ORIGINAL ARTICLE

Prescribing Patterns and Medicine Use at the University Teaching Hospital, Lusaka, Zambia

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ABSTRACT

Background: There is paucity of data on rational drug use studies at tertiary hospitals in Zambia. The aim of this study was to assess the extent of rational drug use at the adults and paediatrics outpatient departments of the University Teaching Hospital (UTH) using World Health Organization (WHO) standardized drug-use indicators.

Methods: Cross-sectional, descriptive, retrospective study of prescription encounters, selected using systematic random sampling methods was conducted at the adult and paediatric outpatient departments of UTH. WHO format of core and complimentary drug use indicators were used to collect prescribing indicators, patient care data which included consultation time, dispensing time and knowledge of correct dosage.

Results: A total of 1486 drugs encounters were prescribed from both adult and paediatric outpatient wings in 2015. The average number of drugs per prescription was 2.5(SD±1.58), with a range of 1 to 7 drugs per prescription. The antibiotic and injection-prescribing rate was 53.7% and 11.8%respectively. Generic prescribing was at 56.1%. Percentage of drugs prescribed from the Zambia Essential Medicines List (ZEML) was 98.1%.

Average consulting and dispensing time was 9.5 minutes and 1.3 minutes respectively. Percentage of patients with knowledge of correct dosing schedule was 78.9%. Labelling of medicines was adequate. All consultation rooms did not have Standard Treatment Guidelines (STG's) or any reference literature and were not connected to the internet.

Conclusion: Low rate of injection prescribing was rational but consultation times were shorter than recommended and therefore irrational. High rate of antibiotic prescribing was irrational going by WHO standards for health facilities and this could lead to microbial resistance. Brand name prescribing was also irrational and common. Prescribing outside the ZEML was minimal and rational.

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INTRODUCTION

Medicines play an important role in the health care delivery system. Drugs are expensive and in most developing countries including Zambia, about 20–50% of health care budgets are spent on drugs and other health commodities.[1] Therefore there is need to utilize them rationally. Irrational drug use occurs with polypharmacy, with the use of wrong or ineffective drugs, or with underuse or incorrect use of effective drugs. These actions can adversely impact on the quality of drug therapy, cost and may cause adverse drug reactions or negative psychosocial impacts.[2] Irrational drug use can give rise to many problems, including increased mortality, morbidity, poor treatment outcomes and wastage of health care resources.

Key Words: *Rational drug use, WHO drug use indicators, University Teaching Hospital, Out Patient Department.*

The global scale and impact of irrational use of medicines is now clearly appreciated in terms of influence on antimicrobial resistance, cost implications and harm to the individual and the general population.[3] Globally, WHO estimates that at least 50% of all medicines are used irrationally.[4] The conference of experts convened by WHO on rational use recommended that patients should receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community.[5]

WHO core drug use indicators include prescribing indicators, patient care indicators and health facility indicators.[7] Drug use indicators are a set of standardized indices used to measure drug use in outpatient facilities.[7] Drug use indicators provide a measure of the optimal use of these resources and can help in correcting deviations from expected standards and in planning. Drug use indicators include average number of drugs per patient encounter, percentage of patient encounters with a prescribed injection, percentage of patient encounters with a prescribed antibiotic to mention a few. This study adopted these indicators to measure prescribing patterns in adult and paediatric outpatient departments at the University Teaching Hospital in Lusaka.

METHODS

This was a cross sectional, descriptive study that used retrospective data for prescribing, health facility, patient care and complimentary drug use indicators in 2015. Data collection was based on a WHO Standardized method of investigating drug use.[7] The WHO Methods recommended at least 100 patient records in a single health facility or at least 30 records from 10 different clinics or health facilities.[7] This study planned to investigate a total of 600 patient records to increase the precision of the parameters.[8] The records studied were for patients attended to at the outpatient department of the hospital in the first three months of the year 2015. Patient records from the outpatient clinics of both adult and paediatric departments of the hospital were obtained. The attendance record during the period showed that the ratio of adult-to-paediatric attendance was 3:1. This ratio was used to select 450 adult records and 150 paediatric records using systematic sampling method.

Procedure

All information on the prescription and medical records were entered into data collection tools which included detailed prescribing encounter forms, prescribing indicator forms, patient care forms and facility summary forms. Information recorded included age, diagnosis (optional), number of drugs prescribed drugs prescribed by generic name, prescription with an antibiotic, with an injection and prescribed from the ZEML.

Data analysis and presentation

WHO prescribing indicators which included average number of drugs per patient encounter, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic prescribed, percentage of prescriptions with an injection and percentage of drugs prescribed from the ZEML were analyzed using Microsoft excel program. The Index for Rational Drug Prescribing (IRDP) consisting of five indices derived from the above WHO prescribing indicators was determined by adopting a previously validated method by Dong *et al*.[9] Each of these indices was developed by applying a mathematical model developed for comprehensive appraisal of medical care.[10] Similarly, the Index of Rational Patient Care Drug Use (IRPCDU) with 5 indices and index for Rational Facility Specific Drug Use (IRFSDU) with two indices were determined.

Each of the five prescribing indicators has an optimal index of 1; the closer to 1 the calculated index is, the more rational prescribing is considered to be. The index of polypharmacy was measured by the optimal index (containing less or equal to two (2) drugs divided by average number of drugs per prescriptions. In this study, those prescriptions with two or less medicines where considered as non-polypharmacy. The generic name, antibiotic, injection and Zambia essential medicine prescribing indices were defined by dividing the WHO optimal levels of each indicator by the percentage result obtained from the study. The IRDP, which has a maximum value of 5, was then calculated by adding the optimal indices. This approach was also adopted by Cole CP *et al.* [11] The same method was used to calculate the maximum indices for IRPDU (maximum 5) and IRFSDU (maximum 2).

RESULTS

Demographic data of patients

This study analysed 126 paediatric and 423 adult patient medical records with complete information. The average age for paediatric patients was 8.9 years and of which 46% were females and 54% males. The average age for adults was 35.9 years with 20.6% being male and 79.4 % females. For prescriptions, 150 paediatric and 450 adult prescriptions were analysed. There were 150 observations done.

Prescribing Indicators

A total of 1486 drugs were prescribed from both adult (1146) and paediatric (340) outpatient departments. The average number of drugs per prescription was 2.5(SD±1.58), with a range of 1 to 7 drugs per prescription. Generic prescribing was at 56.1%. The antibiotic and injection prescribing rate was 53.7% and 11.8%respectively. A total of 426 antibiotic prescriptions were encountered. Antibiotics commonly prescribed included; amoxicillin (99), ciprofloxacin (61), metronidazole (59), cloxacillin (38), caphalexine (31), cotrimoxazole (18), erythromycin (13) and amoxicillin-clavulanic acid (8). Percentage of drugs prescribed from the Zambia Essential Medicines List (ZEML) was 98.1%. WHO optimal levels for drug use indicators are presented in Table 2.

Patient care indicators

Average consulting and dispensing time was 9.5 minutes and 78 seconds respectively with a range between 1 to 26 minutes consultation time and 10 to 717 seconds dispensing time. From the1486 drugs prescribed, 59.3 %(881) were actually dispensed from the hospital pharmacy. Of the 479 encounters, 32.6% received all the prescribed drugs, 18.2% received more than half, 17.7% received half their drugs, 14.6% received less than half and 16.9% received none. This study showed that 78.9% of patients knew the correct dosage schedule of their drugs. All medicines dispensed were adequately labelled (100%). A summary of findings on patient care indicators are presented in Table 9.

Health facility indicators

Availability of key drugs:

Percentage availability of key drugs to treat important conditions was 83.3% during the period under review. The ZEML was available in the pharmacy. A model of key essential drugs needed for outpatient care is presented in Table 3.

Availability of Standard Treatment Guidelines and Hospital Formulary:

All five doctors' consultation rooms did not have STG's or any reference literature nor were they connected to the internet. Most clinicians indicated that they used the British National Formulary (BNF) though they were not available in the consultation rooms.

Table 1: Model list of essential drugs for outpatient department[12].

Sn	Drug
1.	Aminophylline
2.	Amoxicillin
3.	Arthemeter-Lumefantrine
4.	Atenolol
5.	Chloramphenicol eye drops
6.	Chlorpheniramine
7.	Ciprofloxacin
8.	Cotrimoxazole
9.	Dextrose 5% infusion
10.	Dextrose 50% infusion
11.	Dextrose saline infusion
12.	Diclofenac
13.	Fluconazole
14.	Furosemide
15.	Glibenclamide
16.	Griseofulvin
17.	Hydrocortisone injection
18.	Ibuprofen
19.	Mebendazole
20.	Metformin
21.	Metronidazole
22.	Nifedipine
23.	Oral Rehydration Salts
24.	Paracetamol
25.	Pethidine injection
26.	Prednisolone
27.	Ringer's lactate infusion
28.	Soluble insulin

Table 2: Optimal levels for WHO prescribing indicators.

Prescribing indicator	Optimal level (%)	Optimal index
Average number of medicines prescribed per encounter	≤2	1
Percentage of prescriptions containing antibiotics	≤30	1
Percentage of prescriptions containing injections	≤ 10	1
Percentage drugs prescribed by generic name	100	1
Percentage of drugs prescribed from Essential Medicines List or formulary	100	1
Patient care indicator	**Optimal level (%)**	**Optimal index**
Average consultation time (min)	≥ 30	1
Average dispensing time (sec)	≥ 60	1
% drugs actually dispensed	100	1
% drugs adequately labeled	100	1
% of patients with correct knowledge of dosage	100	1
Facility specific indicator	**Optimal level (%)**	**Optimal index**
% availability of copy of ZEML or hospital formulary	100	1
% availability of key drugs in stock	100	1

Table 3: Results of prescribing indicators

Prescribing indicator	Average/ (%)	WHO recommendation
Average number of drugs per encounter	2.5	1.6-1.8
% of drugs prescribed by generic name	56.1	100
% of encounters with an antibiotic prescribed	53.7	≤30
% of encounters with an injection prescribed	11.8	≤ 10
% of medicines prescribed from the ZEML	98.1	100

Table 4: Index of Rational Drug Prescribing (IRDP)

Index of polypharmacy	Index of Generic prescribing	Index of rational antibiotic prescribing	Index of rational injection prescribing	Index Essential medicines	IRDP
0.64	1.78	0.55	0.84	0.98	**4.79**

Table 5: Results for patient care indicators

Patient care indicator	Average/ (%)	WHO recommendation
Average consultation time (min)	9.5	≥ 30
Average dispensing time (sec)	90	≥ 60
% drugs actually dispensed	59.3	100
% drugs adequately labeled	100	100
% patients with correct knowledge of dosage	78.9	100

Table 6: Index for rational patient care drug use (IRPCDU)

Index for average consultation time	Index for average dispensing time	Index for drugs actually dispensed	Index for drugs adequately labeled	Index for patients with correct knowledge of dosage	IRPCDU
3.15	0.77	1.68	1	1.26	**7.86**

Table 7: Results for facility specific indicator

Facility specific indicator	Average/(%)	WHO recommendation
% availability of copy of ZEML	100	100
% availability of STG in consultation rooms	0	100
% availability of key drugs in stock	83.3	100

Table 8: Index of Rational Facility Specific Drug Use (IRFSDU)

availability of copy of ZEML or formulary	availability of STG	availability of key drugs in stock	IRFSDU
1	0	0.83	**1.83**

Table 9: Summary results of WHO core drug use indicators

Indicator	Result
Prescribing indicator	
a. Average number of medicines prescribed per patient encounter	2.5
b. Percentage medicines prescribed by generic name	56.1
c. Percentage encounters with an antibiotic prescribed	53.7
d. Percentage encounters with an injection prescribed	11.8
e. Percentage medicines prescribed from Zambia Essential Medicines List	98.1
Patient care indicator	
a. Average consultation time (Minutes)	9.5
b. Average dispensing time (Minutes)	1.30
c. Percentage medicines actually dispensed	59.3
d. Percentage patients with knowledge of correct doses	78.9
e. Percentage adequately labeled	100
Facility indicator	
a. Availability of Zambia Essential Medicines List or Hospital Formulary to clinicians	Yes
b. Availability of Standard treatment Guidelines (STG's) to clinicians	No
c. Percentage key medicines available to treat important conditions	83.3

Figure 1: The most commonly prescribed antibiotics

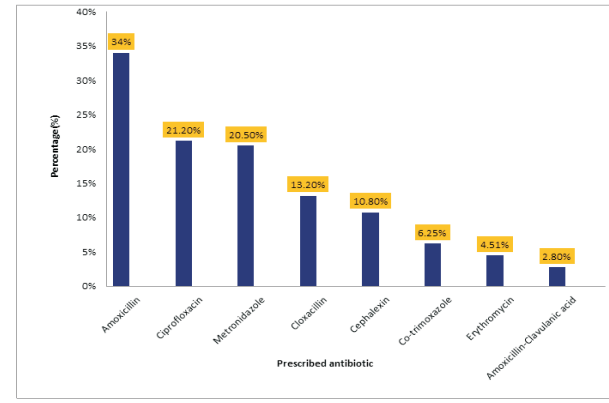


Figure 2: Prescribing patterns at University Teaching Hospital, Lusaka, Zambia

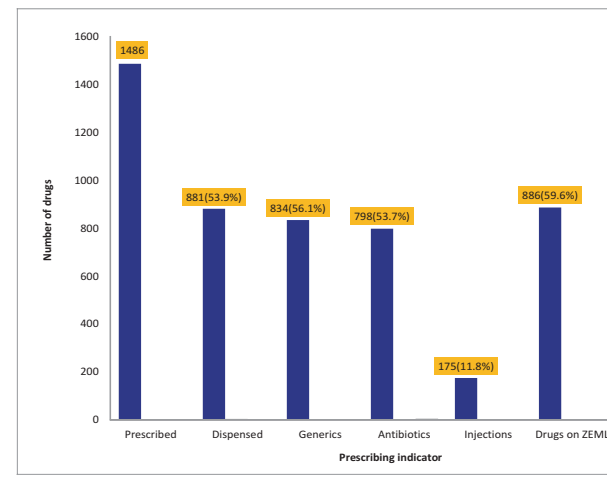
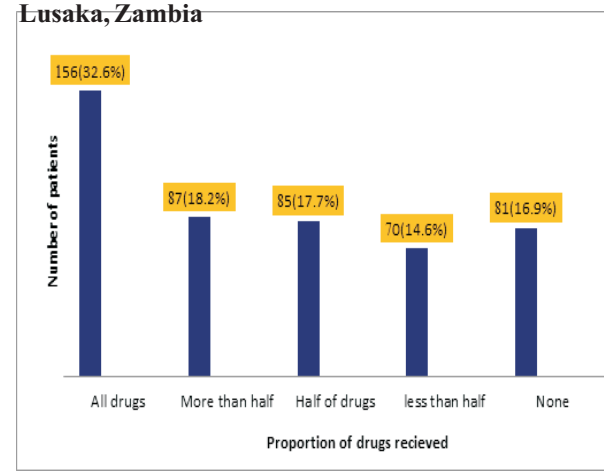


Figure 3: Percentage of patients who received drugs at OPD pharmacies at the University Teaching Hospital, Lusaka, Zambia



DISCUSSION

Prescribing Patterns

The average number of drugs per prescription encounter reported in this study was 2.5±1.58 and this is lower than that reported in Sierra Leone (3.77), Nigeria (3.55) and India (5.6). However our findings are higher than those reported in Saudi Arabia (1.44) and Tanzania (2.2).[11,13,14,15,16]

Sudan and Zimbabwe had an average of less than 1.5 drugs per encounter each whereas Ghana had 4.5 drugs per encounter.[17] This study showed higher figures of prescriptions containing injections (11.8%) than the European country Andorra (3%), but a lower figure when compared to percentages in Yemen (46%), Cameroun (51%), and Swaziland (54%). The result from this study was slightly higher than the WHO recommendation of 10 %. A separate set of OPD medical records was sampled to assess injection use. This was done for two main reasons; the first is that the outpatient departments at UTH orders and collect injectable from the pharmacy as a ward/bulk stock. Therefore injections are not usually shown on prescription slips that are sent to the pharmacy. Secondly, injections are prescribed on patient medical files and administered by the nursing staff at the OPD.

The percentage of prescriptions with antibiotics was 53.7%, which is comparable to Uganda (53%) and Swaziland (54%), but lower than Jordan (60.9%) and Sudan (63%). WHO advocates that encounters with antibiotics prescribed should be less than 30% for it to be considered rational. The result from this study is higher than the WHO optimal level necessitating the need for limiting the use of antibiotics. Though, antibiotic use is influenced by the pattern of infection in a particular region and season, diagnosis is not captured on prescription slips and therefore the rationale (appropriateness) for antibiotic use could not be determined by the researchers. Antibiotic prescribing is a problem in many developing countries including Zambia with physicians prescribing antibiotics for conditions such as viral diarrhoea infections, flu and uncomplicated malaria only and to satisfy patients' demands.[18,19,20,21]

A study conducted in Kenya and the United Arab Emirates had percentage antibiotic encounters of 40% and 45% respectively pre-intervention.[17] Uganda and Sudan had over 50% of the encounters having an antibiotic prescribed; Nigeria and Ghana had about 50% antibiotic encounters while Zimbabwe and Tanzania had less than 40% antibiotic encounters.

For Zimbabwe, the values were just over 30% which is the ideal for rational antibiotic prescribing.[17]

The percentage of drugs prescribed by generic name was 56.1%. This result was much lower compared to results from Tanzania (82%), Uganda (86%) and Zimbabwe (94%). A survey in the North-West of Nigeria reported higher value of 55.7% generic prescribing (Ibrahim, 2004). Also in the survey carried out in a tertiary health facility in Kenya, 40% generic prescribing was reported (Shah, 2007) while a comparative survey between two tertiary hospitals yielded 42.2% and 35.95% in Nigeria.[13] Zimbabwe and Tanzania had figures greater than 80% while Nigeria and Ghana had figures between 55 and 60% in the study conducted in 1993 compared to the WHO optimal index of 100%.[17] This result requires intervention through continuing medical education programs and drug policies to enforce generic prescribing. Generic prescribing has been found to reduce the cost of medicines and also promote better communication among healthcare providers.[22] Low generic prescribing of drugs could reflect the influence of pharmaceutical companies who allow their pharmaceutical sales representative to freely advertise their products in consultation rooms thereby influencing physicians prescribing habits.

The percentage of drugs prescribed from the Zambia Essential Medicines List was 98.1%, which was higher than Tanzania (83.9%), and comparable to Jordan (93%), and Ghana (93.2%). [15, 23] Essential medicines are those that satisfy the priority health care needs of the population, selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness. Prescribers must therefore adhere to the essential medicines list to achieve these benefits.

Patient Care

The result from this study demonstrates that average consultation time was only 9.5 minutes. Such a

comprehensive patient evaluation and consequently prescribe treatment rationally.[24] The optimal consultation time proposed in this study was ≥30 minutes (Table 2). This result compares to 8 minutes obtained from a study done at a tertiary hospital in Ghana but longer than 7 minutes in India.[14,25] Such short consultation time could be attributed to large physician to patient ratio. The average dispensing time was 78 seconds. This result was lower compared to India (4 minutes).[26] Longer dispensing times allow pharmacists to offer adequate drug information to patients with regard to correct dosage, side effects they may experience, adverse drug effects and counselling. This in turn enhances compliance to treatment and leads to better treatment outcomes. WHO recommends a dispensing time of ≥ 60 seconds and therefore the finding from this study was rational. Percentage for drugs actually dispensed was 59.3% and this result was much lower than 96.07% observed in India.[26]

Health Facility

Percentage availability of key drugs to treat important conditions was 83.3% during the period under review. The facility had the ZEML in the pharmacy department. All five doctors' consultation rooms did not have STG's or any reference literature nor were they connected to the internet. Most clinicians indicated that they used the British National Formulary (BNF) though it was not visible in the consultation rooms.

Strength of study

The strength of this study is that it provides baseline information on rational adult and paediatric outpatient prescribing patterns to which future assessments can be compared when monitoring prescribing patterns and providing interventions where necessary. A large sample size of 600 prescriptions, medical records and 150 observations adds to the strength of the study. The use of WHO/INRUD core drug use indicators and compliance to the WHO methodologies also added strength to the study.

Limitations of study

Certain limitations did however exist. Firstly this study was at a tertiary level hospital and therefore further research will be needed to study these parameters at country level to reflect national patterns. Secondly, this was a purely descriptive study, and so the appropriateness and underlying reasons or factors influencing prescribing, especially with regards to antibiotics and injections were not assessed. Furthermore, prescribing patterns for adult and paediatric inpatients was also not evaluated. This makes it difficult to make inferences, develop and implement appropriate interventions that promote rational prescribing holistically. Therefore further studies will be needed to address these limitations.

CONCLUSION

The results of this study indicate that the overall prescribing patterns by tertiary care physicians at UTH are in line with many tertiary institutions in African countries. However, irrational was the low generic prescribing and low consultation times which can be resolved by Medicine and Therapeutic Committee through educational strategies. There is need to conduct a study to understand the high rate of antibiotic prescription (53.7%) at UTH. The pharmacy department need to train all the pharmacists on patient medication use to ensure increased patient understanding of their medication schedules. UTH management should increase the number of clinicians in the outpatient departments, in order to improve patient to clinician average contact time**.** It is important to reinforce generic prescribing and make available to clinicians hospital formulary and standard treatment guidelines. There is need to conduct a drug use study in the in-patient departments

Conflict of interest

None declared

Declaration of funding

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