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Assessment of Drug Utilization and Potential Drug-Drug Interactions Among Adult Patients at a 65-Bed Capacity Private Hospital at Yenagoa, Bayelsa State, Nigeria

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Abstract

Background: Outcomes of drug utilization studies and assessment of prescriptions for potential drug-drug interactions (pDDIs) have been noted to help in improving the quality of drug therapy.

Objectives: To investigate drug utilization and pDDIs in prescriptions written for adult patients at Gloryland Hospital, a private health facility located in Yenagoa, Bayelsa State, Nigeria.

Methods: It was a retrospective study, and involved the evaluation of 384 case notes of patients ($\geq$ 18 years) that were randomly selected from all cases documented at the health facility studied from January 01 to December 31, 2021. Data collected included patients' demographics, diseases presented, and drugs contained in their prescriptions. These were assessed for pattern of drug prescribing, prescribing practice to certain prescribing indicators, and presence of pDDIs. Data generated were presented descriptively in simple frequencies, percentages, and average values. Mean values were compared, where necessary, using a student-t test. A p-value < 0.05 was considered significant.

Results: Relatively similar proportions of male (198, 51.6%) and female (186, 48.4%) patients were encountered. The majority (164, 42.7%) were middle-aged adults (44 [IQR 18 – 95] years), and almost all (350, 91.1%) were treated as out-patients. Each presented with an average of 1.65 ± 0.74 diseases per encounter, notably infections (187, 29.7%) and diseases of the digestive system (105, 16.7%). Each patient was prescribed an average of 4.03 ± 1.55 medications per encounter, at a median duration of 7 (IQR 1 – 28) days, mostly anti-infectives (488, 31.7%), and majorly administered orally (1326, 86.1%). Prevalence of pDDIs identified was 79.7%. Each prescription contains an average of 1.75 ± 1.77 pDDIs per encounter. Of these, 1.27 ± 1.07 and 0.48 ± 1.14 (p < 0.05) were clinically desirable and non-desirable, respectively. Of all prescribing indicators assessed, only a percentage of encounters with an injection prescribed (16.4%) was ideal.

Conclusion: Prescribing indicators and presence of pDDIs in prescriptions written at the Gloryland hospital, a private health facility in Bayelsa State have been assessed and the outcomes presented. Prescribers at the study centre require training and retraining in other to encourage rational drug prescribing among them.

Keywords: bayelsa state; Yenagoa; potential drug-drug interactions; prescription pattern; prescribing practice

Introduction

Experts have consistently advocated for routine conduction of drug utilization studies (DUS) in healthcare facilities and related settings to promote rational drug use (RDU), (Wettermark et al., 2016). According to Mekonnen *et al.* (2021), RDU entails patients receiving medications that are appropriate for their health conditions, in the correct dosages tailored to individual needs, for an adequate duration, and at the lowest possible cost to both the patient and the community. In essence, DUS, established as a distinct field of research, plays an essential role in evaluating how medications are prescribed, dispensed, and used, ensuring these processes adhere to clinical guidelines and contribute to optimal therapeutic outcomes (Gangwar *et al.*,

2023). As noted by Meena and Jayanthi (2019), DUS has evolved into a scientifically rigorous tool used worldwide to assess and enhance the quality of medication use in healthcare systems. It provides insight into prescriber adherence to treatment protocols, drug prescribing patterns, and patient compliance to prescribed therapy, all of which are critical components influencing the rationality of drug use (Rasmussen et al., 2022).

Drug-drug interactions (DDIs) present a significant challenge in clinical practice, particularly in healthcare settings where polypharmacy is prevalent. DDIs can lead to adverse effects, reduced therapeutic efficacy, or increased toxicity, thus undermining the overall goal of rational drug therapy (Bettonte et al., 2022). DDIs may, however, be desirable in certain

cases in which the therapeutic effect of one drug is enhanced by the other as exemplified in a report by Ganiyu *et al.* (2022). Given the above, a comprehensive assessment of DDIs, along with DUS, is crucial for ensuring that medications are used safely and effectively in clinical practice. This is especially relevant in settings where healthcare infrastructure and monitoring systems may be limited, such as in many health facilities in Nigeria (Welcome, 2011).

In Nigeria, the promotion of RDU is vital in addressing healthcare challenges related to irrational prescribing and high rates of self-medication (Adeosun *et al.*, 2022). Studies conducted in various healthcare settings across the country have revealed patterns of inappropriate prescribing, including polypharmacy, overuse of antibiotics, and poor adherence to treatment guidelines (Suleiman *et al.*, 2020; Adeosun *et al.*, 2022). These issues have significant implications for patient safety, particularly in private hospitals where regulatory oversight may be less stringent than in public health institutions. Conducting a DUS in such settings is essential for identifying prescribing practices that may deviate from recommended guidelines, evaluating the prevalence of potential DDIs, and developing strategies to promote safer, more effective medication use.

This study aims to assess drug utilization patterns and the prevalence of potential drug-drug interactions among adult patients at a 65-bed capacity private hospital in Yenagoa, Bayelsa State, Nigeria. By evaluating prescribing trends, adherence to clinical guidelines, and the occurrence of DDIs, the study seeks to provide evidence that can inform interventions to enhance the quality of pharmaceutical care in similar healthcare settings.

Methods

Study Setting

The study was conducted at the Gloryland Hospital, which is located in Yenagoa Local Government Area of Bayelsa State. It is a 65-bed capacity facility, and probably the largest among all the private hospitals in Bayelsa State, South-South of Nigeria. The male, female, private, and emergency wards contain 25, 22, 10, and 8 beds, respectively. This health facility attends to the healthcare needs of patients from Bayelsa State and the neighboring communities in Delta State and Rivers State. It is one of the health facilities that cater to patients who have registered for the Nigerian National Health Insurance Scheme (NHIS) and Bayelsa State Health Insurance Scheme (BSHIS). Its medical staff includes a medical director, seven medical officers, and 17 visiting specialists. Twenty-one nurses are in charge of nursing care, while one pharmacist, assisted by 6 pharmacy technicians takes care of pharmaceutical services at the health facility. About 28,661 patients comprising 25,750 adults and 2,909 children were seen at the health facility in the year 2021.

Study Design

The study design was a descriptive, cross-sectional, retrospective study. A total of 384 case notes belonging to patients aged ≥ 18 years were randomly selected from all 25,750 cases seen and documented for adults at the health facility from January 01 to December 31, 2021.

Study Population

The target population for this study were all adults (aged, ≥ 18 years), who attended clinics at the study center from January 01 to December 31, 2021. Pregnant women were excluded from this study.

Sample Size Determination and Sampling Technique

A sample size of 379 was derived from a total of 25,750 adult patients seen at the study center within the study period. This was done with the aid of a sample size calculator by Qualtrics®XM (www.qualtrics.com) at a confidence level of 95% and 5% margin of error. Meanwhile, a sample size of 384 was eventually adopted for this study given that it is very close to the estimated 379 and is the recommended default number that is considered representative of a very large population (n > 5000, a margin of error of ±5%) of subjects (Bullen, n.d.). Thus, case notes belonging to 384 out of all documented adult patients were selected using a systematic random sampling technique at a sampling interval of 67. Information contained in the designated software for patients' health records at the health facility was used as a guide.

Data Collection

Relevant data on patients' demographics and clinical variables regarding their age, gender, diseases presented, and status (whether treated as outpatient or inpatient) were collected using an appropriately structured data collection form. Also, data were collected on drugs prescribed and were assessed for

the presence of potential drug-drug interactions and prescribing practice at the study center.

Diseases treated were classified using the guidelines by the International Classification of Diseases 11th Revision (ICD-11), (World Health Organization, 2020), while all drugs prescribed were categorized in accordance with recommendations of the World Health Organization Collaborating Centre for Drug Statistics Methodology (2019). Potential drug-drug interactions (pDDIs) were identified using the Drugs.com Application (www.drugs.com), pharmacology textbooks, and clinical judgment as guides. Their potential clinical consequences and their therapeutic desirability were noted. Those pDDIs with the possibility of causing improved effectiveness of therapy were termed desirable, while those capable of precipitating reduction in the effectiveness of therapy and/or adverse events were described as non-desirable. Prescribing practice at the study center was compared against standard references for prescribing indicators from a WHO study on the pattern of drug prescribing (Isah *et al.*, 2002). Thus, prescribing indicators assessed in this study included average number of drugs prescribed per encounter, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection prescribed, percentage of drugs prescribed by their generic names, and percentage of drugs prescribed from an essential drug list.

Ethical Issues

Approval to carry out the study was obtained in writing from the management of the health facility where the study was conducted.

Data analysis

All data were coded as appropriate and fed into the Statistical Package for Social Sciences (SPSS) version 23 software. They were processed into frequencies and percentages, and presented in tabular formats. In addition, average (i.e., mean) and median values were generated using GraphPad Instat 3.10 for Windows (GraphPad Software, San Diego California USA). Where necessary, comparisons of average values were done using Student t-test. The level of significance at the tail test was set at $p < 0.05$.

Results

Relatively similar proportions of male (198, 51.6%) and female (186, 48.4%) adult patients were seen within the study period. They were mostly (164, 42.7%) of middle age (i.e., 36 – 55 years) and their median age (years) was 44 (IQR 18 - 95). Virtually all (350, 91.1%) were treated as outpatients (Table 1).

The average number of diseases diagnosed per patient was 1.65 ± 0.74. The majority were treated for infectious or parasitic diseases (187, 29.7%), followed by diseases of the digestive system (105, 16.7%), diseases of the musculoskeletal system or connective tissue (78, 12.4%), and diseases of the genitourinary system (75, 11.9%). Others were diseases of the circulatory system (70, 11.1%), diseases of the respiratory system (50, 7.9%), and diseases of the skin (23, 3.7%) among others (Table 2).

In treating diseases encountered at the study center, most of the patients seen were prescribed 3 drugs (110, 28.6%) per encounter, and mostly for seven days and more (206, 53.7%) at a median value of 7 (IQR 1 – 28) days. The majority of all formulations ordered were intended for the oral route (1326, 86.1%). These were distantly followed by those intended for administration via intramuscular or intravenous (im/iv) route (164, 10.7%), transdermal route (33, 2.1%), including vaginal route (10, 0.7%) among other routes of drug administration that were rarely employed. A total of 1540 drugs were prescribed for all cases assessed among the 384 adult patients. Of these, 488 (31.7%) were those working as anti-infective drugs for systemic use, 386 (25.1%) were drugs working on the musculoskeletal system, while 198 (12.9%) were those drugs working in the alimentary tract and metabolism. Others were drugs working in the blood and blood-forming organs (166, 10.8%), and drugs working on the cardiovascular system (147, 9.5%) among other related categories. See Table 3 for details.

Three hundred and six (79.7%) of all 384 prescriptions vetted contained at least a pDDI. In total, 675 pDDIs were identified. Pharmacodynamic interactions accounted for 649 (96.1%) of all types of pDDIs. The remaining 26 (3.9%) were pharmacokinetic in nature. Of the pharmacodynamic interactions, 283 (41.9%) were by additive mechanism, while 233 (34.5%) and 133 (19.7%) were by synergistic and antagonistic mechanisms, respectively. Impairment of absorption was the main mechanism noted for the pharmacokinetic interaction. Meanwhile, 488 (72.3%) of all 675 pDDIs identified were desirable therapeutically, while the remaining 187 (27.7%) were not. Average values of desirable and non-desirable pDDIs identified per encounter were 1.27 ± 1.07 and 0.48 ± 1.14 ($p < 0.05$),

respectively. Overall, 1.75 ± 1.77 was the average of all pDDIs noted per encounter (Table 4).

Each of the patients treated in the study was prescribed an average of 4.03 ± 1.55 drugs per encounter, while percentages of encounters with an antibiotic prescribed and an injection prescribed were estimated as 43.2 and 16.4%, respectively. For drugs prescribed by their generic names and those prescribed from an essential medicines list (EML), their respective percentages were recorded as 62.7 and 92.6% (Table 5).

Table 1: Demographics and status of patients encountered

Characteristics	Frequency	Percentage %
Gender (n = 384)		
Male	198	51.6
Female	186	48.4
Age (n = 384)		
Younger Adulthood (18-35 years)	118	30.7
Middle age (36 – 55 years)	164	42.7
Older adults (≥ 56 years)	102	26.6
Status (n = 384)		
Inpatient	34	8.9
Outpatient	350	91.1

Median age (IQR, interquartile range) in years, 44 (IQR 18 - 95)

Table 2: Diseases diagnosed among the patients

Disease variables	Frequency	Percentage (%)
Classes of Diseases diagnosed (n = 630)		
Certain infectious or parasitic diseases	187	29.7
Diseases of the digestive system	105	16.7
Diseases of the musculoskeletal system or connective tissue	78	12.4
Diseases of the genitourinary system	75	11.9
Diseases of the circulatory system	70	11.1
Diseases of the respiratory system	50	7.9
Diseases of the skin	23	3.7
Diseases of the visual system	9	1.4
Diseases of blood or blood-forming organs	7	1.1
Diseases of the nervous system	7	1.1
Developmental anomalies	4	0.6
Diseases of the immune system	3	0.5
Sleep-wake disorders, mental, behavioral or neuro-developmental disorders	3	0.5
Injury, poisoning or certain other consequences of external causes	5	0.8
Endocrine, nutritional or metabolic diseases	2	0.3
Neoplasms	2	0.3

Mean ± SD; SD, standard deviation; Average number diseases diagnosed per patient, 1.65 ± 0.74

Table 3: Pattern of drug prescribing among the patients

Characteristics of drugs prescribed	Frequency	Percentage (%)
Number of drugs prescribed per patient (n = 384)		
1 drug	1	0.3
2 drugs	56	14.6
3 drugs	110	28.6
4 drugs	91	23.7
5 drugs	71	18.5
≥ 6 drugs	55	14.3
Duration of drug therapy (n = 384)		
1 day	10	2.6

2 days	9	2.3
3 days	35	9.1
4 days	5	1.3
5 days	117	30.5
6 days	2	0.5
≥ 7 days	206	53.7
Route of drug administration (n = 1540)		
Oral route	1326	86.1
Intramuscular/Intravenous route (IM/IV)	164	10.7
Transdermal route	33	2.1
Vaginal route	10	0.7
Ocular (eye) route	4	0.3
Rectal route	2	0.1
Inhalational route	1	0.0
Classes of medications prescribed (n = 1540)		
Anti-infective drugs for systemic use	488	31.7
Drugs working on the musculoskeletal system	386	25.1
Drugs working in the alimentary tract and metabolism	198	12.9
Drugs working in the blood and blood-forming organs	166	10.8
Drugs working on the cardiovascular system	147	9.5
Drugs working on the skin	35	2.3
Drugs working on the respiratory system	79	5.1
Drugs working on the nervous system	19	1.2
Drugs working on the sensory organs (eyes, ears, tongue, skin and nose)	9	0.6
Drugs working in the genitourinary tract	8	0.5
Systemic hormonal preparation	4	0.2
Antineoplastic and immune-modulating agents	1	0.1

Median duration of therapy (IQR, interquartile range), 7 (IQR 1 – 28) days

Table 4: Potential Drug-Drug Interactions identified

Characteristics of Drug-Drug Interaction	Frequency	Percentage (%)
Presence of at least a pDDI in a prescription (n = 384)		
Yes	306	79.7
No	78	20.3
Total number of pDDIs (n = 675)		
Number of desirable pDDIs	488	72.3
Number of non-desirable pDDIs	187	27.7
Possible clinical consequences of identified pDDIs (n = 675)		
Improvement in effectiveness of therapy	488	72.3
Reduction in effectiveness of therapy	86	12.7
Adverse events	101	15.0
Mechanisms of pDDIs (n = 675)		
Pharmacokinetic interactions	26	3.9
Pharmacodynamic interactions	649	96.1
Specific mechanisms of pDDIs and levels potentially affected (n = 675)		
Pharmacokinetic interactions		
Absorption	26	3.9
Distribution	-	-
Metabolism	-	-
Excretion	-	-
Pharmacodynamic interactions		
Antagonism	133	19.7
Additive	283	41.9
Synergism	233	34.5

Average values of pDDIs encountered		Mean ± SD
Average number of all pDDIs per encounter		1.75 ± 1.77
Average number of desirable pDDIs per encounter		1.27 ± 1.07†
Average number of non-desirable pDDIs per encounter		0.48 ± 1.14†

†*p < 0.0001*

Table 5: Prescribing indicators assessed at the study centre

Indicators	Value	Standard values
Average number of drugs prescribed per encounter, (mean ± SD)	4.03 ± 1.55	(1.6 – 1.8)
Percentage of encounters with an antibiotic prescribed, (%)	43.2	(20.0 – 26.8)
Percentage of encounters with an injection prescribed, (%)	16.4	(13.4 – 24.1)
Percentage of drugs prescribed by their generic names, (%)	62.7	100
Percentage of drugs prescribed from an essential medicines list, (%)	92.6	100

Standards culled from the report by Isah et al. (2002).

Discussion

This study set out to investigate drug utilization and identification of pDDIs in prescriptions written for adult patients, who attended clinics at a private hospital located in Yenagoa, Bayelsa State, South-South of Nigeria. It was observed that majority of these patients fell within the middle age range and that relatively similar proportions of males and females were encountered. Each patient presented with about two health conditions per encounter, mostly infectious or parasitic diseases and diseases of the digestive system. Almost all were treated as outpatients. Over half of all patients were prescribed drug therapy lasting for periods of seven days and more, and the majority were those drugs working as anti-infective drugs for systemic use and those working on the musculoskeletal system. Majority of all drug formulations were intended for oral and im/iv routes. However, more than three-quarter of all prescriptions evaluated contained at least a pDDI. Most of the pDDIs noted were pharmacodynamic. Slightly over a quarter of all pDDIs eventually identified were not desirable therapeutically. Meanwhile, only the percentage of encounters with an injection prescribed, among all other prescribing indicators measured was in line with the quoted WHO reference values.

In this study, more patients in the middle and young adult age range than older adults presented for treatments. This observation contradicts findings elsewhere, where elderly individuals were reported to frequent the healthcare setting more than the younger ones (Faiz & Kristoffersen, 2018). According to the Institute of Medicine (US) Committee on the Future Health Care Workers for Older Americans (2008), older adults "have high rates of chronic disease and disability, particularly as compared to younger adults" hence, the difference in their patterns of healthcare seeking. One thing that is however evident among the population assessed in the present study is that their pattern of clinic attendance somewhat reflects the age distribution of the population of Yenagoa, and Bayelsa State at large, going by outcomes of the Nigerian censors of the year 2006 (Brinkhoff, n.d.a.; Brinkhoff, n.d.b).

The proportion of male patients encountered in this study was slightly more than that for females. This difference, although not particularly significant, contradicts a report by Bertakis *et al.* (2000) in which it was observed that "women had a significantly higher mean number of visits to their primary care clinic and diagnostic services than men". Meanwhile, the pattern of clinic attendance among males and females at 51.6 and 48.4%, respectively encountered in this study reflects the gender distribution prevailing in Bayelsa State, which has been estimated as 51.3% for males, and 48.7% for females (Brinkhoff, n.d.a). All these observations are suggestive of the fact that the population of members of particular groups (i.e., age and gender) may have an important role to play in determining their rate of presentation at clinics for healthcare services at the health facility within their vicinity.

Virtually all patients seen were treated as outpatients, probably in a bid to prevent overcrowding on the wards, thereby curtailing its attendant inconveniences for the patients, their families, and the hospital management. Each patient was treated for an average of two health conditions per encounter. In all, infections accounted for the most encountered of all forms of diseases treated, which is similar to the finding from a study by Ganiyu *et al.* (2016). Corroborating these observations, infections have

consistently been noted, both locally and elsewhere, to be at the forefront of diseases routinely treated (Straif-Bourgeois *et al.*, 2014). Second to infections, diseases of the digestive system also featured prominently among the patients treated. This particular observation calls for some concern given that a similar prevalence has been reported for these types of conditions about other kinds of diseases treated at another healthcare setting in the same locality where the present study was conducted (Ganiyu and Didei, 2019). This suggests that occurrence of diseases of the gastrointestinal system may be on the increase or most likely very rampant, already, among the people residing in Bayelsa State. In addition, a substantial number of diseases of the musculoskeletal system or connective tissue, diseases of the genitourinary system, and diseases of the circulatory system were equally treated, among other varieties of conditions presented by the patients studied. From an economic point of view, paying more attention to providing resources for the management of all aforementioned disease states is advisable, given the constraint of limitation in resources that has been established to be commonplace in Bayelsa State (Statista, 2020). However, this move should not be made to the detriment of other rarely encountered health conditions.

Medication therapies prescribed for patients seen in this study largely included 3 to 4 drugs and were mostly for a week or more. The durations were found to range from 1 to 28 days. These confirmed the notion that individuals presenting for treatments at a given healthcare setting would require varying numbers of drugs for their conditions, and for different durations, owing to differences in their conditions (World Health Organization, 2012). Meanwhile, experts have recommended that the nature of the condition(s) to be treated, type(s) and cost(s) of medication(s) required, the economy of the patient, and a host of other factors should be considered when determining the duration of drug prescribing that would be appropriate for a given patient (Cheprasov, 2017).

Consistent with the position of experts, oral and im/iv routes were found to be the most favored means of drug administration for most patients treated in this study (Pharm approach, 2021). Understandably, oral route is the most acceptable mode of medication administration. It is particularly ideal for out-patients, as it is simple, convenient, noninvasive, safe, and economical. It requires no special precautions for sterility, and exhibits minimal tendency to precipitating acute drug reaction, among other advantages. Apart from the well-known first pass effect, which is its major drawback, oral route is not ideal for emergency situation, and there maybe problem of palatability and incomplete absorption (Kim and De Jesus, 2022; Pharm approach, 2020). On the other hand, im/iv routes are suitable for use in unconscious patients and emergency situations. These injection routes are devoid of first pass effect, but for the problems associated with injectables (Pharm approach, 2021). Researchers have however submitted that "it is inappropriate to simply say that one injection route is overwhelmingly better than another route" (Jin *et al.*, 2015).

Drugs working as anti-infective agents, on the musculoskeletal system, and in the alimentary tract and metabolism were the most encountered of all medications prescribed during this study. They accounted for 70% of all drugs prescribed. This trend in drug prescribing is similar to that observed in an earlier report by Ganiyu *et al.* (2022), although that particular study was carried out at the pediatric unit of a secondary health facility at another location in Bayelsa State. Conversely, outcomes of a report by Fuentes *et al.* (2018) contradict the findings highlighted above. In that report, Fuentes and his colleagues (2018) summarized the most commonly prescribed medications in the US - the most prescribed being those drugs acting on cardiovascular, central nervous, endocrine, and musculoskeletal systems. It is worth noting that researchers have posited that prescribers often prescribe medications in line with the prevailing health conditions in the location where they practice (Ganiyu *et al.*, 2014), hence the differences in drug prescribing patterns noted above.

It was observed that more than three-quarters of all prescriptions evaluated contained at least a pDDI per encounter. This translated to a prevalence of pDDIs summing up to 79.7%, which is similar to 78.3%reported by Bhandari *et al.* (2022), but lower compared to the 83.4% prevalence related by Patel *et al.* (2014). The majority of the pDDIs recorded were found to be mediated via pharmacodynamic interactions, by way of additive, synergistic, and antagonistic mechanisms. To a lesser extent, some of the pDDIs were mediated via pharmacokinetic interaction, mainly by way of interactions impacting drugs absorption. This observation is somewhat

similar to that of Patel *et al.* (2014), but for the fact that only absorption mechanism was noted for pharmacokinetic interaction observed in the present study. In the study by Patel *et al.* (2014), apart from absorption, pharmacokinetic interactions were also found to be mediated via distribution, metabolism, and excretion. Altogether, each prescription contained an average of two pDDIs per encounter, which is lower than the average of 5.90± 6.0 estimated elsewhere (Patel *et al.* 2014). Interestingly, more of the pDDIs encountered in this study were desirable therapeutically, which is good. However, the non-desirable pDDIs noted, even though not significant in number, require some attention. This is because the goal of every therapy should be to avoid non-desirable pDDIs, given the possible untoward clinical consequences the occurrence of such may precipitate in the patients for whom medications are prescribed. Fortunately, researchers have recommended that prescriptions issued by prescribers should be checked against drug interaction checker databases before the prescribed medications are dispensed to patients (Bhandari *et al.*, 2022). In their opinion, doing this will enable the pharmacist to detect pDDIs contained in a prescription and have them addressed in a timely manner.

Each of the patients received an average of four drugs per prescription. This is above the upper limit of 1.8 recommended by the WHO (Isah *et al.*, 2002). Similarly, Ganiyu *et al.* (2016) have previously reported that averages of 4.0 ± 1.40 and 4.32 ± 1.12drugs were prescribed per encounter at a university-based health facility and a community-based health center, respectively. Both of these centers are in the same State where the current study was conducted, but situated at different location. Similar to the foregoing, percentage of an antibiotic prescribed per encounter was also found to be in excess of the recommended range of 20.0 to 26.8% per encounter, while percentages of generic name prescribing and prescribing from EML both fell short of the ideal value of 100% in each case. It was only the percentage of encounters with an injection prescribed that was found to be within the standard reference values, which is an improvement over findings noted in the previous study (Ganiyu *et al.*, 2016) cited above. Another report corroborating the aforementioned perceived improvement only in the area of injection prescribing within the locality of the present study is the outcomes of a recent investigation on drug prescribing among pediatrics by Ganiyu *et al.*

(2022). These findings show that prescribing practices at health facilities in Bayelsa State require some attention, as this will go a long way to improve rational drug use.

Some limitations are inherent in this study. The first is that electronic databases on drug interactions of an application by Drugs.com and clinical judgment by the investigators were largely depended on for the identification of most of the pDDIs reported. This might have caused under- or over-reporting of pDDIs presented. Moreover, this is a single-site study, limited to a private hospital. Therefore, the findings reported may not be the true picture of drug prescribing, prescribing practices, and incidences of pDDIs at other health facilities in Bayelsa State.

Conclusion

The patients studied at the private health facility were mostly within the middle age range, and there was no difference in their gender distribution. Each presented with an average of 2 health conditions per encounter, notably infections and diseases of the digestive system. Most patients were prescribed medication therapy lasting seven or more days. The majority of the medications prescribed were anti-infective drugs for systemic use and drugs working on the musculoskeletal system. Oral and im/iv routes were the most adopted means of medications administration. However, prescribing practice at the study center was largely suboptimal, and some of the prescriptions were fraught with non-desirable pDDIs.

Recommendation

Prescribers at the study centre require training and retraining in other to encourage rational drug prescribing among them.

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