ORIGINAL ARTICLE

Factors Associated with Irrational Drug use at a District Hospital in Zambia: Patient Record-based Observations

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ABSTRACT

***Background**:* The irrational use of drugs remains a key health problem in many developing countries. The prevalence of irrational drug use and factors associated with it were investigated at Kapiri Mposhi District Hospital in Zambia.

***Methods**:* The outpatient records (n = 680) of clinical encounters from the hospital registry department for the year 2010 were analysed. The selection process adapted a random sampling method using the patient logbook in order to get a representative sample. Standardised World Health Organization (WHO) prescribing and facility indicators were used to describe irrational drug use. The composite measure of irrational drug use was used to determine the prevalence of irrational drug use at the hospital. Logistic regression was used to assess factors associated with irrational drug use. In addition, a self-administered questionnaire was administered to assess the availability of key medical personnel at the hospital.

Findings: Overall prevalence of irrational drug use was 51.4% (n = 680) at Kapiri Mposhi District Hospital Outpatient Department. Disaggregating the composite indicators revealed that antibiotics (65.4%) and polypharmacy (52.2%) were the highest contributors to irrational drug use. A mean of 2.5 (SD 1.07) drugs were prescribed, with a low rate of prescribing by generic name 56.9% (95%CI 52.4-58.8). The proportion of prescriptions for antibiotics was 65.4% (95%CI 61.7-68.9) and for injections, it was 9.7% (95%CI 7.48-11.9). A high percentage of drugs were from the essential drugs list (95.9%) while drug availability was 92%. The essential drug list was not available at the hospital. The availability of prescribers was 55% whereas that of dispensers was 67%. In multivariate logistic regression, polypharmacy was the main determinant of irrational drug use. A one-unit increase in drug use increased the odds of using antibiotics by 2.7 times (P < 0.001; OR=2.68, 95%CI 2.20-3.25) and injections by 2.3 times (P < 0.001; OR=2.28, 95%CI 1.75-2.97).

Conclusion: The prevalence of irrational drug use at Kapiri Mposhi District Hospital was high suggesting the need for rationalisation. Overuse of antibiotics, polypharmacy and the use of non-generic names were the identified drug-use problems. These findings suggested that there is a need for continuous monitoring of rational prescribing of drugs and strengthening of factors that support the rational use of drugs.

INTRODUCTION

Irrational use of drugs/medicines continues to be a serious and widespread public health problem in developing countries.[1] According to World Health Organisation (WHO) estimates, more than half of all medicines are prescribed, dispensed or sold inappropriately, and half of all patients fail to take medicines prescribed to them correctly.[2] In relation to this, of the world's seven billion people, 75% of whom live in developing countries, 25–50% have little or no access to basic pharmaceutical drug availability.[3]

The misuse of medicines tends to be determined by economic, cultural and structural factors. Economic factors include considerations such as the price of the

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drug and the purchaser's financial means, financial incentives to prescribers and drug supply at a health facility.[4] Cultural preferences and beliefs also influence the use of drugs.[5] Structural factors such as the health system, prescriber, dispenser, patient and the community are all involved in the therapeutic process and can contribute to irrational use in a variety of ways.[6] For instance, national drug regulatory agencies in most developing countries do not have enough qualified personnel, financial resources and equipment to regulate medicines. In poor parts of sub-Saharan Africa, it is common to find prescription drugs being sold in the markets and open areas by unqualified people.[1] The misuse of medicines continues to be widespread and this has serious health and economic implications, especially in resource-poor settings.[7]

Knowing the exact burden of irrational drug use and associated determinants is critical for developing strategies and interventions to improve rational drug use. In Zambia, the Ministry of Health (MoH) developed and adopted the National Drug Policy in 1999 in order to ensure that essential drugs are always available and are rationally used. In 2004, the MoH also undertook other interventions such as development of the Essential Drugs List, establishment of the Zambia Logistic Management Information System as well as the establishment of the Pharmaceutical Regulatory Authority through an Act of Parliament. However, shortages and irrational usage of drugs remain a major problem.[8,9]

The objective of this study was to describe the extent of irrational use of drugs and factors associated with it Kapiri Mposhi District Hospital. The information gathered could be helpful in stimulating continuous operational research in health facilities and guide national policy on drug use.

METHODS

In order to ascertain which factors were associated with irrational drug use in a district hospital the following methodology were used.

Population and sampling procedures

The study population consisted of all the patient files or the prescribing encounters at the hospital's outpatient department from which a representative sample was drawn. The study unit was each patient's file or the prescribing encounter. The sampling frame was all the prescribing encounters in the patient logbook for the year 2010 (n = 1,257). The researchers aimed to get at least 50% of these records to reach the target sample size. Patient files were sampled systematically to reach the calculated sample size of 687. After sampling 687 patient files, data was collected from the files.

Data collection

Prescribing and facility indicator forms were used to collect information on demographic characteristics of each patient, the number of drugs per prescription, the antibiotics and injections prescribed, the number of generic names used and associated information on all eligible records which had the required information. To collect human resource information, a self-administered questionnaire was given to the hospital administrator. To ensure the validity of this study, data collection tools were pretested for completeness and for user-feasibility at Kapiri Mposhi Urban Health Centre Outpatient Department. Thorough checks for errors and inconsistencies were carried out on the collected data. After all the needed information was collected from the hospital outpatient files, it was entered into a data set and analysed.

Analysis

The manner in which the analysis was done was mainly guided by WHO core drug use indicators, particularly the prescribing and facility indicators.[10] The prescribing indicators measured the performance of prescribers in several key dimensions related to the rational use of drugs, such as average number of drugs per encounter, use of antibiotics and injections, use of generic names of drugs and prescribing of drugs from the essential drug list. The facility indicators determined the availability of specific factors which support the rational use of drugs, such as adequate supply of essential drugs and the availability of the essential drug list at the hospital. Statistical Package for Social Sciences (SPSS, Chicago, Illinois, USA) version 17.0 was used for the main analysis of the research findings. Overall prevalence of irrational drug use was determined by the composite measure of each of the prescribing indicators. The associations between antibiotic or injection use and its predictors were measured using logistic regression models.

Ethical approval

The study received clearance from the University of Zambia Research Ethics Committee and the Kapiri Mposhi District Health Management Team (KMDHMT). In addition, an information sheet concerning the rights of participants taking part in the research was provided for the self-administered questionnaire.

RESULTS

The major findings of this research were:

Participation and distribution

Of the 687 listed patient records, 680 (48.7% males; 51.3% females) were enrolled. Overall mean age was 22.9 (SD 19.7) but in males it was 22.6 (SD 19.1) and females 23.1 (SD 20.2) Non-participation was due to incomplete data or missing records (1.2%). The missing records were mostly due to filing challenges. Only the records with completed data were included in the final analysis.

Irrational drug use

From the records it was clear that there was a 51.4% prevalence of irrational drug use at Kapiri Mposhi District Hospital, which was high (see Table 1 in Appendices). Of the five prescribing indicators, the hospital did not perform well in the average number of drugs per encounter (a mean of 2.5 drugs prescribed per encounter), a low rate of prescribing by generic name 56.9% (95%CI 52.4-58.8) and an overuse of antibiotics 65.4% (95%CI 61.7-68.9) (see Table 2). Health support system tools, such as the essential drug list, were not available at the hospital and the provision of human resources was inadequate.

Table 1. Composite measure of irrational drug use at a district hospital in Zambia

Indicator	Number (n)	Weights(n/N)	Percentages x weights
Antibiotics given	445 (65.4%)	0.37	24.2
Non - generics	293 (43.1%)	0.25	10.8
Injections given	66 (9.7%)	0.06	0.6
Average number of drugs (polypharmacy)	355 (52.2%)	0.30	15.7
Number of drugs not on EDL	28 (4.1%)	0.02	0.1
TOTAL	**N = 1187**		**51.4**

Note: Irrational drug use is a composite index comprising of antibiotics given, non generics, injections given, average number of drugs and number of drugs not on EDL.

Table 2. A summary of comparative selected WHO-based drug use indicators and study findings at Kapiri Mposhi District Hospital

	Indicator	WHO standard values	Study findings /proportions at 95% Confidence Interval
1.	Average number of drugs prescribed	< 2	2.4
2.	Percentage of drugs prescribed by generic name	100%	56.9% (52.4 -58.8)
3.	Percentage of encounters with an antibiotic	< 30 %	65.4% (61.7 -68.9)
4.	Percentage of encounters with an injection	< 20%	9.7% (7.5 -11.9)
5.	Percentage of drugs from essential drug list	100%	95.9% (88.2 -104.5)

Note: The availability of key indicator drugs at the hospital was 92% and the essential drug list was not available

Table 3. Utilisation of antibiotics and injections in various disease domains based on the Zambian Health Management Information System (HMIS) Register

	Proportion of antibiotic use by disease domain		Proportion of injection use by disease domain	
Diseases listed according to HMIS register	Not given an antibiotic	Given an antibiotic	Not given an injection	Given an injection
Notifiable diseases (n = 24)	10 (41.7%)	14 (58.3%)	20 (83.3%)	4 (16.7%)
Malaria (n = 79)	31 (39.2 %)	48 (60.8%)	73 (92.4%)	6 (7.6%)
ENT (n = 13)	3 (23.1%)	10 (76.9%)	13 (100%)	0 (0%)
Chronic diseases (n = 43)	18 (41.9%)	25 (58.1%)	41 (95.3%)	2 (4.7%)
RVD (n = 10)	5 (50%)	5 (50%)	9 (90%)	1 (10%)
Obstetric complications (n = 29)	13 (44.8 %)	16 (55.2%)	27 (93.1%)	2 (6.9%)
STIs (n = 41)	9 (22%)	32 (78%)	37 (90.2%)	4 (9.8%)
Neonatal diseases (n = 18)	9 (50%)	9 (50%)	15 (83.3%)	3 (16.7%)
Others (n = 423)	137 (32.4%)	286 (67.6%)	379 (89.6%)	44 (10.4%)
Total	235	445	614	66

Note: n represents the total number of prescribing encounters in each disease domain

Evaluation of factors associated with irrational drug use

In the regression model, factors used to assess irrational drug use were age, sex and the number of drugs prescribed. The results revealed that a one-unit upward adjustment in drug use increased the odds of using antibiotics by 2.7 times (OR=2.68, 95%CI 2.20-3.25). In general, females had a smaller likelihood of getting antibiotics, irrespective of age. Alternately, a one-year increase in age reduced the odds of using injections by 1%, while a one-unit upward adjustment in drug use increased the odds of using injections by 2.3 times (OR=2.28, 95%CI 1.75-2.97), although this was not influenced by gender (see Table 4).

Table 4. Multivariate regression analysis showing antibiotic and injection use by demographic and system factors

Predictors	Antibiotics use			injection use		
	Co-efficient (B)	Standard Error (S.E)	P value	Co-efficient (B)	Standard Error (S.E)	P value
Age [+]	-0.00	0.01	0.543	-0.01	0.01	0.267
Number of drugs	0.75	0.12	< 0.001	0.82	0.14	< 0.001
Sex(females) *	0.31	0.12	< 0.001	-0.03	0.27	0.921

Notes: 1) [+]Representing Odds Ratio (OR); OR=2.68(95%CI 2.20 – 3.35) for antibiotic use. 2) *Representing OR= 0.01(95%CI 0.00 – 0.01) for antibiotic use. 3) [+]Representing OR = 2.28 (95%CI 1.75 – 2.97) for injection use. 4) *Representing OR 1.04 (95%CI 0.57 – 1.67) for injection use. 5) Sample size (n) was 680

These results indicate that, although age and sex may have played varying roles in influencing irrational drug use in the case of antibiotics and injections, the number of drugs (polypharmacy) was the major factor in both instances.

DISCUSSION

This study was conducted with the objective of determining the extent of irrational drug use and factors associated with it at Kapiri Mposhi District Hospital. The prevalence of irrational drug use at the hospital was high, accounting for 51.4% of the records surveyed. Further analysis of this prevalence revealed that the prescribing indicators, such as the use of antibiotics (65.4%) and number of drugs also known as polypharmacy (52.2%) were the highest contributors to irrational drug use. This seems to suggest that the prescribers had a generally higher number of antibiotics and drugs on their prescriptions. According to the WHO, the optimal number of antibiotics to be prescribed should be less than 30% of all the prescriptions surveyed at a given time, whereas the optimal value of the number of drugs per prescription should be less than two.[11]The average number of drugs or polypharmacy appeared to be a major cause of irrational drug use in this study. Polypharmacy is the use of two or more therapeutic agents to manage disease states in a patient.[12] The study indicated that a one-unit increase in the number of drugs resulted in more than twice the increase in either the use of antibiotics **(**OR=2.68, 95CI%CI 2.20-3.25) or the use of injections (OR=2.28, 95CI%CI 1.75-2.97). The results of this work show that both the average number of drugs and the use of antibiotics use were high as compared to the WHO standard values. Thus, there seems to be a relationship whereby if prescribers increased the number of drugs on a prescription, there was a high likelihood of prescribing an antibiotic as well. Prescribing a high number of drugs could have cost implications on the health institution and health implications on the patient. Prescribing many drugs may lead to ever-increasing drug expenditures by the hospital and sometimes drug shortages. The patient's health may also be affected as the likelihood of having drug reactions may increase. Polypharmacy is known to a contributing factor to hospitalisations.[13] Polypharmacy may be influenced by a number of factors such as lack of laboratory facilities, inadequate medical personnel, prescribers' judgement and erratic drug supply.

The other factors which seemed to influence the use of drugs were age and gender. This study showed that a one-year increase in age reduced the odds of using injections ($p = 0.267$) by about 1%. This is illustrated by our findings (see Table 3) in which the highest use of injections was recorded in notifiable diseases (16.7%) and neonatal diseases (16.7%), which mainly affected children. A similar study[14] indicated that age produced a statistically more significant effect than gender. This could be because as most children grow to adulthood, they tend to seek less health services. It was also observed that females as compared to males had a 99% reduced possibility of getting antibiotics ($p < 0.001$). This is similar to a study done in Italy[15] in which the prevalence of drug use (mainly antibiotics) was slightly higher in boys than in girls for all ages ($p < 0.001$). This result was unexpected as our findings indicated that more females accessed the health services at the hospital than males. Females generally tend to seek health services more than males due to gender differences in health-seeking behaviour linked to customary gender roles and traditional perceptions of the male gender role.[16] However, analysing the diagnosis of the patients could justify why males had more antibiotics on their prescriptions than females.

This study also indicated that the percentage of encounters where antibiotics were prescribed was 65.4% (CI 61.7, 68.9). This value is quite high compared to studies done in Malaysia (23.2%)[17] and Nigeria (55%)[18] but almost similar to studies in Jordan (60.9%)[19] and Yemen (66.2%).[20] Of particular concern was the fact that

antibiotics use accounted for 60.8% of all the diseases surveyed in the treatment of malaria (see Table 3). The Zambian treatment guidelines do not recommend the use of antibiotics in treating malaria as using a recommended antimalarial would be enough to resolve symptoms of malaria.[21] Moreover according to the WHO,[22] antibiotics misuse has contributed to the worldwide increase in antimicrobial resistance that is now being observed in major infectious diseases including tuberculosis, gonorrhoea, malaria, bacterial diarrhoea and pneumonia. On the other hand, injection use accounted for 9.7% (CI 7.48, 11.9) of the total prescription surveyed. This was low compared to data reported in Nigeria (14%)[18] and the Republic of Yemen (46%)[20] but higher compared to that reported in Jordan (1.2%),[19] Malaysia (1.7%)[17] and India (0.2%)[23] implying that there is still room for improvement. According to the WHO, many patients and even health workers in various countries think that injections are more effective than tablets.[24] In the present research, injection use was low as compared to WHO standard indicators (Table 2). There is a need for continuous health education to both prescribers and patients on the disadvantages of high injection use. Injections are inconvenient, more expensive, less safe, painful and require skilled personnel to administer.

The strengths of this study were that the drug use indicators used to measure drug use were adapted from standardised methods. The prescribing and facility indicators were adapted from the WHO drug use manual.[10] These indicators have been extensively reviewed and field-tested in many developing countries. We therefore have no reason to believe that the drug use indicators were measured inaccurately. The limitation of this study could have been the measurement of the prevalence of irrational drug use. Irrational drug use is a complex phenomenon and in view of this, we may not have fully captured the prevalence of irrational drug use with our scale suggesting that we might have under-estimated the magnitude of the problem. We thus argue that the presence of this bias may not be important in explaining the magnitude of the problem given the possibility of under-estimates.

CONCLUSION

Our findings suggest that the prevalence of irrational drug use at Kapiri Mposhi District Hospital was high and therefore requires rationalisation. Of particular concern was the over-prescribing of antibiotics, polypharmacy and the under-prescribing of generic names. To improve the rational use of drugs there is a need for continuous monitoring of rational prescribing patterns of drugs and strengthening of factors that support them. This is important as it will lead to cost minimisation on drug expenditures and also improve health outcomes.

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