Original article

The pattern of antibiotic usage in surgical in-patients of a teaching hospital, northwest Ethiopia

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Abstract

Background: Prudent use of antibiotics will curtail health care costs and potential adverse effects to the individual taking them and also diminishes the wide ecologic effects leading to selection of antibiotic resistant pathogenic Organisms. Adverse-effects to the individual taking them diminish the wide ecologic effects leading to selection of antibiotic resistant pathogenic organisms.

Objective: To assess the pattern of antibiotic usage in surgical in-patients of a teaching hospital in north west of Ethiopia

Subjects and method: Hospital-based prospective cross-sectional study was conducted on surgical in-patients for a duration of three months (Jan.-Mar.2002).

Results: Out of 236 patients who have been admitted to the surgical ward during the study period, 167(70.8%) received antibiotics for prophylaxis (32%) and treatment (38.8%)purposes mainly on empirical basis. The average number of antibiotics per patient was 2.17 for prophylaxis and 2.18 for treatment; and the mean duration of therapy was 3.2 days for prophylaxis and 8.7 days for treatment. Frequently prescribed antibiotics or their combinations were ampicillin, chloramphenicol and gentamicin.

Conclusion: The average number of antibiotics and the mean duration of particularly prophylactic antibiotic therapy were some how increased. The use of antibiotics on empirical basis was a routine prescribing practice .The rationale of some antibiotic combinations requires evaluation; and the establishment of antibiotic policy and treatment guidelines with periodic assessment of the sensitivity pattern of pathogenic organisms are recommended. [*Ethiop.J.Health Dev.* 2004;18(1):35-38]

Introduction

Antibiotics are one of the pillars of modern medical care and play a major role both in the prophylaxis and treatment of infectious diseases. The issues of their availability, selection, and proper use are of critical importance to the global community.

Antibiotic misuse is, however, a worldwide problem with the extent of the problem being greater in the developing countries through their purchase (without prescription) in local pharmacies and drug stores, and through inappropriate prescribing habits and an over-zealous desire to treat every infection (1-4). The misuse involves both overuse and under-use, where both types of uses are inappropriate.

Growing misuse of antibiotics also has been reported in hospitals, causing untoward toxic effects and various infections due to resistant microorganisms that increase the cost and duration of hospitalization (5-10). Increased cost of health care will definitely jeopardize the capacity of the poor population to seek modern health care.

There is a pressing need to develop appropriate measures to curtail misuse of drugs in general and antibiotics in particular. Besides, drug use in hospitals has a considerable influence on further drug use outside the hospitals.

Ethiopian hospitals consume about 50% of the national drug budget (11), which are considered to have high drug budget compared to the population segment using these health facilities. However, very little is known how drugs (particularly antibiotics) are used in hospitals like in other health facilities. Therefore, the objective of the present study was to investigate the usage, pattern of antibiotics in the surgical ward of a teaching hospital.

Patients and Method

This is a hospital-based prospective study conducted on surgical patients for whom major surgical procedures were done and have been admitted in Gondar College of Medical Sciences Hospital (GH). The Hospital is located in Gondar Town, which has more than 160000 inhabitants, and the Hospital is the only referral & teaching hospital in northwest Ethiopia.

All patients who have been operated (major operation) in the three-months period (January to March 2002) were included in the study. The hospital director and head of the Department of Surgery were informed about the purpose of the study and full agreement and co-operation was obtained. Totally, 236 patients with major surgical operations were included in the study.

Protocols consisting of open and closed-ended questions were prepared to fill socio-demographic data, drug data (drug name, dosage form, route and duration of therapy), type of use (prophylactic or treatment), basis of prescription (empirical or definitive), and other relevant information.

Data were collected by a trained general practitioner and entered into a computer and analyzed using EPI INFO statistical package.

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Operational definition: the term "antibiotic" also includes anti-microbial drugs, which are not products of microbes.

Results

The case notes of 236 admitted surgical patients were surveyed prospectively during a three-months period. Out of 236 admitted surgical patients, 167(70.8%) were prescribed antibiotics whereas the remaining 69(29.2%) received no antibiotics. Table 1 shows the characteristics of patients for whom antibiotics were prescribed. The mean age of the patients was 39.7 years with preponderance of male patients. The average hospitalization period was 14.2 days with about 90% of the patients being discharged with improvement. The commonly encountered diagnoses for which antibiotics were prescribed include abscesses and chronic osteomyelitis, intestinal obstruction, genito-urinary problems, gall bladder & biliary problems, and injuries to other body parts.

Table 1: **Patient characteristics of surgical inpatients taking antibiotics (n=167) in GH, 2002**

Variable	N (%)
Age (years):	
Mean ±S.D	39.7±17.4
Range	8-84
Sex:	
Male	115 (68.9)
Female	52 (31.1)
Average hospital stay (days)	14.2±8.4
Average discharge diagnosis/Patient	1.1
Condition on discharge:	
Improved	151 (90.4)
Died	10 (6.0)
Referred	3 (1.8)
No. change*	3 (1.8)

* Discharged against medical advice.

Antibiotics were prescribed for prophylaxis in 75 patients and for treatment in 92 patients. The basis for their prescription was empirical in all, but three cases.

Antibiotics prescribed for prophylaxis and treatment of infections are shown in table 2. Ampicillin was the most commonly prescribed drug for prophylaxis and treatment usually in combination with other antibiotics.

Table 2: **Antibiotics prescribed for prophylaxis (freq=163) and for treatment (freq=209) in surgical in patients, GH, 2002**

Antibiotic	Prophylaxis Freq (%)	Treatment Freq (%)
Ampicillin	69 (42.0)	76 (36.5)
Gentamicin	42 (26.0)	46 (22.2)
Chloramphenicol	36 (22.0)	53 (25.4)
Metrondiazole	10 (6.0)	7 (3.2)
Cloxacillin	3 (2.0)	20 (9.5)
Ceftriaxone	3(2.0)	7 (3.2)

Chloramphenicol and gentamicin were prescribed in almost 50% of patients both for prophylaxis and treatment. The same type and number (totally 6) of antibiotics were prescribed by generic names for both the prophylactic and treatment purposes.

Antibiotic combinations were prescribed for the majority of patients with the maximum number of antibiotics combined being 4 (table3). The average numbers of antibiotics per patient were 2.17 for prophylaxis and 2.18 for treatment. Mono-therapy with antibiotics was used in 13 prophylactic and 24 treatment cases.

Table 3: **Exposure of patients to antibiotics for prophylaxis (n=75) and treatment (n=92), GH, 2002**

No. of antibiotics	Prophylaxis	Treatment
One	13 (17.4)	24 (26)
Two	39 (52.2)	36 (39.3)
Three	20 (26.1)	23 (25)
Four	3 (4.3)	9 (9.8)
Average No. of antibiotic/Patient	2.17	2.18

Table 4 shows the type of antibiotic combinations for both prophylaxis and treatment. The combination of ampicillin with gentamicin or chlorampheicol or both was the most frequent. A combination of four drugs was observed in 3 patients for prophylaxis and in 9 patients for treatment purpose(s).

Table 4: **Antibiotic combinations for prophylaxis (n=62) and treatment (=69) of surgical infections, GH, 2002.**

Antibiotics	Prophylaxis	Treatment n (%)
AMP+GEN	26 (42.0)	15 (21.7)
AMP+CAF	7 (11.3)	23(33.3)
AMP+MET	4 (6.3)	-
AMP+CLO	3 (4.8)	-
AMP+GEN+CAF	16 (25.8)	16 (23.1)
AMP+CAF+MET	3 (4.8)	-
AMP+GEN+MET	-	3 (4.3)
AMP+CAF+CLO	-	3 (4.3)
AMP+CAF+MET+CEF	3 (4.8)	-
AMP+GEN+CAF+CEF	-	3 (4.3)
AMP+GEN+CAF+CLO	-	3 (4.3)
AMP+GEN+CAF+MET	-	3 (4.3)

AMP = ampicillin; GEN = gentamicin; CAF = chloramphenicol; MET = Metonidazole; CLO = cloxacillin; CEF = ceftriaxone

The route of administration and duration of therapy with antibiotics are shown in table 5. The intravenous route or intravenous plus, oral or intra-muscular routes were used for the administration of antibiotics in the majority of patients for prophylaxis and treatment of infections. The oral route was used for the administration of prophylactic antibiotics in 10 patients.

As a whole, the mean duration of administration of antibiotics for the prophylaxis was 3.2 ±2.4 days, whereas that of the treatment was 8.7±3.3days.

Table 5: **Route and duration of administration of antibiotics for prophylaxis (n=75) and treatment (n=92), GH, 2002.**

Group	Patients N (%)	Route	Average duration (days)
Prophylaxis	50 (66.7)	IV only	2.2
	15 (20.0)	IV+PO	6.8
	10 (13.3)	PO only	5.7
Treatment	36 (39.1)	IV+PO	9.59
	23 (25)	IV	8.28
	20 (21.7)	IM+IV+PO	9.21
	13 (14.1)	PO	7

IV = intravenous; IM = intramuscular; PO = Oral

Discussion

The use of antibiotics in surgical patients both for the prophylaxis and treatment of infections is a justifiable practice that, however, requires a regular review of the chosen regimen on the grounds of efficacy, toxicity, cost and other aspects to maximize the benefits to the patient. The present study attempts to assess the general pattern how antibiotics are used in surgical wards rather than attempting to judge individual prescriptions as appropriate or inappropriate.

This study revealed that antibiotics are used (prescribed) for about 70% of the patients who undergo major operations with almost all patients taking antibiotics on empirical basis of prescription. On the average, more than two antibiotics are used for a mean duration of 3.2 days for prophylactic purpose, which are relatively higher than those in other reports (12-14). Taking the basis of prescription of antibiotics (mainly empirical), the number and type (broadspectrum) of antibiotics prescribed, the duration of administration, and non-periodic assessment of the sensitivity pattern of the likely pathogens in the study setting into consideration, antibiotics might have been overused particularly for the prophylactic regimens. Empirical anti-microbial therapy should be based on local epidemiological data on potential pathogens and their patterns of antibiotic susceptibility. The route of administration, timing and duration of prophylactic antibiotics should be chosen to achieve high plasma and tissue levels of antibiotic(s) during and shortly after the surgical procedure when bacterial contamination is maximal. A critical period for successful prophylaxis lies in the 4 hours following implantation of organisms into wound for which one or two doses of anti-microbial drugs parenterally may be sufficient (15).

Accordingly, extended postoperative oral administration of prophylactic antibiotics as it has been observed in some cases of this study may not be justified as long as suitable parenteral dosage forms are available.

Antibiotics, which are used for the prophylactic and treatment regimens in this study, were the same (broadspectrum agents largely); and combinations of two or three antibiotics were common. Although the simultaneous use of two or more antibiotics has a certain rationale, indiscriminate or routine combination of antibiotics may have several negative consequences, primarily to the patient. Expectedly, the selection of resistant microorganisms to antibiotics that may not have been necessary, the risk of toxicity from two or more agents, and increased cost can be mentioned as negative aspects of inappropriate antibiotic combinations. The emergence and spread of drug-resistant microorganisms can also have an ill consequence for other individuals.

The study revealed that ampicillin was usually combined with chloramphenicol and/or gentamicin both for prophylaxis and treatment of infections. An increasing resistance of most pathogens particularly gram-negative rods to ampicillin and chloramphenicol in the same study setting has been reported previously (16). The wide use of ampicillin and chloramphenicol on empirical basis, however, needs further evaluation. Moreover, the combination of a bacteriostatic drug like chloramphenicol with ampicillin a bactericidal drug, is found to result in antagonism of the antibacterial effect (17). From the potential toxicity of chloramphenicol, it needs be emphasized that the drug should never be employed in undefined situations or in diseases readily, safely, and effectively treatable with other anti-microbial agents.

Reports indicating inappropriate use of antibiotics for the prophylaxis or treatment of infections are mentioned in a bulk of literature (6,7,10,16-19). Intervention strategies directed at establishment of antibiotic policy (9), education of prescribers (13,20), establishment of a novel prescription system (14), were found to reduce the inappropriate use of antibiotics particularly for the prophylaxis of infections. Careful preoperative preparations and clean postoperative care have been found to decrease postoperative wound infections and thus reduce the use of antibiotics (21-22). The significant savings that can be made with appropriate antibiotic prophylaxis and treatment have been pointed out by many authors (5,18,19,23), and such savings would contribute to the promotion of health care of a developing nation like Ethiopia.

In conclusion, the empirical prescription of antibiotics is high leading to overuse of antibiotics. The average number of antibiotics and the mean duration of particularly prophylactic regimen shows an increasing tendency. The combination of some antibiotics needs further evaluation.

Finally, the development of effective control programs through adoption of measures that restrict use of specific antibiotics, establishment of therapeutic guideline, a constant monitoring of the antibiotic resistance pattern of

the common pathogenic organisms in the hospital are recommended in order to improve the usage of antibiotics.

Acknowledgement
The authors would like to thank Dr.Yonas Yilma for his technical assistance and W.t Ejigayehu Melkie for typing the manuscript.

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