

## ARTICLE

## A Retrospective Study on Antibiotic Use in Different Clinical Departments of a Teaching Hospital in Zawiya, Libya

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### Abstract

A cross-sectional retrospective drug utilization study was conducted in different wards of the Zawiya teaching hospital, Libya, over a 15-month period. One hundred prescriptions were examined, of which 51% were for females. The World Health Organization (WHO) indicators (utilization in defined daily doses (DDD); DDD/1000inh/day) were used and the ATC/DDD method was implemented. The most frequently prescribed antibiotic (30 occurrences) was amoxicillin+clavulanic acid, while the least frequent (once) was neomycin or cloxacillin. The DDD/1000inh/day of amoxicillin+clavulanic acid was the highest (11.69) and that of ciprofloxacin was lowest (2.86). The ward with the highest number of prescribed antibiotics (35%) was surgery, while the ward with the lowest number (9%) was ENT. Average treatment period was found to be five days. In conclusion, our data showed an overuse of amoxicillin+clavulanic acid in contrast to other antibiotics. High pharmacological effectiveness against most local and

systemic infections, low incidence of side effects, and the availability of many suitable dosage forms with different strengths was thought to be the reason that prescribers tended to prefer amoxicillin+clavulanic acid over other antibiotics. This study showed a need for microbiological investigation before treatment of infections. This also helps physicians to have a more precise idea about prescriptive patterns prevalent in the Libyan community.

**Key words:** Drug utilization research, cross-sectional, inpatient, defined daily dose, anatomical therapeutic chemical (ATC)

### Introduction

Antibiotics are the most frequently prescribed group of drugs among hospitalized patients, especially in intensive care and surgical departments. Programs designed to encourage appropriate antibiotic prescriptions in health institutions are an important element in quality of care,

infection control, and cost containment.

Drug utilization research aims to assess whether drug therapy is rational or not. To reach this goal, methods for auditing drug therapy towards rationality are necessary. Drug utilization research can be divided into descriptive and analytical studies. The emphasis of the former has been to describe patterns of drug utilization and to identify problems deserving more detailed studies. Analytical studies try to link data on drug utilization to figures on morbidity, outcome of treatment, and quality of care, with the ultimate goal to assess whether drug therapy is rational or not. Drug utilization research also provides insight into the efficiency of drug use, i.e. whether a certain drug therapy provides value for money and the results of such research are used to help to set priorities for the rational allocation of health care budgets (1).

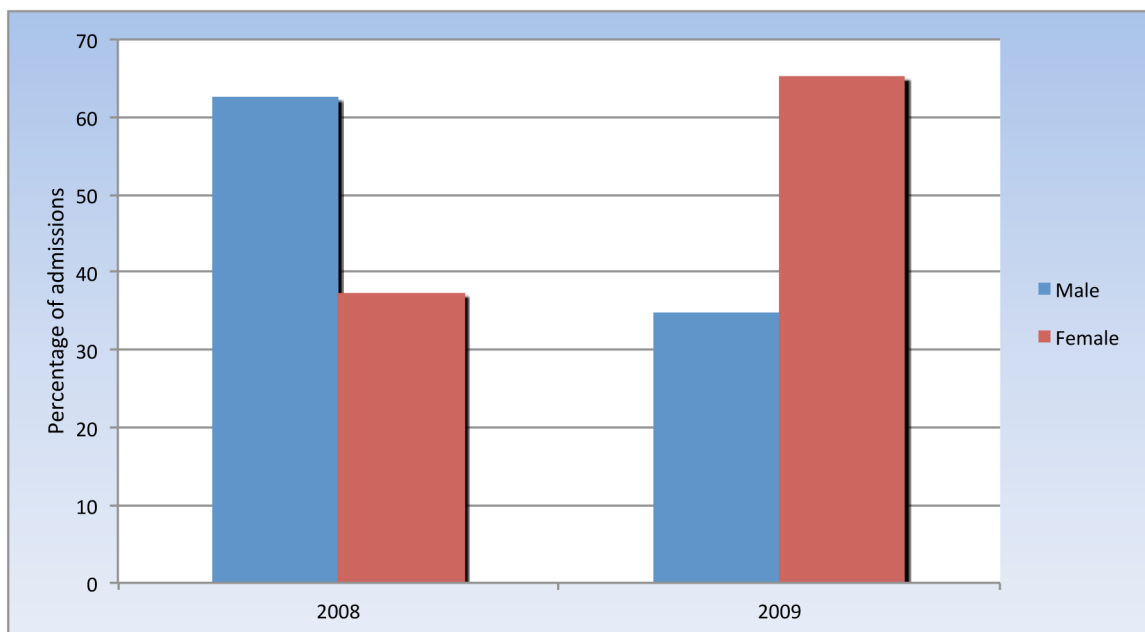
Surveillance studies provide important information that identifies trends in pathogen incidence and antimicrobial resistance, including identification of emerging pathogens at both the national and global levels. Routine surveillance is critical for creating and refining approaches to controlling antimicrobial resistance, and for guiding clinical decisions regarding appropriate treatment. The traditional approach has been to monitor pathogen- antimicrobial susceptibility. Numerous large studies have been performed, and their

designs have evolved with time (2).

There are no studies about drug utilization patterns of antibiotic use in hospitals. Therefore the aim of our research was to evaluate drug utilization of antibiotics in different units of the government teaching hospital in Zawiya, Libya. The objectives of the study were (a) to obtain information about the most suitable routes of administration of antibiotics for hospitalized patients, (b) to correlate the use of antibiotics with different diseases, (c) to find out the defined daily dose (DDD) of each prescribed antibiotic and (d) to provide the prescribers with information about the use of antibiotics in the Libyan community.

### Materials and Methods

A cross-sectional retrospective drug utilization study was conducted in different wards of Zawiya Teaching Hospital, Libya. The study was approved by hospital clinical administration. The study period was 15 months (01/01/2008 to 03/31/2009). Data were collected retrospectively from inpatients medical files. Each drug prescribed was recorded including its dosage form, route of administration, frequency of administration, indications for use, and duration of therapy. The data then was evaluated by Microsoft Excel software for analysis and descriptive statistics.



**Figure 1.** Number of patients admitted in the hospital showing males 32 (62.6%) and females 19 (37.4%) in 2008 and males 17 (34.7%) and females 32 (65.3%) in 2009.

Drug consumption data were expressed as defined daily doses (DDD) per 1000 inhabitants per day. The WHO indicators (3) (Utilization in DDD; daily defined dose/inhabitants/day) were employed to calculate the defined daily dose using the following formula:

$$\text{DDD}/1000 \text{ inh/day} = \frac{\text{Total consumption in DDDs}}{\text{Covered inhabitants} \times \text{Days in the period of data collection}} \times 1000$$

Anatomical Therapeutic Chemical (ATC) classification system was prescribed by WHO and the ATC codes for each antibiotic were obtained from WHO Guidelines for ATC classification (4). Aggregate data were analyzed according to the ATC/DDD methodology (5).

## Results

A total of 100 in-patients (51 for the year 2008, 49 for the year 2009) were included during a 15 month study. Results showed that the percentage of patients in 2008 was 62.6, and 37.4% for males and females respectively. In 2009, it was 34.7 and 65.3% for males and females respectively (Figure 1). In 2008, the most frequent diagnosis was

gastrointestinal infections 43.14%, while in 2009 it was respiratory infections 30.6%. Figure 2 shows the percentage of admissions as related to diagnosis/antibiotic exposure. Average treatment period was rounded off and found to be five days.

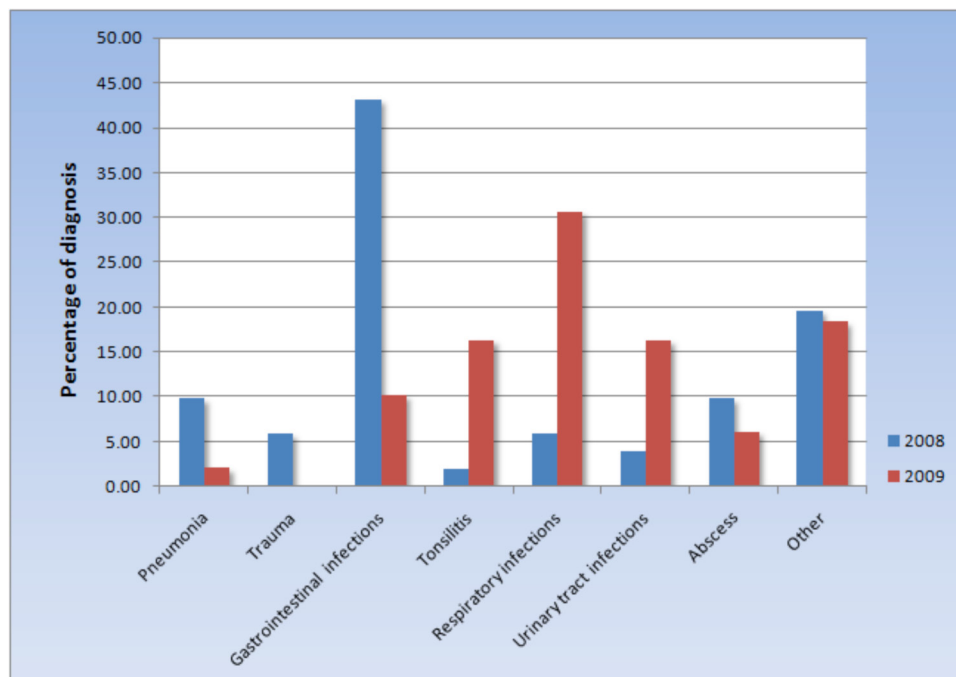
The data in table 1 show that in 2008 the highest consumed antibiotic in DDDs (gm) was amoxicillin+clavulanic acid 36.38 g, while consumption of cloxacillin, neomycin and procaine penicillin was 0 gm. In 2009, amoxicillin+clavulanic acid was highly consumed with DDD of 68.89 g compared to that of cefixime whose consumption was 0 gm.

After calculating the DDD/1000inh/day for each antibiotic in 2008, the highest value was found to be 5.19 for amoxicillin+clavulanic acid. Antibiotics such as cloxacillin, neomycin and procaine penicillin showed zero consumption values of DDD. In 2009, the highest DDD/1000 inh/day value was 9.13 for ampicillin, erythromycin and cloxacillin, while the lowest value was zero for cefixime (Figure 3). The overall antibiotic consumption in terms of DDD/1000 inh/day had more than

Antibiotic (ATC code)	Total consumed DDDs (gm)		DDD/1000 inh/day	
	2008	2009	2008	2009
Amoxicillin + Clavulanic acid (J01CR02)	36.4	68.9	5.2	6.5
Ceftriaxone (J01DD04)	26.8	20.5	2.8	4.0
Metronidazole (J01XD01)	15.0	7.5	2.6	3.4
Ampicillin (J01CA01)	1.6	4	1.2	9.1
Gentamicin (J01GB03)	0.3	1.5	0.2	3.4
Erythromycin (J01FA01)	0.6	4	1.4	9.1
Ciprofloxacin (J01MA02)	2.8	2.2	1.6	1.3
Cefixime (J01DD08)	2	0	4.6	0
Amoxicillin (J01CA04)	1	1.5	2.3	1.7
Cefotaxime (J01DD01)	2	11	4.6	6.3
Clarithromycin (J01FA09)	1.5	4	3.4	2.3
Cloxacillin (J01CF02)	0	4	0	9.1
Neomycin (J01GB05)	0	1.5	0	3.4
Procaine Penicillin (J01CE09)	0	4	0	4.6
<b>Total</b>	<b>90.0</b>	<b>131.1</b>	<b>30.0</b>	<b>64.2</b>

**Table 2.** Antibiotics use in different wards of hospital during 2008-09

Antibiotic	Gender		Hospital ward					Total (%)
	Male	Female	Surgery	Medicine	Pediatrics	ENT	Urology	
Amoxicillin+Clavulanic acid	18	22	8	17	6	6	3	40 (31.3)
Ceftriaxone	21	13	18	7	2	1	6	34 (26.6)
Metronidazole	8	9	11	4	1	0	1	17 (13.3)
Ampicillin	4	0	0	1	3	0	0	4 (3.1)
Gentamicin	4	1	1	0	3	0	1	5 (3.9)
Erythromycin	0	2	0	1	1	0	0	2 (1.6)
Ciprofloxacin	2	6	3	4	0	0	1	8 (6.3)
Cefixime	1	0	1	0	0	0	0	1 (0.8)
Amoxicillin	2	1	1	0	0	2	0	3 (2.3)
Cefotaxime	1	4	2	3	0	0	0	5 (3.9)
Clarithromycin	0	5	1	4	0	0	0	5 (3.9)
Cloxacillin	0	1	0	1	0	0	0	1 (0.8)
Neomycin	0	1	0	1	0	0	0	1 (0.8)
Procaine penicillin	2	0	0	0	0	2	0	2 (1.6)
<b>Total</b>			<b>46</b>	<b>43</b>	<b>16</b>	<b>11</b>	<b>12</b>	<b>128</b>

**Figure 2.** Admission diagnosis and total antibiotic exposures/diagnosis

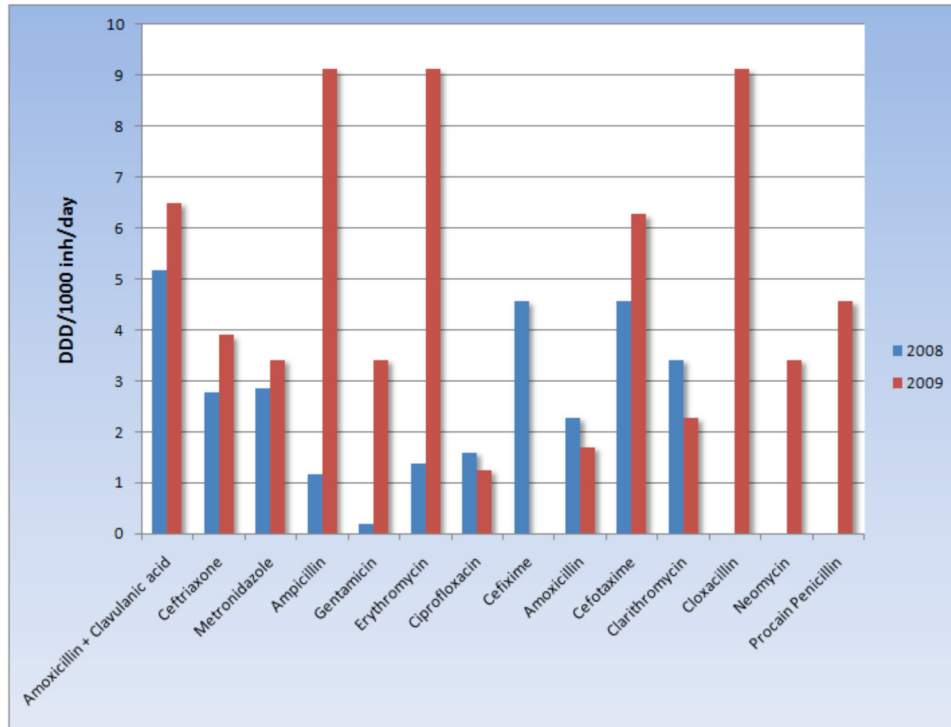


Figure 3. Antibiotic consumption in terms of DDD/1000 inh/day

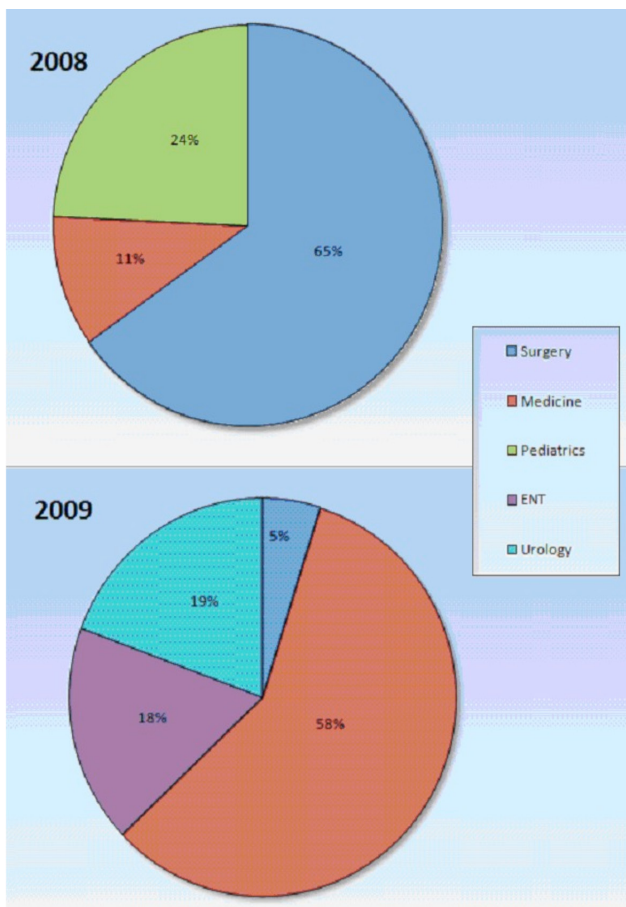


Figure 4. Antibiotics use in different hospital wards in 2008 and 2009

doubled from 30 to 64.15 g. The amoxicillin+clavulanic acid consumption had been doubled between 2008 and 2009, with 36.38 and 68.89 gm respectively, where it has been mostly prescribed for respiratory tract infections. Table 2 summarizes the prescribing frequency of each antibiotic distributed for males and females in different hospital wards. Those wards in which antibiotic use was the highest were surgery 65% and medicine 58% in 2008 and 2009 respectively (Figures 4a and 4b). The three most frequently used antibiotics were amoxicillin+clavulanic acid, ceftriaxone and metronidazole 31.25%, 26.56% and 13.28% of the total prescribed antibiotics respectively. The average of duration of hospitalization is 6.37 days ranging from 1-16 days. Based on data obtained from patients, only six were found to have undergone microbial culture investigations. Furthermore, 98% of them had undergone hematological and serological tests and 65% had undergone urine tests prior or after treatment.

## Discussion

The principal aim of drug utilization research is to facilitate the rational use of drugs in populations. For the individual patient, the rational use of a drug implies the prescription of a well-documented drug at an optimal dose, together with the correct information, at an affordable price. Drug utilization research can increase our understanding of how drugs are being used. Several reports have investigated the antibiotic utilization pattern in various hospitals around the world (6-10). Krivoy N, et al (2007), has reported concern about the continuous, indiscriminate, and excessive use of antimicrobial agents that promote the emergence of antibiotic-resistant organisms. Monitoring antimicrobial use as well as evaluating prescription habits are some of the strategies recommended to contain resistance to antimicrobials in hospitalized patients. Antimicrobial resistance substantially raises already-rising health care costs and ultimately increases patient morbidity and mortality (11).

The present investigation was conducted over 15 months. The goal was to determine antibiotic utilization for inpatients at the teaching hospital in Zawiya, Libya. The incidence of microbial infections among the reported population was 59% in 2008 and 49% in 2009, indicating that there was no significant change in occurrence of infections. The incidence of infections in males was dominant with 62.6% in 2008 and 34.7% in 2009. In females the incidence was reversed as compared to males during those two years. The absence of inpatient data during the months of April, May, August, September and October of 2008 showed that the prevalence of bacterial infections was less severe as compared to patients admitted to the hospital. There was also a variation in incidence of type of infections during the study period. In 2008 the most frequent diagnosis was gastrointestinal infections at 43.14%. In 2009 the most frequent diagnosis was respiratory infections at 30.61%. This could indicate that there is a need to concentrate on the prevention of these diseases at a national level. Average treatment period was found to be five days during which the infections cease.

During the study period of 15 months, the most commonly used antibiotic was amoxicillin+clavulanic acid combination and the DDD which was nearly doubled from 36.38 in 2008 to 68.89 gm in 2009, This may highlight a tremendous increase in prescriptions for this antibiotic combination especially in respiratory tract infections. The least frequently prescribed antibiotics (one time) were

neomycin and cloxacillin. Drug consumption data were expressed as defined daily doses (DDD) per 1000 inhabitants per day. In 2008, the highest value of 5.19 DDD/1000 inh/day for amoxicillin+clavulanic acid showed that it was the popular drug of choice as a broad spectrum antibiotic. The trend has changed towards ampicillin, erythromycin and cloxacillin with 9.13 DDD/1000 inh/day (Figure 3). The overall antibiotic consumption in terms of DDD/1000 inh/day has more than doubled from 30 to 64.15 g. The frequency of prescriptions was 65% for surgery in 2008 and 58% for medicine in 2009. The three most frequently used antibiotics were amoxicillin+clavulanic acid, ceftriaxone and metronidazole, 31.25%, 26.56%, and 13.28% of total prescribed antibiotics respectively. The average of duration of hospitalization is 6.37 days ranging from 1 – 16 days.

Several studies have already shown that broad-spectrum antibiotics are often indiscriminately prescribed (11-13). From the data obtained, only six patients were found to have undergone microbial culture investigations, showing that the demand for the initiation of treatment could have dominated over the time-consuming tests for identification of microorganism. Prescribers might have started treatment based on experience about the indication. Furthermore, 98% of the patients had gone through hematological and serological tests. 65% had urine tests prior or after treatment, indicating the ease of tests that can be conducted before treatment and that those results could be obtained within short span of time.

In conclusion, the present study demonstrated overuse of amoxicillin+clavulanic acid in contrast to other antibiotics. High pharmacological effectiveness against most local and systemic infections, low incidence of side effects and availability in many suitable dosage forms with different strengths is likely the reason that prescribers preferred amoxicillin+clavulanic acid over other antibiotics. There is a vital need for microbiological investigation before treatment of infections. This study should help physicians to have better insight about prescription patterns prevalent in the Libyan community.

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