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Drug prescribing, prescription errors and prescription legibility at a primary healthcare center in a semi-urban community, South-South of Nigeria

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ABSTRACT

Background:
Routine assessment of prescriptions written at health facilities is essential to determining rationality of drug use in a bid to improve health outcomes in patients receiving treatments. This study was aimed at assessing prescription pattern, errors, and legibility, including prescribing practice at Amassoma Comprehensive Health Center, Bayelsa State, South-South, Nigeria.

Methods: Total enumeration of appropriately documented 233 prescriptions of patients, who attended clinics at the study center from January 01 to December 31, 2020, was conducted. The prescriptions were assessed for errors, legibility and drug use. Also, prescribing practice at the center was assessed using selected WHO prescribing indicators. The SPSS v23.0 was employed for data analysis, and all data generated were presented in simple frequencies, percentages, and average values.

Results: Anti-infectives (457, 40.2%) were the most prescribed. A total of 2,392 errors were encountered, at 10.3 errors per prescription. Errors of omission related to drugs (1465, 61.2%) were the most observed, followed by errors of omission related to prescriber (623, 26.1%), and lastly, errors of commission (304, 12.7%). Meanwhile, missing information on quantity of medication to supply (1127, 99.2%) and prescriber's department (201, 86.3%) were the most noticeable among errors of omission related to drugs and prescribers, respectively, while drug-drug interactions (198, 17.4%) accounted for the most encountered of all errors of commission. Only a quarter (58, 24.9%) of all prescriptions seen were clearly legible, and none of the selected prescribing indicators was within the referenced standards.

Conclusion: Majority of the prescriptions contained mostly anti-infectives. Most were not completely legible and were fraught with several errors. In all, prescribing practice at the study center was suboptimal.

1. Introduction

A prescription, issued by a physician or other suitably qualified healthcare professionals, has been described as "a request for the dispensing of one or more items or service to a patient"[1]. It is, however, important to note that, the term, prescription, when used in the context of healthcare, is not limited to ordering for medicines or remedies only. It could be a request for specific care and/or relevant items, such as dressings for wound care, surgical materials, and other supplies for the use of the patient[2]. In essence, a well written prescription for medications, as part of requirements for good prescribing practice, will be that which is legible, unambiguous, devoid of errors, and which conforms to recommendations contained in relevant guidelines and local formularies, amongst others[3,4].

Prescription writing is an important component of the medication use process. When not done in accordance with relevant guidelines, or when fraught with errors or not legibly written, it may cause harm to the patient[5]. Although this is not in all cases, as it has been reported that not all

errors inherent in faulty prescriptions would cause harm to the concerned patients[6]. Corroborating the foregoing, a survey conducted elsewhere reported that only 1 in 550 prescription errors encountered could be adjudged as being serious enough to warrant attention[7]. Notwithstanding the above, some harms resulting from faulty prescriptions, when they arise, may be burdensome to the patients and their caregivers. This is because they may precipitate complex medical needs that require high cost of management[5]. Aside from causing harm in patients with the attendant dissatisfaction, inappropriately written prescription has been implicated in bringing about litigation claims in general medical practice[8]. Fortunately, modalities are available to encourage appropriate prescribing practice that incorporates good prescription writing. According to experts[9], efforts should be made to ensure that prescribers are well educated and appropriately trained in the art of prescription writing. Importance of exploiting online aids in achieving the foregoing has equally been noted. In addition, introduction of automated systems, feedback control systems, and prescription review, done immediately following issuance have been recommended by researchers. Periodic prescription audits have also been recommended[9].

Interestingly, prescribing styles have been noted to vary across regions[10]. In addition, researchers have reported that most errors, routinely encountered during medicines use process, usually occur during prescription writing stage[11]. Given the foregoing, it is, therefore, imperative that prescription writing be assessed, locally, among the prescribers in a given setting. To this end, the main aim of this study was to assess drug prescribing, prescription errors, and prescription legibility at a primary healthcare center in a semi-urban community in Bayelsa State, which is in the South-South of Nigeria.

2. Methods

2.1 Setting

The study was carried out at the only primary health center in Amassoma, which is a semi-urban community in the Southern Ijaw Local Government Area of Bayelsa State, South-South of Nigeria. This study center is a 15-bed capacity health facility. It caters to the basic healthcare needs of the people resident in the Amassoma community and the neighboring riverine communities of Ebini, Tantua, Ogobiri *et cetera*. Prescribing at this center is done by senior community health extension workers (SCHEWs). Occasionally, a medical doctor does come around to see patients.

2.2 Study Design

A descriptive cross-sectional retrospective study was conducted. It involved the total enumeration of appropriately documented 233 prescriptions of patients, who attended clinics at the study center from January 01 to December 31, 2020. This was the year when the world experienced the covid-19 pandemic, hence the overall number of clinic attendants recorded was very low owing to the lockdown imposed on the people by the government. In addition, appropriate documentation was not done for most of the patients seen.

2.3 Data Collection

A suitably designed data collection form was employed for retrieval of pertinent data on, errors noted in prescriptions, legibility of the prescriptions, prescription pattern, and prescribing practice.

2.4 Prescription errors

Relevant parameters on prescription errors were documented, categorized, and presented in line with a checklist adopted in the work of Shrestha and Prajapati[12]. Parameters noted included errors of omission related to prescriber (i.e., patient's name, patient's age, prescription date, prescriber's name, prescriber' signature, department, and diagnosis), errors of omission related to drugs (i.e., dose, frequency, dosage form, and quantity to supply), and lastly, errors of commission (i.e., strength, drug name [not spelling], dosage form, and drug-drug interaction).

2.5 Legibility of prescriptions

Legibility of contents of each prescription was evaluated and categorized as previously done by Vigneshwaran *et al*.[13] as, totally illegible i.e., almost all words are unclear to identify (Grade 1); barely legible i.e., most words are illegible, but prescription was understood by the researcher, who is a pharmacist (Grade 2); moderately legible i.e., some words are illegible, the meaning unclear (Grade 3); and clearly legible i.e., all words are clear (Grade 4).

2.6 Prescription pattern and prescribing practice

Medications prescribed were noted and classified according to recommendations by the World Health Organization Collaborating Centre for Drug Statistics Methodology[14]. In addition, prescribing practice at the health facility was assessed using selected WHO prescribing indicators[15]. 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[16] (i.e., number of medications prescribed from the EML divided by total number of medications prescribed, multiplied by 100).

2.7 Data Analysis

Data analysis was done manually and with the aid of Statistical Package for Social Sciences (SPSS) version 23 software. All data generated were presented in frequencies, percentages, and average values as appropriate.

3. Results

Patients treated at the study center were mostly prescribed anti-infective drugs for systemic use (457, 40.2%), drugs working in the blood and blood forming organs (264, 23.2%), drugs working on the nervous system (197, 17.3%), and drugs working in the alimentary tract and metabolism (118, 10.4%) among others. Other medications prescribed were drugs working on the musculoskeletal system (28, 2.5%), drugs working on the cardiovascular system (16, 1.4%), drugs working on the skin (14, 1.4%), antineoplastic and immune-modulating agents (6, 0.5%), and systemic hormonal preparations (2, 0.2%), (Table 1).

A total of 2,392 prescription errors were encountered in the 233 prescriptions vetted, at 10.3 errors per prescription. Of these, errors of omission related to drugs (1465, 61.2%) were the most observed, followed by errors of omission related to prescriber (623, 26.1%), and lastly errors of commission (304, 12.7%). Among all errors of omission related to drugs, quantity to supply was not mentioned in most (1127, 99.2%) cases. Dose, frequency, and dosage form of drugs were not mentioned in 131 (11.5%), 124 (10.9%), and 83 (7.3%), respectively of all drugs ordered. Non-mentioning of prescriber's department (201, 86.3%) and name (175, 75.1%) were the most noticeable of errors of omission related to prescriber. Meanwhile, drug-drug interactions (198, 17.4%) and wrong strength featured more among all forms of errors of commission observed among the prescriptions evaluated (Table 2).

One hundred and thirty-nine (59.6%) of all prescriptions were moderately legible. Others were either clearly legible (58, 24.9%), barely legible (34, 14.6%) or totally illegible (2, 0.9%). Only 58 (24.9%) of all 233 prescriptions vetted were clearly legible (Table 3).

Average number of drugs prescribed per encounter was 4.9. Meanwhile, percentage of encounters with injections and percentage of encounters with antibiotics prescribed were 57.9% and 69.1%, respectively. Percentage of medications prescribed from the EML was 97.9%, and about a third of all drugs prescribed were written in brand names (Table 4).

Table 1: Drugs prescribed for patients seen.

Classes of medications prescribed (n = 1,136)	Frequency	Percentage
Anti-infective drugs for systemic use	457	40.2
Drugs working in the blood and blood forming organs	264	23.2
Drugs working on the nervous system	197	17.3
Drugs working in the alimentary tract and metabolism	118	10.4
Drugs working on the musculoskeletal system	28	2.5
Drugs working on the cardiovascular system	16	1.4
Drugs working on the skin	14	1.2
Antineoplastic and immune-modulating agents	6	0.5
Systemic hormonal preparations	2	0.2
Various/others	34	3.0

Table 2: Prescription Errors encountered.

Types error	Number of errors (%)	Average number of errors per prescription
Errors of omission relatedto prescriber (n = 233)		
Patient name not mentioned	0 (0)	0
Age not mentioned	2 (0.9)	0
Prescription date not mentioned	10 (4.3)	0
Prescriber name not mentioned	175 (75.1)	0.8
Prescriber signature not indicated	67 (28.755)	0.3
Department not mentioned	201 (86.3)	0.9
Diagnosis not indicated	168 (72.1)	0.7
Total number of errors	623	2.7
Errors of omission related to drugs (n = 1,136)		
Dose not mentioned	131 (11.5)	0.6
Frequency not mentioned	124 (10.9)	0.5
Dosage form not mentioned	83 (7.3)	0.4
Quantity to supply not mentioned	1127 (99.2)	4.8
Total number of errors	1465	6.3
Errors of commission (n = 1,136)		
Wrong strength	46 (4.1)	0.2
Wrong drug name (not spelling)	24 (2.1)	0.1
Wrong Dosage form	36 (3.2)	0.2
Drug-drug Interaction	198 (17.4)	0.8
Total number of errors	304	1.3

Table 3: Legibility of prescription

Legibility of Prescription (233)	Frequency	Percentage (%)
Grade 1	2	0.9
Grade 2	34	14.6
Grade 3	139	59.6
Grade 4	58	24.9

Grade 1: Totally illegible, Grade 2: Barely legible, Grade 3: Moderately legible, Grade 4: clearly legible

Table 4: Selected prescribing indicators

Indicators		Reference values†
Average number of drugs prescribed per encounter	4.9	(1.6 – 1.8)
Percentage of encounters with an antibiotic, (%)	69.1	(20.0 – 26.8)
Percentage of encounters with injections, (%)	57.9	(13.4 – 24.1)
Percentage of drugs prescribed by their generic names, (%)	70.2	100
Percentage of drugs prescribed from EML, (%)	97.9%	100

†Reference values for core prescribing indicators culled from the study conducted by Isah *et al*.[15]; EML, essential medicines list[16]

4. Discussion

In the study, it was observed that patients were mostly prescribed anti-infective drugs for systemic use and drugs working in the blood and blood forming organs, among others. In all, an average of 10.3 errors were noted per prescription. Errors of omission related to drugs were mostly observed, followed by errors of omission related to prescriber, and lastly errors of commission. Only a quarter of all prescriptions vetted were clearly legible, and polypharmacy was noted in the prescribing practice at the health center. In the same vein, all other prescribing indicators did not meet WHO recommendations.

The finding that the anti-infective drugs were the most prescribed in this study is consistent with the prescription pattern observed among nurse practitioners in Australia by Buckley *et al*.[17] In the Australian study, Buckley et al.[17] posited that their observation is comparable to the prescribing style seen in most parts of the country. This, in a way, also holds true for the SCHEWs, who are the main prescribers at the PHC investigated for this study. This is because, like present finding, Ganiyu *et al*.[18] have previously reported that antibiotics were the most prescribed medications by the medical officers at a General Hospital, which is in the same community hosting the present study center. By implication, prescription pattern of anti-infectives can be said to be comparable for both SCHEWs and the medical officers in the locality hosting the respective PHC and the general hospital, where they work. However, findings from all studies cited above contrast with the observation made recently by Fuentes *et al*.[19] who reported cardiovascular drugs as the most prescribed medications in the United States.

Drugs working in the blood and blood forming organs were also abundantly prescribed in this study. In fact, close to a quarter of all patients seen received at least a drug indicated for anaemic condition. According to World Health Organization[20], anaemia results when "the number of red blood cells or the haemoglobin concentration within them is lower than normal." The most common cause of anaemia has however been identified as nutritional deficiencies[20]. Incidentally, prevalence of cases of nutritional deficiencies have been noted to be very high in Bayelsa State[21,22]. This suggests the reason for the large number of patients requiring medications for anaemic conditions in this study. Other medications appreciably prescribed in the present study included those working on the nervous system and those working in the alimentary tract and metabolism, among others, confirming the fact that patients do routinely present at PHCs with health conditions requiring prescribing of a variety of medications[23].

Several prescription errors were encountered in the study, and it was observed that omissions related to drugs were the most encountered of all prescription errors recorded. These were followed by those related to prescribers, the last being errors of commission. Interestingly, similar trends in occurrence of prescription errors have been previously reported in Nepal[12]. Meanwhile, among errors of omission related to drug, missing information on quantities of drugs to supply to patients was the most noticeable, compared to the others, such as dose, frequency, and dosage form of drugs that were less frequently encountered. On the contrary, Shrestha and Prajapati[12] in their own study related that information were missing, notably for dose, followed by quantity of drug to supply, dosage form, and frequency of use for drugs ordered for patients. Concerning errors of omission related to prescriber, prescriber's department was not indicated on almost all prescriptions issued, which is in sharp contrast to that related in the Nepal's study. In that study, the department was mentioned for all prescribers. Meanwhile, findings regarding other forms of errors of omission related to prescriber in terms of not indicating prescriber's name, diagnosis, and signature were substantial in extent of occurrences, and somewhat similar to those reported in Shrestha and Prajapati's[12] study. For errors of commission encountered, the extents at which the strength, the name, and dosage form of drugs prescribed were wrongly presented were slightly more in the present study compared to those reported previously elsewhere[12]. Similarly, prevalence of drug-drug interactions that was estimated in this study as 17.4%, was slightly higher than the 10.2% reported by Shrestha and Prajapati[12].

In all, the average number of errors recorded per prescription in this study was 10.3. This is high compared to a prevalence of 3.4 reported elsewhere[12] and calls for a need for the prescribers at the PHC to be appropriately educated as to the importance of avoiding prescription errors in their prescribing practice. This is because prescription errors have been linked to causation of adverse effects in affected patients[9] and litigation claims in general medical practice[8].

A quarter of all prescriptions vetted were clearly legible. This implies some improvement over 7.9% previously reported at the same study center[24]. Unfortunately, the other three-quarter of the prescriptions were either moderately legible, barely legible, or totally illegible. This finding makes it imperative that the prescribers at this study center be cautioned to always ensure that their writings are legible. This is because legible prescriptions are easy to read, hence, devoid of misinterpretation and likelihood of occurrence of

adverse drug events[4].

Drug prescribing practice among the prescribers at the study center was grossly suboptimal, as evident by the fact that none of the prescribing indicators evaluated was in line with their corresponding WHO standard values. The average of 4.9 drugs prescribed per encounter in this study connotes polypharmacy, and it passes for moderate polypharmacy, numerically. According to Masnoon *et al*.[25], polypharmacy has variable definitions, among which the most adopted is the use of five or more drugs. For the sake of clarity, and using numerical only definitions, polypharmacy has been categorized into, minor polypharmacy (2 to 4 drugs), moderate polypharmacy (4 to 5 drugs), and major polypharmacy (5 to 9 drugs). Various terms such as hyperpolypharmacy, excessive polypharmacy, and severe polypharmacy have been used in describing prescriptions containing 10 medications and above.[25] Importantly, it is a known fact that multi-drug prescribing can be desirable or non-desirable, depending on the disease condition(s) and the prevailing circumstances surrounding therapy initiation[26,27].

The 69.1% that was estimated as the percentage of encounters with an antibiotic prescribed in this study is higher than the 34.4% reported by Tamuno and Fadare[28] at another location in Nigeria. It is not within the limits (i.e., 20.0 – 26.8%) recommended by the WHO[15] and it shows no significant improvement when compared with the 86.8 and 85.5% previously reported at the center[24,29]. By implication, prescribers at this study center require training and retraining to inculcate in them the need to embrace rational antibiotic prescribing, for obvious reasons. Asides increase in antibiotic resistance and cost implications, overprescribing of antibiotics have been noted to be associated with elongation of length of disease, increase in severity and complications of diseases, including risk of death[30].

Asides the fact that the 57.9% recorded for percentage of encounters with injections prescribed at the PHC is above the recommended upper limit of 24.1%[15], it is, unfortunately, a deviation from the 14.3% previously reported locally, at the study center[29]. Therefore, it is important that overprescription of injections be discouraged among the prescribers at this center to protect their patients from the ills of excessive exposures to injectables.

Generic prescribing by the SCHEWs, at 70.2% in the present study, although not up to the recommended 100%, is commendable, in comparison to the 47.9% reported, previously[29]. In prescription writing, experts have often correlated prescribing drugs in their generic names with good prescribing practice, being that it promotes rational and cost-effective drug use. However, there are situations in which generic prescribing is not encouraged, particularly when the medicines are not interchangeable. According to The Best Practice Advocacy Centre New Zealand[31], medicines may not be interchangeable when "the product has a narrow therapeutic range", "the product is modified release", or "the delivery systems or dose forms of the product are not pharmaceutically equivalent".

Virtually all the medications written for patients encountered in this study were found to have been prescribed from the EML, which is highly commendable. This is because prescribing from EML is known to promote availability, accessibility, affordability, quality, and rational drug use[32]. All of these have been noted to improve overall quality of prescribing. However, some criticisms do exist for the adoption of EML. In describing these, Jasso *et al*.[33] posited that "the main criticism to essential medicines lists is that they restrict prescription freedom, on the grounds that it is a restrictive rule manipulated by pharmaceutical interests, and that medicines not included in the referred catalog cannot be used in health institutions." Notwithstanding the presumed drawbacks stated above, adoption of EML has been found to be very useful in resource-limited settings, particularly in the areas of selection, procurement, good prescribing, and dispensing of drugs[34].

Some limitations exist for this study. Firstly, the study entails process-oriented investigation of prescription errors and might be fraught with observations that are inadvertently exaggerated, contrary to if it were an outcome-oriented study. The concepts of process-oriented and outcome-oriented studies as they relate to prescription errors are better explained in the work of Velo and Minuz[9]. Secondly, drug-drug interactions noted were not disaggregated into desirable and non-desirable types. Thirdly, errors and mistakes may result from slips and lapses in prescription writing, sometimes due to the prescribers having to contend with excessive workload and fatigue[35]. Therefore, findings from this study should not be considered an indictment on the prescribers that are working at the PHC studied.

5. Conclusion

Majority of the prescriptions written by the SCHEWs at the study center contained anti-infective drugs for systemic use. Most of these prescriptions were not completely legible, and were fraught with several errors, notably errors

of omission related to drugs. In all, prescribing practice at the study center was suboptimal, as all prescribing indicators that were assessed did not conform to WHO standards. Hence, the findings from this study call for the needs for the relevant authority in charge of the study center to put in place modalities for training and retraining of the SCHEWs who prescribe medications to patients at the center. This training should be designed in such a way that the importance of embracing good prescribing practice is impressed on the prescribers being trained.

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