcare settings including primary health care (15–17), private (18) and specialized (19) settings. The prescribing indicators, a subset of the core indicators, are the major indicators used in auditing and evaluating prescribing practices (11). The WHO-EDM/INRUD supported study, which developed reference values for the WHO health facility core prescribing indicators in Nigeria, has helped to provide tools for effective monitoring (Table 1) (20). Assessing rational drug prescribing using the core indicators as elucidated by WHO/INRUD involves the five dimensions of antibiotic use, injection safety, polypharmacy, generic name and essential medicine (11, 21–23).

Table 1: Prescribing Indicators with Standards Developed for its Evaluation

Prescribing Indicators	Reference Values
Average number of drugs prescribed per patient encounter	1.6 – 1.8
% Prescriptions including antibiotic	13.4 – 24.1
% Prescriptions including injection	13.4 – 24.1
% Drugs prescribed by generic name	100
% Drugs prescribed from essential medicines list or formulary	100

Isah *et al.* (20)

The general objective of this study was to describe the current treatment practices in the hospital using the WHO core and other indicators. The consumption of analgesics, antibiotics and antihypertensive drugs in the facility was also documented to confirm if the general perception of high rate of use of these drug classes is accurate.

MATERIALS AND METHODS

Study Design and Data Collection

This survey was conducted at the Lagos University Teaching Hospital (LUTH), Idi-Araba, Surulere, Lagos State, Nigeria, a tertiary level referral hospital. The general out-patient Pharmacy Department is where the prescriptions written for patients who have no need for immediate hospitalization or who have been discharged are dispensed (24). All the prescriptions from January to December 2015 represented the target population for the survey. For comparative analysis, the WHO requires that a minimum of one hundred sampling units should be assessed (11). However, the larger the sample size, the more reliable the data. Prescription slips of two (2) randomly selected patients that visited the out-patient Pharmacy from January 2015 to December 2015 were assessed to give an expected sample size of 212 prescriptions.

The WHO/INRUD detailed prescribing indicator form (11) was used to collect relevant information from the facilities including the core indicators:

a) Average number of drugs per encounter
b) Percentage of drugs prescribed by International Non-proprietary Name (INN or generic name)
c) Percentage of encounters in which an antibiotic is prescribed
d) Percentage of encounters in which an injection is prescribed
e) Percentage of drugs prescribed from essential drugs list or formulary
f) Percentage of drugs actually dispensed.

Other indicators assessed were:

Percentage of prescription with prescriber's ID (Name and/or Signature), percentage of prescription with prescription date, age of patient, gender of patient, diagnosis, and cost per dose of drugs written as brand or generic name.

Data Analysis

Microsoft Excel was employed for entry and Statistical Packages for Social Sciences (SPSS) version 20 for analysis of the quantitative data using the standardized WHO/INRUD formulae to assess and document the observed treatment patterns. The collected data were entered after being coded. In the statistical analysis frequencies, means and percentages were obtained. In addition, Pearson's chi-squared tests were done to check for associations among different variables (numbers of encounters and drugs versus gender of patients). For statistical significance p-value less than or equal to 0.05 at 95% confidence interval (CI) was considered. Results were presented as frequency tables, percentages and means as appropriate.

Ethical Considerations

Ethical approval for the study protocol was granted by the Lagos University Teaching Hospital Health Research Ethics Committee (LUTH-HREC)

RESULTS

Respondents Sociodemographic Data

A total of one hundred and ninety-eight (198) prescriptions were assessed in the facility. About 58% of the prescriptions were for females while 81% were for adults (Figure 1).

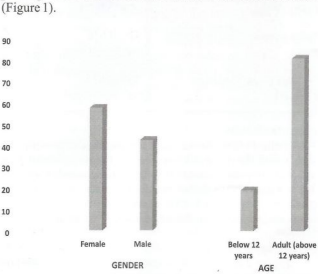

Fig. 1: Demographic Profile of Study Sample.

Number of Drugs Prescribed

The number of drugs prescribed were between 1 to 8, with most ranging from 3 – 5 drugs (Table 2).

Table 2: Frequency Table Showing Number of Drugs Prescribed Per Prescription

No. of Drugs	Frequency	Percentage (%), n=182
1 drug	2	1.1
2 drugs	18	9.9
3 drugs	41	22.5
4 drugs	49	26.9
5 drugs	42	23.1
> 5drugs (6–8)	30	16.4

Core Indicators

Table 3 shows the core prescribing indicators; an average of 3.41 drugs per prescription was prescribed while the percentage antibiotic and injection use were 30.3 % and 2 % respectively. About 62 % of the drugs were prescribed with generic nomenclature.

Table 3: Result Table Showing Various Core Prescribing Indicators

Indicator	Frequency	Value (%)
Average number of drugs per prescription	676 of 198 encounters	3.41
% encounters with an antibiotic prescribed	60 of 198 encounters	30.3
% encounters with an injection prescribed	4 of 198 encounters	2
% drugs prescribed by generic name	420 of 676 drugs prescribed	62.1
% drugs prescribed from EDL/NF	598 of 676 drugs prescribed	88.46

Other Indicators

Table 4 below shows that the percentage of prescription sheets with the diagnosis indicated on them was about 28% while all the prescriptions (100%) had the prescriber's name. Table 4 also shows that of the six hundred and seventy-six (676) drugs prescribed, 42% consisted of antihypertensives while analgesics and antibiotics made up 14% each.

Mean Cost of Drugs

Figure 2 shows the average cost of drugs prescribed by generic names compared to that prescribed by brand (proprietary) names with generic prescribing being cheaper at a mean cost of N==74.87 to N===120.57.

Table 4: Other Prescribing Indicators and Proportion of Selected Drugs Prescribed

Indicator	Value (%)
Other Prescribing indicators (n=198 encounters)	
% encounters bearing indication or diagnosis	28.30
% encounters with Prescriber's name	100.00
% encounters with prescriber's signature	98.98
% encounters with prescription date inscribed by prescriber	98.48
Drugs Evaluation (n=676 drugs)	
% of prescribed drugs actually dispensed (304)	45.0
% antihypertensive prescribed (284)	42.0
% antibiotics prescribed (92)	13.6
% analgesic prescribed (92)	13.6

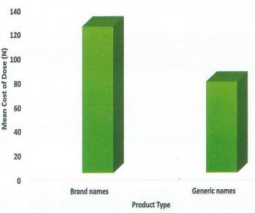

Fig. 2: Comparison between average cost of Dose of Generics and Brands.
Brand (N120.57±213.29); Generic (N74.87±102.35)

Consumption Pattern of Selected Drugs

The five most frequently prescribed drugs for each drug class assessed is presented in Table 5 below. Paracetamol (24%), Amoxicillin-Clavulanic acid (28%) and Frusemide (13%) were the most frequently prescribed analgesic, antibiotic and antihypertensive agents respectively.

Inferential Analysis

Table 6 shows that no statistically significant difference exists in the numbers of encounters of the different drug classes with the different gender of patients. The result shows that 56% and 44% of the encounters were for female and male patients respectively. The result shows that a statistically significant difference exists for the numbers of the different drug classes prescribed versus gender. Antihypertensives were much more frequently used in females than males. Furthermore, 60% of the drugs prescribed were for females and 40% for males (Table 6).

Table 5: Five Most Frequently Prescribed Drugs for Assessed Drug Classes

S/N	Drug Class								
	Analgesic (n=92)		%	Antibiotics (n=92)		%	Antihypertensive (n=284)	%	
1.	Paracetamol	22	23.9	AmoxiClav*	26	28.3	Frusemide	38	13.4
2.	Diclofenac	22	23.9	Ciprofloxacin	15	16.3	Amlodipine	32	11.3
3.	Athrotec	10	10.8	Metronidazole	11	11.96	Losartan	30	10.6
4.	Tramadol	10	10.8	Levofloxacin	8	8.7	Lisinopril	30	10.6
5.	Aspirin	7	7.6	Cefuroxime	4	4.4	Spironolactone	25	8.8

**Amoxicillin-Clavulanic acid*

Table 6: Relationship between Encounters and Drugs Prescribed versus Gender of Patient

Item	Drug Class	Female (freq)	Male (freq)	p-value
Number of Encounters per Class versus Gender	Antibiotics	29	31	0.1347
	Analgesics	32	30	
	Antihypertensives	81	49	
	Total	**142**	**110**	
Number of Drug of Class prescribed versus Gender	Analgesic	49	43	0.0015*
	Antibiotics	43	49	
	Antihypertensives	188	96	
	Total	**280**	**188**	

**Significant*

DISCUSSION

In this study, average number of drugs per encounter was 3.41 which showed an improvement over previous surveys carried out in 2012 (25) and 2015 (24) of 3.68 and 4.3 respectively in the out-patient Pharmacy of this same facility. Comparable values ranging from 3.2 to 3.9 in other facilities are documented in literature (25-28) though higher values are obtained in yet other studies (14, 29). A previous national study in Nigeria gave average value of 3.8 (13) which is higher than average values of 2.3 and 2.4 obtained in selected facilities in Tanzania and China (21, 23). In a study by Summoro *et al.* (30), drug-prescribing patterns in four hospitals in Ethiopia gave average number of drugs per prescription ranges from 1.82±0.90 to 2.28±0.90. Reference values of 1.6 – 1.8 drugs per encounter are recommended by the WHO guidelines on rational use of drugs (20). The result obtained shows that there is a slight reduction in the numbers of drugs prescribed in the facility.

Analysing prescribing pattern for this facility revealed that the range of drugs prescribed was between 1 and 9 with a high proportion (89%) having 3 or more drugs which can adversely influence treatment outcomes in a way that patients are at a higher risk of adverse events, drug interactions and this discourages adherence (31). Previous studies in this facility showed 70.5 and 84.6% of the encounters had 3 drugs and 75.9% for another tertiary hospital in Lagos State (24, 25). In a similar study in Ethiopia, only about 1% of the encounters had 3 or more drugs prescribed (32).

Antibiotic use was moderately high in this study with 30% of encounters compared to the reference value of 20.0 – 25.4% (20). However, it is lower than figures reported in earlier studies (13, 21-25, 33, 34). Inappropriate use of antibiotics can potentially lead to antimicrobial resistance and increase the necessity to use more expensive antibiotics to treat common and life-threatening infections (35). Results obtained show a reduction in antibiotic use in the facility over previous years and gives an indication that antimicrobial stewardship programs instituted in the facility will achieve the expected outcome of more judicious use of antibiotics.

Injection use recorded in this study was low (2%), which was lower than the WHO reference value of 13.4 – 24.1% (20). In many general outpatient departments, including the site for this study, stable patients are managed routinely thereby eliminating the need for many injections except for insulin parenteral drugs. Injections use rate will likely be higher if the study was done in the Accident and Emergency Department (35). In a study in 2013, percentage of encounters with injection in LUTH was similarly low at 3.4% (25). Though, minimal use of injections is preferred as it reduces the risk of infection through parenteral route and cost incurred in therapy (36), the lower prevalence of injection in this study cannot be generalized for the institution for the reason stated above. In some countries like Ethiopia, there are cultural barriers against injection based treatments which shows in the low results obtained (37).

Only 62% of the drugs were prescribed using generic names in this study, similar to result obtained by Dong *et al.* (21). Previous values in LUTH range from 42% to 68% (24,

25, 38). WHO recommends prescribing by generic names (100% generic prescribing) as they are more affordable and allows flexibility of choice between many alternatives in terms of source, price or convenience. The value obtained is higher than that obtained in other studies in Nigeria (13, 19, 28). Irunde *et al.* (23) reported generic prescribing values of about 96% in Tanzania. Higher values for generic prescribing is desired as this would have a significant effect on the cost of treatment for the patient. This study shows that the average cost of prescribing with brand names is over 60% higher than those prescribed using generic names proving that prescribing using generic names makes therapy more affordable to patients (39).

Percentage of drugs prescribed from the national essential drug list (EDL) was 88% which though high did not meet the optimal with respect to the WHO reference value of 100% (20) and low compared to the higher value (97%) obtained by Soremekun and Omitiran (38) for the same facility three years ago. Tamuno and Fadare (35) and Summoro *et al.* (30) obtained higher values of 94% each, though no copy of the EDL was available at the points of prescription for the Tamuno and Fadare study (35). It was documented in that study that all the Clinicians at the General Out-Patient Department (GOPD) admitted to knowledge of the essential drug list and the usefulness of the list (35). The concept of essential drugs was introduced to ensure positive outcomes for the health seeking populace especially in developing countries (40). The essential drugs list is a tool to assure availability of those drugs needed to satisfy the healthcare needs of the majority of the population and should be available at all times, in adequate amounts and in the appropriate dosage forms (41, 42). The Essential Medicines List and generic prescribing are commonly used in drug utilization interventions across the globe for healthcare cost reduction (21, 23). Failure to use the list may be due to lack of awareness and/or unavailability of the list.

In this present study, only 28% of the encounters had diagnosis indicated on the slip. Sharif *et al.* (43) documented that 0% of the prescriptions in their survey carried the diagnosis. The inclusion of the indication or diagnosis on a prescription slip/record helps the Pharmacist to better understand what the drug and dose being prescribed is for. This eliminates the need for Pharmacists to seek clarification when unusual doses or drug combinations are prescribed (43). The Pharmacists further action is dependent on the outcomes of the clarification obtained. Indicating the diagnosis also helps the patient to know what their medications are for and/or the condition(s) they are being treated for.

Regarding prescriber related information, a high proportion – 100%, 98.98% and 98.48% of the prescription slips had names, signature of prescribers and prescribing date respectively specified by the prescriber. These values are higher than previous studies done in Ethiopia, Saudi Arabia and France (44-46). Omitted prescriber information shows a clear need for improvement in prescription practices by prescribers. The prescription is a legal document that can be used both for and against the Physician and the Pharmacist in cases attributed to prescribing or dispensing errors and should be filled completely and legibly (43).

Less than 50% of the drugs prescribed were actually dispensed which could be due to out of stock syndrome, patients' inability to pay or failure of prescribers to prescribe using generic nomenclature or restrict prescribing to the essential medicines list, to mention a few (47). This value is half of the WHO reference value of 100% for this indicator. Previous studies shows that 60% and 97% of the drugs prescribed were actually dispensed (22, 47).

The result obtained shows that antihypertensives were the most prescribed with 62.3% of encounters having an antihypertensive prescribed. This is higher than values obtained in other studies (8, 33, 35). It would seem that antihypertensive drug usage increased over the years and this supports the prediction that by year 2025 the global prevalence of hypertension will be 60% higher than year 2000 values (48). The percentage of encounters with an analgesic was 31.3%, a value lower than 36.2% reported in Kano (35) but higher than an average of 18.2% reported for two health facilities in Warri (8). These show that common disease categories in Nigeria are hypertension and pain and the healthcare delivery system must be well equipped to meet these patients' healthcare needs.

For the actual drugs prescribed, out of the total analgesics, paracetamol was the most commonly prescribed, 23.9%, a value lower than recorded in previous studies (33, 49). The most commonly prescribed antibiotic was amoxicillin-clavulanate combination followed by ciprofloxacin which is similar to the first two antibiotics prescribed by Akande and Ologe (33) whilst Tamuno and Fadare (35) reported ciprofloxacin as the most commonly prescribed antibiotic. Furosemide (diuretic class of antihypertensives) and amlodipine (calcium channel blocker class) are the most frequently prescribed of the antihypertensives and this is similar to results obtained from previous recent studies (50, 51). Modalities must be put in place to ensure that these essential medicines are available at all times and at the right price (41, 42).

The study shows that more female patients were prescribed drugs in the period under review like results obtained in two previous studies (29, 39). Though no significant difference exists in the gender distribution of patients per encounter, a statistically significant difference was found to exist for the gender distribution of patients per drugs prescribed. Characterising patients based on their socio-demographic data will enable appropriate logistics arrangements to be put in place to meet their medicine and other needs.

Implications of this study can be broken down into three broad groupings: policy considerations, current practice and future research thrusts. The study showed that prescription sheets generally do not have position for diagnosis. Appropriate policies need to be enacted to ensure the insertion of this important parameter in prescription sheets nationwide to ensure rational use of medicines. Current practice areas that need to be strengthened include overuse of antibiotics, prescribing using generic nomenclature and complete and legible filling of prescription sheets by

prescribers. One of the core reasons for implementation of the essential drugs lists and national formulary is to ensure positive outcomes for patients; these issues contribute to cost ineffectiveness in rational use and may help explain the relatively high cost of drugs in the country (26). The future research agenda for this facility should focus on reasons behind the irrational prescribing documented and then appropriate intervention studies to address these reasons.

In terms of limitations, the findings of this study cannot be generalized for the state as only one facility was studied, though the findings have extended the body of knowledge in this field. Another limitation is that though a tertiary facility was studied, comparisons were made with different types of facilities including primary and secondary healthcare facilities, private hospitals and international sites.

CONCLUSION

On conclusion of this survey, polypharmacy, overuse of antibiotics, low proportion of drugs actually dispensed, and low generic and essential medicine list prescribing were prevalent in this facility. Consumption pattern reveals that antihypertensives were most often prescribed. Intervention programs should be carried out to ensure improvement in practice, and effective monitoring and supervision should be conducted frequently and regularly to assure sustainability.

ACKNOWLEDGMENTS

The authors would like to thank the management and staff of the Lagos University Teaching Hospital and especially the Head of Pharmacy and her staff for their cooperation and assistance in the collection of data for this study.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. Shukrala F, Gabriel T. Assessment of prescribing, dispensing and patient use pattern of antihypertensive drugs for patients attending outpatient department of Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia. *Drug Des Devel Ther.* 2015; **9:** 519–523.
2. FMOH. Federal Ministry of Health and World Health Organization. Regulations for prescribing and dispensing drugs. National Drug Policy. 2005; 1–32. Available from: www.collections.infocollections.org/whocountry/en/d/Js6865e/9.17.html; Accessed on 17th July 2016.
3. WHO. Medicines: Rational use of medicines. Fact sheet no. 338; 1-4, 2010. World Health Organization. Available from: http://www.who.int/mediacentre/factsheets/fs338/en/index.html; Accessed 13th July 2016.
4. Ross-Degnan D, Laing R, Quick J, Ali HM, Ofori-Adjei D, Salako L, Santoso B. A strategy for promoting improved pharmaceutical use: the international network for rational use of drugs. *Soc Sci Med.* 1992; **35:** 1329–1341.
5. Hogerzeil H. Promoting rational prescribing: An international perspective. *Br J Clin Pharmacol*, 1995; **39:** 1–6.
6. Chaturvedi VP, Mathur AG, Anand AC. Rational drug use – as common as common sense? *Med J Armed Forces India.* 2012; **68:** 206–208.
7. Isenalumehe AE, Oviawe O. Polypharmacy: Its cost, burden and barrier to medical care in a drug oriented health care system. *Int J Health Serv.* 1988; **18:** 335–342.
8. Erah PO, Olumide GO, Okhamafe AO. Prescribing practices in two health care facilities in Warri, Southern Nigeria: A comparative study. *Trop J Pharm Res.* 2003; **2:** 175–182.
9. Builders MI, Okonta JM, Aguwa CN. Prescription patterns of analgesics in a community hospital in Nsukka. *J Pharm Sci Res.* 2011; **3:** 1593–1598.
10. WHO (World Health Organization). Chapter 29: Promoting rational prescribing. Paper submitted to WHO Archives. 2012; 1-29. Available: http://apps.who.int/medicinedocs/documents/s19606en/s19606en.pdf; Accessed 30th July 2016.
11. WHO. World Health Organization Action Programme on Essential Drugs. How to investigate drug use in health facilities: Selected drug use indicators. Geneva, World Health Organization, 1993 (WHO/DAP/93.1).
12. Quick JD, Laing R, Ross-Degnan D. Intervention research to promote clinically effective and economically efficient use of pharmaceuticals: The International Network for Rational Use of Drugs (INRUD). *J Clin Epidemiol.* 1991; **44 (Suppl 2):** 57–65.
13. Hogerzeil HV, Bimo D, Ross-Degnan DG, Laing RO, Ofori-Adjei D, Santoso B *et al*. Field tests for rational drug use in twelve developing countries. *Lancet.* 1993; **342:** 1408–1410.
14. Quick JD, Rankin JR, Laing RO, O'Connor RW, Hogerzeil HV, Dukes MNG *et al.* (eds). Managing drug supply, 2nd ed. West Hartford, CT: Kumarian Press, 1997.
15. Olayemi SO, Akinyede AA, Oreagba AI. Prescription pattern at primary health care centres in Lagos State. *Niger Postgrad Med J.* 2006; **13:** 220–224.
16. Oyeyemi AS, Ogunleye OA. Rational use of medicines: Assessing progress using primary health centres in Shomolu Local Government Area of Lagos, Nigeria. *West Afr J Med.* 2013; **32:** 121–125.
17. Adisa R, Fakeye TO, Aindero VO. Evaluation of prescription pattern and patients' opinion on healthcare practices in selected primary healthcare facilities in Ibadan, South-Western Nigeria. *Afr Health Sci.* 2015; **15:** 1318–1329.
18. Tamuno I. Prescription pattern of clinicians in private health facilities in Kano, Northwestern Nigeria. *Asian Pac J Trop Dis.* 2011; **1:** 235–238.
19. Adebayo ET, Hussain NA. Pattern of prescription drug use in Nigerian army hospitals. *Ann Afr Med.* 2010; **9:** 152–158.
20. Isah AO, Laing R, Quick J, Mabadeje AFB, Santoso B, Hogerzeil H *et al*. The Development of Reference

Values for the World Health Organization (WHO) Health Facility Core Prescribing Indicators. *West Afr.J. Pharmacol. Drug. Res.* 2002; **18(1 & 2):** 6–11.

21. Dong L, Yan H, Wang D. Drug prescribing indicators in village health clinics across 10 provinces of Western China. *Fam Pract.* 2011; **28:** 63–67
22. Santos V, Nitrini SM. Prescription and patient-care indicators in healthcare services. *Rev Saude Publica.* 2004; **38:** 819–26.
23. Irunde H, Minzi O, Moshiro C. Assessment of Rational Medicines Prescribing in Healthcare Facilities in Four Regions of Tanzania. *J Pharm Pract Comm Med*, 2017; **3(4):** 225–231.
24. Awodele O, Fadipe AO, Adekoya M, Adeyemi OO. Prescribing Pattern of Non-Steroidal Anti-Inflammatory Drugs at the Outpatient Pharmacy Department of a University Teaching Hospital in Nigeria. *Ghana Med J*, 2015; **49(1):** 25 –29.
25. Joda AE, Aderemi-Williams RI. A Comparative Study of Prescribing Patterns in Two Tertiary Care Teaching Hospitals in Lagos, Nigeria. *Int J Pharm Pharmacol.* 2013; **2(1):** 41–46.
26. Enwere OO, Falade CO, Salako BL. Drug Prescribing Pattern at The Medical Outpatient Clinic of a Tertiary Hospital in Southwestern Nigeria. *Pharmacoepidemiol Drug Saf.* 2007; **16(11):** 1244–9.
27. Ibrahim MTO. Physicians' Prescribing Behaviour in Two Tertiary Health Care Facilities in North Western Nigeria. *Sahel Med J.* 2004; **7(4):** 115–118.
28. Fadare JO, Adeoti AO, Aina F, Solomon OA, Ijalana JO. The influence of health insurance scheme on the drug prescribing pattern in a Nigerian tertiary healthcare facility. *Niger Med J*, 2015; **56:** 344–8.
29. Babalola CP, Awoleye SA, Akinyemi JO, Kotila OA. Evaluation of prescription pattern in Osun State (Southwest) Nigeria. *J Public Health Epidemiol.* 2011; **3:** 94–98.
30. Summoro TS, Gidebo KD, Kanche ZZ, Woticha EW. Evaluation of trends of drug-prescribing patterns based on WHO prescribing indicators at outpatient departments of four hospitals in Southern Ethiopia. *Drug Des Devel Ther.* 2015; **9**: 4551-4557.
31. Abdulahi M, Shiferaw T. Pattern of prescription in Jimma hospital. *Ethiop J Health Dev.* 1997; **11:** 263–267.
32. Isah AO, Ohaju-Obodo J, Isah EC, Ozemoya O. Drug use profile in a Nigerian city hospital. *Pharmacoepidemiol Drug Saf.* 1997; **6:** 319–324.
33. Soremekun RO, Omitiran B. Factors affecting physicians' prescription and pattern of prescription in the management of secondary infertility. *Afr J Pharm Pharmacol.* 2014; **8:** 1205–1212.
34. Gagne JJ, Choudhry NK, Kesselheim AS, Polinski JM, Hutchins D, Matlin OS, *et al.* Comparative effectiveness of generic and brand-name statins on patient outcomes: a cohort study. *Ann Intern Med.* 2014; **161**: 400–407.
35. Akande TM, Ologe MO. Prescription pattern at a secondary health care facility in Ilorin, Nigeria. *Ann Afr Med.* 2007; **6:** 186–189.
36. Ghimire S, Nepal S, Bhandari S, Nepal P, Palaian S. A prospective surveillance of drug prescribing and dispensing in a teaching hospital in Western Nepal. *J Pak Med Assoc.* 2009; **59:** 726–731.
37. Bilial AI, Osman ED, Mulugeta A. Assessment of medicines use pattern using World Health Organization's prescribing, patient care and health facility indicators in selected health facilities in eastern Ethiopia. *BMC Health Serv Res.* 2016; **16:** 144.
38. Chedi BAZ, Abdu-Aguye I, Kwanashie HO. WHO core prescription indicators: Field experience in public health facilities in Kano, Nigeria. *Bayero J Pure Appl Sci.* 2004; **6**: 66–70.
39. Tamuno I, Fadare JO. Drug prescription pattern in a Nigerian tertiary hospital. *Trop J Pharm Res.* 2012; **11:** 146–152.
40. WHO. WHO medicines strategy: Framework for action in essential drugs and medicines policy 2000–2003. Geneva: WHO; 2000 (WHO/EDM/2000.1).
41. WHO. The use of essential drugs. 6 Report of the Expert Committee. Geneva: WHO Technical Report Series 850.3; 1995. Accessed at: http://apps.who.int/medicinedocs/en/d/Jwhozip13e/
42. Hogerzeil HV, Walker GJA, Sallami AO, Fernando G. Impact of an essential drugs program on availability and rational use of drugs. Lancet 1989; **1(8630):** 141–142.
43. Sharif SI, Al-Shaqra M, Hajjar H, Shamout A, Wess L. Patterns of drug prescribing in a hospital in Dubai, United Arab Emirates. *Libyan J Med.* 2008; **3:** 10–12.
44. Gelaw BK, Feyissa AF, Tegegne TG, Defersha AD, Ayinalem GA. Prescription Pattern of Injection at Out Patient Pharmacy Department of Adama Hospital Medical College, Adama, Ethiopia. *J Pharm Alt Med.* 2015; **6:** 38–43.
45. Binu M, Sabbu R, Surendra K, Hiremath D. A retrospective analysis of prescribing practice based on WHO prescribing indicators at four selected hospitals of West Ethiopia. *East Cent Afr J Pharm Sci.* 2013; **16:** 69–74.
46. François P, Chirpaz E, Bontemps H, Labarère J, Bosson JL, Calop J. Evaluation of prescription-writing quality in a French university hospital. *Clin Perform Qual Health Care.* 1997; **5:** 111–115.
47. Atif M, Sarwar MR, Azeem M, Umer D, Rauf A, Rasool A, *et al*. Assessment of WHO/INRUD core drug use indicators in two tertiary care hospitals of Bahawalpur, Punjab, Pakistan. *J Pharm Policy Pract.* 2016; **9:** 27.
48. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet.* 2005; **365:** 217–223.
49. Irshaid YM, Al-Homrany MA, Hamdi AA, Adjepon-Yamoah KK, Mahfouz AA. A pharmacoepidemiological study of prescription pattern in outpatient clinics in Southwestern Saudi Arabia. *Saudi Med J.* 2004; **25:** 1864–1870.
50. Osibogun A, Okwor T. Anti-hypertensive prescription and cost patterns in an outpatient department of a teaching hospital in Lagos State, Nigeria. *Open J Prev Med.* 2014; **4:** 156–163.
51. Bakare OQ, Akinyinka MR, Goodman O, Kuyinu YA, Wright OK, Adeniran A, *et al*. Antihypertensive use, prescription patterns and cost of medication in a teaching hospital in Lagos, Nigeria. *Niger J Clin Pract.* 2016; **19**: 668-672.