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Antibiotic Prescription Pattern and Cost at University of Ilorin Teaching Hospital, Ilorin, Nigeria

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Abstract: Appropriate antibiotic prescription is the first step for optimum antibiotic use and has the potential impact of reducing resistant micro-organisms generated by excessive use and to also save cost in health care. This study examines the antibiotic prescription pattern and the related cost in a tertiary hospital in Nigeria, a descriptive cross-sectional survey. Data were collected from prescription sheets of patients that reported to the Pharmacy Department of the Teaching Hospital. Six hundred and thirty prescription sheets were selected by systematic random sampling. Data was analyzed with EPI-info software. Only 14.1% had >4 drugs prescribed, 83.5% of the prescriptions had at least one antibiotics prescribed and more than a third (35.9%) of antibiotics prescribed were in the penicillins group. Mean number of drugs prescribed is 2.987±1.470 compared with the mean number of antibiotics of 1.015±0.670 and the mean duration of prescribed antibiotics is 10.59±13.15 days. Mean cost of drugs on a prescription sheet is ₦ 1108.69±976.73 (US$9.25), while the mean cost of antibiotics is ₦802.83±734.81 (US$6.72). Averagely Antibiotics make up 72.7% of total cost of drug in a prescription sheet. Significantly higher mean cost of drugs prescribed for out-patients than in-patients ($p<0.001$) but not significantly different for antibiotics. Antibiotics prescription is high in developing countries and calls for concern. A lot of money can be saved if policies are formulated and promoted on rational antibiotics prescription in developing countries like Nigeria.

Key words: Antibiotic, prescription pattern, cost, Teaching Hospital, Nigeria

INTRODUCTION

Antibiotics are the most frequently prescribed drugs among hospitalized patients and there are reported concerns about the continuous indiscriminate and excessive use of antimicrobial agents that promote the emergence of antibiotic-resistant organisms (Krivoy *et al*., 2007). Since the antibiotic introduction and their massive use, a significant increase in the prevalence of bacterial resistance has been verified on an international scale (Wise *et al*., 1998). Appropriate antibiotic prescription is the first step for optimum antibiotic use and has the potential impact of reducing resistant micro-organisms generated by excessive use.

The cost of medical care continued to increase due to invention of highly sophisticated equipment and technology, increase in the cost of the manpower, materials and irrational use of drugs specially antibiotics. Approximate 20% of drug cost can be saved without impairing the quality of care and maintaining the patient satisfaction (Chandra and Naik, 2005). Studies have been conducted to determine whether limiting the use of certain drugs, such as antibiotics, can help to reduce the risk of developing antibiotic-resistant bacteria, thus decreasing costs related to hospitalization (Kass-Bartelmes and Bosco, 2007). Inappropriate drug prescription has been identified in many health facilities in developing countries (Akande and Ologe, 2007; Erah *et al*., 2003).

Several professional societies have issued statements to reduce the use of antibiotics worldwide by means of strict antibiotics policy. For such a policy to be implemented, detailed knowledge of antibiotic prescription pattern and related cost is important (van Houten *et al*., 1998). Not many studies have looked at the prescription pattern and cost in Nigeria. This study examines the antibiotic prescription pattern and the related cost in a tertiary hospital in Nigeria.

MATERIALS AND METHODS

The study was conducted in the University of Ilorin Teaching Hospital, Ilorin. The hospital is tertiary health

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facility owned and run by the Federal Government. It serves as referral centre for patients from Kwara State and other neighbouring states in Nigeria like Oyo, Kogi, Niger States. It provides tertiary level health care services even though quite a number of patients bypass the primary and secondary health facilities to obtain care in this hospital for ailments that can be treated at lower levels. The hospital has over 100 specialists in various disciplines of medicine, in addition to resident doctors in-training and medical officers.

This study is a descriptive cross-sectional survey. Data were collected from prescription sheets of patients that reported to the Pharmacy Department of University of Ilorin. Only prescriptions that satisfy the minimum criteria of details required for this study were used. Systematic random sampling was used to select prescriptions to be used for the study among prescriptions taken to the hospital pharmacy. Data for this study was collected over a period of 2 months.

The data collected were manually checked and analyzed using EPI-INFO software version 2000. Frequency distribution, means, median, standard deviation and cross tabulation with appropriate statistic were done, $p<0.05$.

RESULTS

A total of 630 patients prescription sheets were used for the study, out of which 123 (19.5%) was for in-patients and 509 (80.5%) were for the out-patients. Males were 54.0% of the patients with prescription used. The mean age of the patients was 25.12±20.87 years. Almost all (94.4%) of the prescriptions were written on the hospital prescription sheet (Table 1).

In the 630 prescription sheets, only 14.1% had >4 drugs prescribed. Only 104 (16.5%) of the prescriptions did not have any antibiotics prescribed, the rest 83.5% of the prescription had at least one antibiotic prescribed. Only 45.6% of the antibiotics were prescribed in generic names. The mean number of drugs prescribed on a prescription sheet is 2.987±1.470, while the mean number of antibiotics on a prescription sheet is 1.015±0.670. The mean duration of prescription for the antibiotics is 10.59±13.15 days. The mean number of prescribed antibiotics is found to be significantly higher in the out-patients prescriptions than in-patient and also significantly higher in females than in males.

Among the antibiotics with clear indication of the route of administration on the prescription, those to be taken by oral route were most prescribed (85.8%), 10.4% were parenteral and the rest 3.9% were through other routes. Out of the 597 antibiotics prescribed, 551 (92.3%) were available in the hospital pharmacy and the rest 45 (8.5%), the drugs were not available in the hospital pharmacy. Drug-drug interaction was considered possible among the drugs prescribed in 18 (3.1%) of the prescriptions (Table 1).

Table 1: Characteristics of prescriptions and prescribed drugs

Variable	Frequency (%)
Type of patient (N = 630)	
In-patient	121 (19.5)
Out-patient	509 (80.5)
Hospital prescription sheet	
Yes	595 (94.4)
No	35 (5.6)
No. antibiotics in prescription (N = 599)	
Nil	73 (12.2)
1	464 (77.5)
2	55 (9.3)
≥3	7 (1.0)
Route of prescribed antibiotics (N = 584)	
Oral	513 (85.8)
Parenteral	62 (10.4)
Others	23 (3.9)
Possible drug-drug interaction (N = 584)	
Yes	18 (3.1)
No	566 (96.9)
Antibiotic prescribed in generic name (597)	
Yes	272 (45.6)
No	325 (54.4)
Prescribed antibiotic available (597)	
Yes	551 (92.3)
No	46 (8.7)

Table 2: Classification of prescribed antibiotics

Class of drug	Frequency (%)
Penicillins	190 (35.9)
Quinolones	144 (27.1)
Cephalosporines	74 (13.9)
Macrolides	58 (11.0)
Sulphonamides	29 (5.5)
Others (aminoglycocides, tetracyclines, etc.)	46 (8.5)
Total	541

Among the 541 antibiotics that were classified, more than a 3rd (35.9%) were in the penicillins class, quinolones were 27.1% and cephalosporines were 13.9% of the prescribed antibiotics (Table 2).

There is no significant difference in the mean number of drugs prescribed on a prescription sheet across the various age groups. There is significantly longer mean duration on prescription for use of antibiotics prescribed in the age groups 35-45 years and those older than 50 years as compared with other age groups ($p<0.05$) (Table 3).

The mean cost of drugs on a prescription sheet in this study is ₦1108.69±976.73 (US$9.25), while the mean cost of antibiotics on a prescription sheet is ₦802.83±734.81 (US$6.72). The mean cost of prescribed

Table 3: Number and cost of antibiotics prescribed drugs by age group

Age group (years)	Mean No. drugs prescribed	Mean duration of antibiotics prescribed (days)	Mean cost of all drugs (₦)	Mean cost of antibiotics prescribed (₦)
0-5	2.956±1.420	5.33±5.28	1000.52±1090.49	711.22±625.56
6-15	2.735±1.271	6.20±4.76	1224.79±994.44	944.57±908.08
16-25	3.017±1.315	8.86±7.20	1158.76±775.58	815.91±655.30
26-35	3.205±1.438	9.22±5.85	1140.48±1023.82	754.55±825.60
36-45	2.957±1.264	24.80±27.18	1155.82±1108.48	841.31±997.09
46-50	3.381±1.431	3.50±2.12	1550.00±710.90	952.38±615.19
>50	3.388±1.522	13.00±2.65	1394.49±957.41	817.14±604.99
Statistic	F-statistic = 1.7285 p = 0.1121	F-statistic = 3.1548 p = 0.0098	Kruskal-Wallis H = 22.4427 p = 0.0010	Kruskal-Wallis H = 9.3135 p = 0.1567

Table 4: Parameters of prescribed drugs

Variable	Mean	Median	p-value
Cost of drugs	1108.69±976.73	897.500	
Cost of antibiotics	802.83± 734.81	550.000	
No. drugs prescribed			
In-patient	2.246±1.663	2.000	F = 40.907, p = 0.000
Out-patient	3.165±1.363	3.000	
No. antibiotics prescribed			
In-patient	0.667±0.783	0.000	
Out-patient	1.084±0.662	1.000	F = 30.856, p = 0.000
No. antibiotics prescribed			
Male	0.946±0.498	1.000	T statistic = 2.5012
Female	1.090±0.871	1.000	p = 0.0126
Cost of antibiotics			
Male	740.71±609.44	550.0000	Kruskalis Wallis H = 0.9128
Female	863.39±833.64	550.0000	p = 0.3394
Cost of drugs			
In-patient	710.94±797.99	400.0000	Kruskalis Wallis H = 51.81
Out-patient	1207.53±992.51	1010.0000	p = 0.000
Cost of antibiotics			
In-patient	929.68±869.52	790.2300	Kruskal-Wallis H = 1.0613
Outpatient	710.00±719.91	550.0000	p = 0.3029

drugs is significantly higher in patients aged at least 46 years (p = 0.001) (Table 3). However, there is no significant difference in the mean cost of antibiotics prescribed across the various age groups (p>0.05) and also by gender of the patients (Table 4). There is significantly higher mean cost of drugs prescribed for out-patients than in-patients (p<0.001) but for antibiotics prescribed there was no significant difference between mean cost for out-patients and in-patients (p>0.05) (Table 4).

DISCUSSION

Polypharmacy is a common problem of prescription in Nigeria like many other developing countries. However, in this study the level of polypharmacy of 2.99±1.47/prescription sheet is lower when compared with 3.99±1.55/prescription sheet in another study conducted in a Secondary health facility in Ilorin, Nigeria. In this study, only 14.1% of prescriptions had at least 4 drugs as compared with the finding in the secondary health facility located in the same town that 61.6% of the prescriptions had at least 4 drugs (Akande and Ologe, 2007). Rational drug prescription is expected to be better in the tertiary health care delivery level than in the secondary care level because of the cadre of doctors at the tertiary level and laboratory support in diagnosing should reduce symptomatic treatment which is a major factor in polypharmacy. The level of polypharmacy in this study is also better than the situation in a study of 2 tertiary health facilities in North-Western Nigeria with 3.5 drugs per prescription (Ibrahim, 2004).

Prescription of antibiotics in generic names is also poor in this study as only 45.6% of the antibiotics were prescribed in generic names; this is similar to the finding in a secondary health facility located in the same town (Akande and Ologe, 2007). Also in the study of tertiary health facilities in North-Western Nigeria, 55.7% generic prescribing was found (Ibrahim, 2004). In another study, prescribing of generic antihypertensives in 3 district hospitals in Tanzania was found to be low with a mean of 33% (Rimoy *et al.*, 2007). These findings suggest that generic prescription of drugs is still not a popular practice in African countries.

Majority of prescriptions (83.5%) in this study contained antibiotics. This is rather high when compared with finding is some other studies; the study in north western Nigeria found 51.2% antibiotic prescriptions (Ibrahim, 2004). In another study in Warri, Nigeria the percentage of encounters with antibiotics prescribed was

also found to be high, 75% in the public hospital and 55% in the private hospital (Erah *et al*., 2003). Anti-infective drugs (with preponderance of anti-bacterial drugs) accounted for almost half of the total prescription frequency and >70% of the medical inpatients received antibiotics mainly on empirical basis in a study conducted in Ethiopia (Abula *et al*., 2002). These findings support the call by several professional societies to reduce the use of antibiotics worldwide by means of strict antibiotics policy (van Houten *et al*., 1998). In a related study in a private hospital in Dubai the finding of 21.4% antibiotics prescription was much lower than that of this study (Sharif *et al*., 2008).

This study found that the mean number of prescribed antibiotics is significantly higher in the out-patients prescriptions than in-patient and also significantly higher in females than in males. Further studies will be required to ascertain reasons for these differences.

Parenteral route of administration was prescribed for 10.4% of the antibiotics, this is similar to 7.4% of all antibiotics prescribed given by injection in the Dubai study (Sharif *et al*., 2008). The mean duration of antibiotics prescribed in this study is 10.59±13.15 days; this is higher than the finding in a study conducted in a pediatric outpatient clinic in a Teaching Hospital in Lagos, Nigeria where antibiotics were prescribed for an average of 6.2±1.0 days (Oshikoya and Ojo, 2007). However, when compared with pediatric age group in this study of 5.33±5.28 and 6.20±4.76 days for age groups under 5 and 6-15 years, respectively, the findings are similar. This study found that the older age groups had significantly longer prescribed duration of antibiotics than the younger age groups.

Cost of antibiotics per prescription is relatively high. While the mean cost of all prescribed drugs on prescription sheet is ₦1108.69±976.73 (US$9.25), the mean cost of the antibiotics in those prescription is ₦802.83±734.81 (US$6.72). This is implies that averagely 72.7% of total cost of drugs on a prescription sheet can be attributed to antibiotics. Since most of the patients received antibiotics prescription it therefore implies patients are having heavy drug bills mostly from antibiotics prescription. In a study in Northwestern Nigeria, it was reported that estimation and deduction of the cost of irrationally prescribed antibiotics and injections from the average cost of prescribed drugs (₦232.83) resulted in a 26.7% reduction in the cost of drugs per prescription (Ibrahim, 2004). This study is however, limited in cost implication of antibiotics use for patients since prescriptions used do not reflect total medications for the episode of illness the patient presented to the hospital.

In a study in Spain of all cases given antibiotics in primary health care, Global clinical inappropriateness was found in 43.7% of the cases: antibiotics not required but prescribed (27.9%) and costs of inappropriateness reached 68.4% of the estimated total cost (Caminal and Rovira, 2005). The several authors have reported concern about the continuous indiscriminate and excessive use of antimicrobial agents that promote the emergence of antibiotic-resistant organisms. Monitoring of antimicrobial use and knowledge of prescription habits are some of the strategies recommended to contain resistance to antimicrobials. Antimicrobial resistance substantially raises already-rising health care costs and increases patient morbidity and mortality (Krivoy *et al*., 2007).

It has been reported that approximately 20% of drug cost can be saved without impairing the quality of care and maintaining the patient satisfaction (Chandra and Naik, 2005). Hoffman *et al*. (2003) reported that several non-clinical factors, such as patient expectation and doctors perception of this expectation, were associated with antibiotic prescribing. However, prescribing was also strongly related to the doctor's view that an antibiotic was indicated.

CONCLUSION

Antibiotics prescription habits of doctors in developing countries calls for concern in view of the enormous health resources that goes into health care, where so much is consumed by drugs. Measures can be put in place in hospitals for cost containment and cost reduction with a view to make optimum utilization of available resources without compromising the quality of care. A lot of money can be saved if policies are formulated and promoted on rational antibiotics prescription in developing countries like Nigeria. Further studies are needed in this part of the world to identify critical factors contributing to antibiotics prescription habits of doctors.

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