The Islamic University Journal (Series of Natural Studies and Engineering)
Vol.15, No. 2, pp 59-66, **2007**, ISSN 1726-6807, http://www.iugaza.edu.ps/ara/research/

Utilization of Anti-infective Agents Measured in "Defined Daily Dose" (DDD): A Study in Palestine

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Abstract: Over utilization of anti-infective agents is a worldwide problem. The Anatomical Therapeutic Chemical (ATC) classification/DDD system is adopted by the world health organization (WHO) for drug utilization research to compare the pattern of drug usage at international level. This is the first study in Palestine that uses this methodology. The study was carried out for 30 consecutive days (23/10/2005-23/11/2005) in the internal wards at Al-Watani governmental hospital in Nablus-Palestine. Data collected included, age sex, diagnosis, anti-infective agents prescribed, dosage regimen and number of doses of antibiotic administered. Data were analyzed using SPSS version 12. DDD/100 bed-days were calculated for the anti-infective agents using the international formula.During the study period, 442 patients were admitted to the internal wards. The patients were 193 females (43.7%) and 249 males (56.3%). Among these patients, 191 (43.2%) were prescribed anti-infective agents. Cefuroxime, ceftriaxone, and metronidazole were the most frequently prescribed with the percentages of 27.8%, 6.1% and 5.7% respectively. The total amount of anti-infective agents prescribed was 38.99 DDD/100 bed days. The DDD/patient/day was 0.4 compared to 1 DDD/patient/day as the optimum. The results of this study reflect a deviation from the optimum use of anti-infective agents. Optimizing anti-infective therapy is necessary.

مدى استهلاك المضادات الحيوية في فلسطين بمقياس الجرعة الدوائية اليومية

ملخـــص: كثرة استعمال المضادات الحيوية ظاهرة عالمية. الجرعة الدوائية اليومية هي النظام المقبول لمنظمة الصحة العالمية للمقارنة بين الدول في مدى استهلاك المضادات الحيوية. هذه الدراسة هي اول دراسة من نوعها لقياس مدى استهلاك المضادات الحيوية في فلسطين بمقياس الجرعة الدوائية اليومية. تم اجراء الدراسة على مدى ثلاثين يوما" متواصلا" في قسم الامراض الباطنية في المستشفى الوطني في نابلس/ فلسطين. تم جمع معلومات عن المرضى من حيث العمر، الجنس، تشخيص المرض، الجرعـــة الدوائية الكاملة للمضاد الحيوي المستهلك. تم استعمال المعادلة الحسابية لمنظمة الصحة العالمية لقياس مدى استهلاك المضادات الحيوية محسوبا" بالجرعة الدوائية اليومية. خلال فترة الدراسة، 442 مريض تم ادخالهم الى القسم، 193 امرأة و 249 رجل. من بين هؤلاء المرضى 191 مريضا" تم صرف مضادات حيوية لهم. الأدوية التالية كانت الاكثر شـــيوعا" cefuroxime, ceftraixone and metronidazole بنسبة 27.8%، 6.1% و 5.7% على التوالي. مجموع استهلاك المضادات الحيوية كان 38.99 جرعة يومية دوائية لكل 100 يوم سريري. نتائج الدراسة تشير الى عدم توافق مع الاستهلاك الامثل للمضادات الحيوية. يجب ترشيد استهلاك المضادات الحيوية.

Introduction:

Over utilization of anti-infective agents is associated with high hospital-acquired infection rates, increase in morbidity and mortality and rapid development of bacterial resistance against the most powerful drugs [1-4]. Other problems caused by over utilization of anti-infective agents include increased risk of side effects and high cost [5, 6]. There are no published data about the extent of use of anti-infective agents in Palestine. However, in order to analyze and compare antibiotic utilization internationally, we must use an acceptable measuring unit like the defined daily dose (DDD) [7]. The DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults. The DDD provides a fixed unit of measurement that is independent of price and formulation, and thus enabling the researcher to assess trends in drug consumption and to perform comparisons between international population groups.

This study aims to evaluate the pattern of antibiotic prescribing in the internal wards of Al-Watani Governmental Hospital in Palestine. The defined daily dose (DDD) system and the Anatomic-Therapeutic-Chemical (ATC) classification suggested by the World Health Organization (WHO) were used in the analysis and comparison of the data. The study of prescribing patterns seeks to monitor, evaluate and suggest modifications in practitioners prescribing habits so as to make medical care more rational and cost effective.

Materials and Method:

This study was carried out for a period of thirty consecutive days (23rd October – 23rd November 2005) in the internal ward of Al-Watani non-surgical governmental hospital in Nablus/Palestine. Data collection was done using a pre-designed form which included; patient's file number, age, sex, diagnosis, site of infection, type of anti-infective agent given, duration and number of doses of the antibiotic. Data collection was made based on the educational agreement between An-Najah National University and the Ministry of Health. To perform a standardized and repeatable study, the Anatomic-Therapeutic-Chemical classification and defined daily dose (ATC/DDD) methodology was used for the first time in Palestine. The quantity of systemic anti-infective agents prescribed for inpatients over a period of 30 days was converted to DDDs which is then calculated as DDD per 100 bed-days. Data were compared with those of similar studies in other countries. The following worldwide formula is used to calculate and compare antibiotic usage in hospitals:

DDD/ 100 bed-days equals:

No. of units administered in a given period (mg) X 100 divided by DDD (mg) X no. of days in the period X no. of beds X occupancy index.

In the above formula, the occupancy index was 0.7 representing the average bed occupancy in the internal ward. The number of days in the equation was 30 days and the number of beds in the hospital is 50. The DDD value for each antibiotic is given by the DDD/ATC WHO system.

Results:

During the thirty days of the study, 442 patients were admitted to the internal ward; 193 females (43.7%) and 249 males (56.3%). Mean age of admitted patients was 53.43 years (Std. deviation =19.46). Among the total admitted patients, 191 (43.2%) were prescribed parenteral and oral anti-infective agents. Twelve different anti-infective agents were available from the hospital pharmacy during the study period. The main groups of anti-infective agents used were B-lactams, macrolids and aminoglycosides. The anti-infective agents prescribed were mainly parenteral. Some patients were prescribed both parenteral and oral anti-infective agents. Less than 1% of the patients were prescribed only oral anti-infective agents. Cefuroxime, ceftriaxone, and metronidazole were the most frequently prescribed (figure 1). One hundred and forty four patients were prescribed a single antibiotic, 36 patients were prescribed two anti-infective agents, 8 patients were prescribed three anti-infective agents and one patient was prescribed four anti-infective agents. The anti-infective drug prescribing was more common among women (49.7%) than men (38.1%).

Utilization of Anti-infective Agents Measured in "Defined Daily Dose" (DDD):

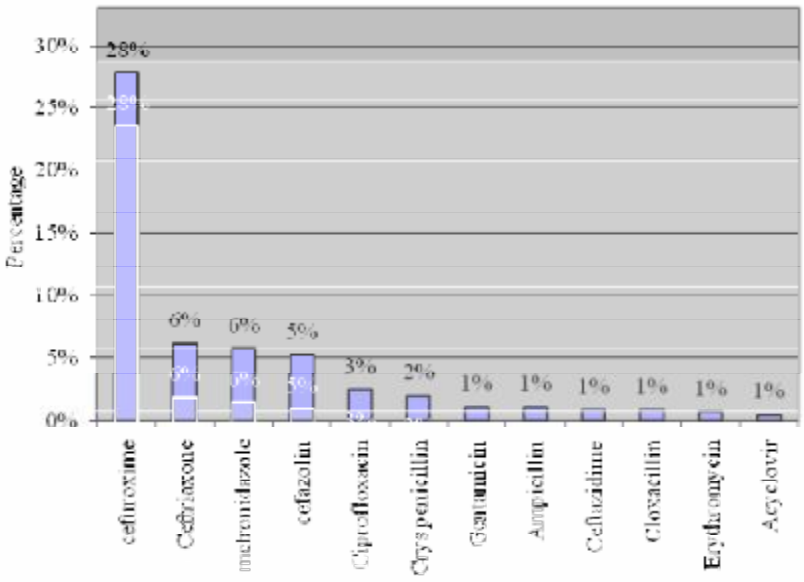

Figure 1: Extent of utilization of the various anti-infective agents among the admitted pateints (n = 442).

During the study period, there were a total of 38.99 DDD / 100 bed days of antimicrobial use at the internal department of Al-Watni governmental hospital. The number of DDDs/100 bed days of the most commonly prescribed anti-infective agents is shown in figure 2. It is noticed that the second generation cephalosporin, cefuroxime, accounted for approximately 40% of the total antibiotic utilization. It is also noticed that ceftriaxone, the third generation cephalosporin, accounted for approximately 15% of total antibiotic use. The total number of DDD per patient per 100 bed days of both ceftriaxone and cefuroxime is approximately 22. The unit price of the locally manufactured cefuroxime or ceftriaxone vial is approximately 4 USD. This means that approximately 88 USD of these 2 anti-infective agents are spent per day at the department of internal medicine.

Comparing figure 1 and 2 indicated showed that metronidazole has lesser extent of utilization than ceftriaxone, yet metronidazole has higher DDDs than ceftriaxone. This indicates that although ceftriaxone is prescribed more commonly than metronidazole, yet metronidazole is used for longer periods at the recommended dose for its main indication.

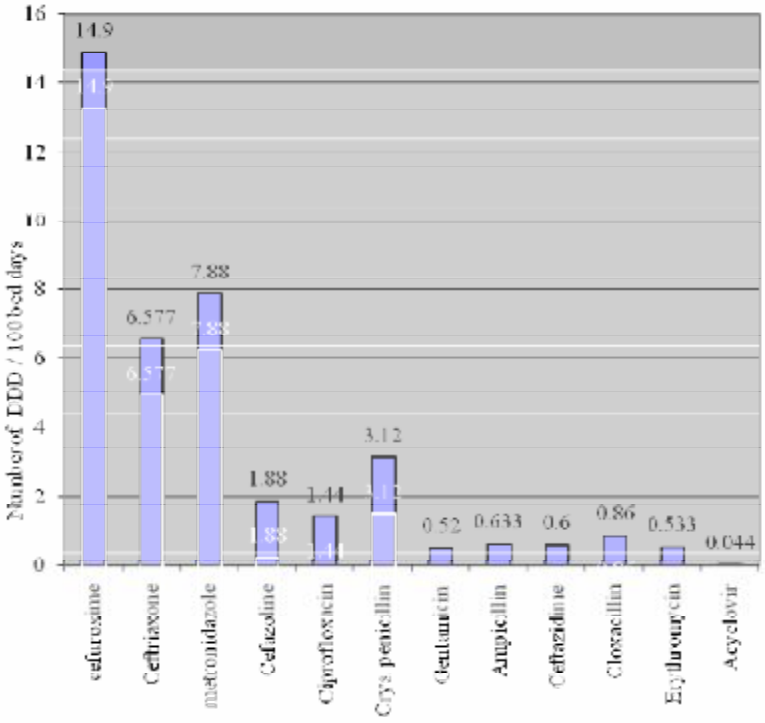

Figure 2: number of DDD per 100 bed days

Discussion:

The main goal of this study was to investigate the extent of antibiotic utilization for a period of 30 consecutive days among patients attending the internal ward of a governmental non surgical hospital. A study have shown that anti-infective agents were used inappropriately in hospitals, because there was no evidence of infection in patients who were administered the anti-infective agents [8]. In another study, the percentage of patients prescribed anti-infective agents was 43.2% [9]. In a 3-month period study at a teaching hospital in Nepal, 29.5% of patients admitted to the internal medicine ward were prescribed anti-infective agents [10]. Similar results

were found by a group of researchers who have surveyed the use of anti-infective agents in seven hospitals in northern Israel. Overall, 30.4% of hospitalized patients were treated with anti-infective agents [11].

This is the first study in Palestine that uses the ATC/DDD methodology. The total amount of anti-infective agents prescribed in the internal wards was 38.99 DDD/100 bed days. The following table shows result of antibiotic utilization from other countries. The difference between the current study and the results shown in table 1 is that these studies measured the DDD in all departments of the hospital and not only the internal department as we did. Yet, the current study gives us an idea where we stand concerning antibiotic utilization.

Table 1: Extent of antibiotic consumption in different hospitals world wide.

Hospital	Use in DDD/100 bed-days	Reference
Bouali Hospital (Iran)	90.1-86.57	12
University Hospital (Estonia)	41.1	13
University Hospital (Spain)	51.4	14
University Hospital (Sweden)	46.5	14
10 Hospitals in Italy	58.8	15-17
7 Hospitals in Portugal	89.7	15-17
9 Hospitals in Spain	83.5	15-17
30 Hospitals in Belgium	54.5	15-17
21 Hospitals in Germany	37.9	15-17
20 Hospitals in Netherlands	34.1	15-17

The total amount of anti-infective agents prescribed was 38.99 DDD/100 bed days. This value (~ 0.4 DDD/patient/day) represents the clinical use of anti-infective agents in our hospital. When the DDD/patient/day equals one, then this means that the anti-infective agent was primarily used for its main indication and its recommended dose. When the clinical measure equals more or less than 1DDD/patent/day it means that the drug is being used primarily for a different indication or at a different dose or the drug is being over or under dosed for its main indication.

In the current study the DDD values show that the anti-infective agents were used for a different indication at a different dose. These results could be attributed to the following reasons: noncompliance of patients, discharging patients before they continue their course of antibiotic, there is a limited number of anti-infective agents in the hospital, culture and sensitivity tests are not done in the hospital (all being prescribed

empirically), prophylactic antibiotic therapy is being used extensively (e.g. with follies catheters). In addition the definite diagnosis is not achieved for all patients, as a result, for many cases anti-infective agents were prescribed with no clear indication for its use.

Conclusion

The results of this study reflect a deviation of the optimum antibiotic use. This will contribute to the emergence and spread of bacterial resistance and will have a negative economical impact on the hospital. Optimizing policies regarding antibiotic therapy is necessary.

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