

**EVALUATION OF CEFOTAXIME USE
IN BAQUBA TEACHING HOSPITAL**

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تقييم استعمال عقار سيفوتاكسيم في مستشفى بعقوبة التعليمي

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Abstract

Background:

Antibiotics are one of the most commonly prescribed drugs today. Rational use of antibiotics is extremely important as injudicious use can adversely affect the patient, cause emergence of antibiotic resistance and increase the cost of health care; Antibiotics resistance is out of the scope of this study.

Methods:

This study was carried out on (686) patients with age range (39.4 ± 20.9 years), of both sexes; to whom cefotaxime was prescribed for different medical and surgical causes in Baquba Teaching Hospital- Diyala; over the period of three months. The selected patients were allocated into 2 groups: Group A (650) patients to whom cefotaxime prescribed without considering any guidelines for antibiotic prescription, compared with group B (36) patients to whom cefotaxime prescribed depending on standard guideline. To each group the following information were collected: age, sex, diagnosis, number of days were cefotaxime used, dose given, laboratory tests done to patients during hospitalization and drug interaction if present in addition to other parameters designed according to this study.

Results:

Results obtained in this study showed that prescription of cefotaxime depending on standard guideline of antibiotic improve the cefotaxime true dose %, reduce occurrence of drug interaction (%), decrease significantly ($P < 0.05$) cefotaxime misuse ratio and significantly ($P < 0.05$) reduce amount and cost of cefotaxime prescribed per month.

Conclusion:

Strictly following standard guidelines for antibiotic prescription; and involvement of clinical pharmacist in the team work improve therapeutic process outcome, prevent many problems like adverse effects and high cost and lead to rational use of antibiotic-the dream of many therapist-.

تعتبر المضادات الحيوية من اكثر الأدوية التي توصف بشكل عشوائي، وان الاستعمال الرشيد لهذه المضادات الحيوية يعتبر من أهم الأهداف في العملية العلاجية وعكس ذلك تحصل الكثير من المشاكل التي تظهر على المريض نتيجة الاستعمال غير الصحيح للمضادات الحياتية وكذلك تؤدي إلى ظهور سلالات من البكتيريا مقاومة لهذه المضادات بالإضافة إلى الكلف الباهضة لهذه المضادات الحيوية.

تم إجراء الدراسة على 686 مريضاً من مختلف الأعمار ومن كلا الجنسين ، والذي تم وصف عقار سيفوتاكسم لهم لمختلف الأسباب المرضية في مستشفى بعقوبة التعليمي، ديالى، العراق. وتم اختيار هؤلاء المرضى من مجموع 4078 مريضاً وهو العدد الكلي للمرضى الداخلين إلى المستشفى خلال ثلاثة اشهر.

تم تقسيم هؤلاء المرضى إلى مجموعتين: مجموعة A وتتكون من 650 مريضاً تم وصف عقار سيفوتاكسم لهم من قبل الأطباء الاختصاص بدون الاعتماد على الأسس القياسية العالمية المتبعة في وصف المضادات الحيوية، قورنت مع مجموعة B والتي تتألف من 36 مريضاً تم وصف عقار سيفوتاكسم لهم بالاعتماد على الأسس القياسية العالمية لوصف المضادات الحياتية. لكلا المجموعتين تم اخذ معلومات المرضى والتي تتضمن العمر، الجنس، التشخيص، عدد الأيام التي تم إعطاء عقار سيفوتاكسم فيها للمريض، الجرعة، التحاليل المختبرية، التداخلات الدوائية إن وجدت بالإضافة إلى عدة متغيرات أخرى صممت حسب طبيعة هذه الدراسة.

أظهرت نتائج هذه الدراسة انه بالاعتماد على الأسس القياسية العالمية في وصف المضادات الحيوية حدث تحسن كبير في نسب الجرعة الصحيحة المعطاة للمرضى، انخفاض نسبة حدوث التداخلات الدوائية، انخفاض نسبة الاستعمال غير الرشيد لهذا العقار وكذلك انخفاض ملحوظ في كمية عقار سيفوتاكسم وكلفة هذا العقار المصروف خلال شهر واحد. ومن خلال نتائج هذه الدراسة يمكن الاستنتاج بان اتباع الأسس القياسية العالمية في وصف المضادات الحيوية وكذلك مشاركة الصيدلي السريري في الفريق الطبي والعملية العلاجية قد احدث تغيراً ملحوظاً في عدة متغيرات أدت إلى استفادة كبيرة للمرضى الراقيين وللمستشفى وكذلك منع حدوث العديد من المشاكل مثل التأثيرات الجانبية والكلفة العلاجية الباهضة وأدى إلى تحقيق الحلم الذي يراود الكثير من المختصين بالعملية العلاجية وهو الاستعمال الرشيد للمضادات الحيوية.

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Introduction:

Antibiotics are one of the most commonly prescribed drugs today. Rational use of antibiotics is extremely important as injudicious use can adversely affect the patient, cause emergence of antibiotic resistance and increase the cost of health care; (Tünger et al, 2000).

Selection of Antimicrobial Agents:

Selection of the most appropriate antimicrobial agent requires knowledge of

- 1) the organism's identity,
- 2) the organism's susceptibility to a particular agent,
- 3) the site of the infection,
- 4) patient factors,
- 5) the safety of the agent, and
- 6) the cost of therapy; (Fraser et al, 1997).

Cefotaxime:

Cefotaxime is a semisynthetic, broad spectrum third generation cephalosporin antibiotic for parenteral administration. The bactericidal activity of cefotaxime results from inhibition of cell wall synthesis. It has *in vitro* activity against wide range of gram positive and gram negative organisms, and has a high degree of stability in the presence of β -lactamases, both penicillinase and cephalosporinases, of gram negative and gram positive bacteria. Cefotaxime has been shown to be active against many microorganisms, gram positive like *Staphylococcus aureus*, *Streptococcus epidermidis*, *Streptococcus pyogenes*, MRSA and gram negative like *E-coli*, *H.influenzae*, *Klebsiella*, *Neisseria gonorrhoeae*, *Proteus spp.* and *Pseudomonas aeruginosa*; also active against *Anaerobes spp.* (Brogden and Spencer, 1997).

Cefotaxime is indicated for the treatment of patients with serious infections caused by susceptible strains in the following diseases (Raddatz et al, 1995):

- 1- Lower respiratory tract infections.
- 2- Genitourinary infections.
- 3- Gynecologic infections.

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- 4- Bacteremia /Septicemia.
- 5- Skin infections.
- 6- Intra-abdominal infections.
- 7- Bone and /or joint infections.
- 8- Central nervous system infections.

Cefotaxime show drug interaction by increased nephrotoxicity following concomitant administration with aminoglycoside.

Cefotaxime given by IM or IV injection or IV infusion 1gm every 12 hours increased in severe infections like meningitis to 8gm daily in 4 divided doses. Higher doses up to 12gm daily in 3-4 divided doses may be required. Neonate, 50mg /kg daily in 2-4 divided doses increased to 150-200mg/kg in severe infection. Child, 100-150mg/kg daily in 2-4 divided doses increased up to 200mg/kg in very severe infection. Gonorrhoea, 500mg as a single dose.

Cefotaxime distributes widely to CSF, bile, bronchial secretion, lung tissue, ascitic fluid and middle ear. Cefotaxime excreted through kidney as unchanged cefotaxime 20-36%; 60% of administered dose was recovered from urine during the first 6 hours following administration (Wilson et al, 1997).

Objectives of the study:

- 1- To study the current status of cefotaxime use in Baquba General Hospital.
- 2- To study the prescribing behavior and practices, dispensing practices of cefotaxime compared with standard guidelines.
- 3- To identify weak areas, if any in the use of cefotaxime and suggest strengthening measures to get rational use of cefotaxime.

Methods:

This study was carried out on (686) patients (389 male and 297 female), with age range (39.4 ± 20.9 years); to whom cefotaxime was

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prescribed for different medical and surgical causes in Baquba General Hospital- Diyala; out of (4078) patients which is the total number of patients admitted to Baquba General Hospital for different causes over the period of three months.

The selected patients (their list of treatment involve cefotaxime) were allocated into 2 groups:

1- Group A: (650) patients, (357 male and 293 female) out of (2243) patients which is the total number of patients admitted to Baquba General Hospital over the period of three months, in this group cefotaxime was prescribed without considering any guidelines for antibiotic prescription.

2- Group B: (36) patients, (32 male and 4 female) out of (1835) patients which is the total number of patients admitted to Baquba General Hospital over the period of three months, in this group cefotaxime was prescribed depending on standard guidelines for antibiotic prescription.

To each group the following information were obtained: age, sex, diagnosis, number of days were cefotaxime administered, dose of cefotaxime administered, laboratory tests done to patients during hospitalization specially culture and sensitivity test and drug interaction if present.

In addition to that, many other parameters were calculated in this study such as percent of medical and surgical cases admitted to hospital in each group, percent of cases in which cefotaxime dose given according to standard guidelines in relation to the total number of cases in which cefotaxime prescribed, we can call it **cefotaxime true dose %**; percent of cases in which cefotaxime was prescribed in relation to the total number of cases admitted to hospital in each group, we can named this percent **cefotaxime prescription %**. Also, to give a clear idea about the behavior of cefotaxime use in each group, ratio of cefotaxime prescription-to- cefotaxime indication was calculated; we can call it **cefotaxime misuse ratio**.

In addition to that; total amount of cefotaxime prescribed and cost of cefotaxime depending on local market prices were calculated to each group.

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Statistical Analysis:

The results were expressed as mean $\pm$ S.D. and student t-test was used to examine the degree of significant changes; and P value less than 0.05 was considered significant.

Results:

As shown in (table 1) and (Figures 1-7), use of cefotaxime depending on standard guidelines for antibiotic prescription has many beneficial effects including increase the cefotaxime true dose % by 30%, increase in laboratory test % from 1% to 10%, also reduction in occurrence of drug interaction manifested as drug interaction % from 8% to 1%.

In addition to that cefotaxime prescription % decreased by 27% after followed antibiotic guidelines compared to group A where these guidelines are not considered, also cefotaxime misuse ratio reduced significantly ($P < 0.05$) by 55% which is a very interested change.

On the other hand, total amount of cefotaxime prescribed (1 gm vial)/month reduced from 4841 vial (group A) to 266 vial in (group B) which is a significant ($P < 0.05$) reduction, also total cost of cefotaxime/month significantly ($P < 0.05$) reduced by \$ 2745 in group B compared to group A (table 1).

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Table 1: Details of cefotaxime prescription and dispensing behavior in Baquba General Hospital over the period of three months.

	Parameters	Group A	Group B
1	Course using cefotaxime (days)	2.67± 1.6 ^a	2.7± 2.1 ^a
2	Cefotaxime True dose %	10%	40%
3	Laboratory test % (C/S)	1%	10%
4	Drug interaction %	8%	1%
5	Cefotaxime prescription %	29%	2%
6	Cefotaxime Misuse ratio	5.57 ^a	2.5 ^b
7	Total amount of cefotaxime prescribed (1gm vial) /month	4841 ^a	266 ^b
8	Total cost of cefotaxime /month	\$ 2904.6 ^a	\$ 159.6 ^b
9	Surgical cases in which cefotaxime used %	45.5%	50%
10	Medical cases in which cefotaxime used %	54.5%	50%

-Group A: patients to whom cefotaxime was prescribed without considering any guideline for antibiotic prescription.

-Group B: patients to whom cefotaxime was prescribed depending on standard guidelines for antibiotic prescription.

-Results represents mean±S.D., percent of total, ratio or total sum.

-Results with non-identical superscripts (a,b) were considered significantly different (P<0.05).

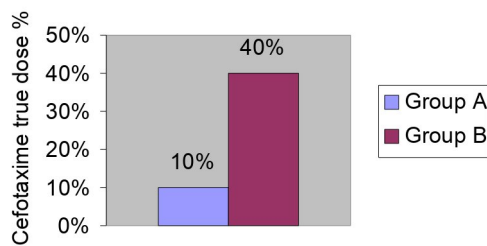


Fig 1:Elevation in cefotaxime true dose%

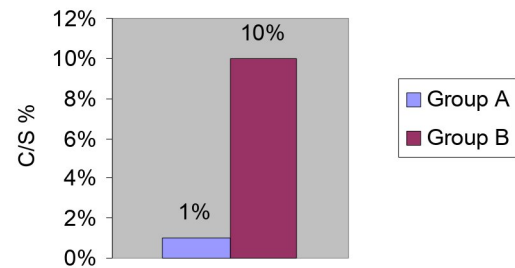


Fig 2:Elevation in C/S %

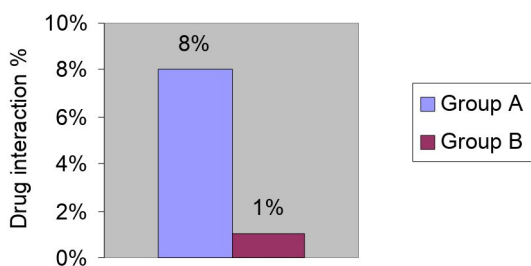


Fig 3:Reduction in drug interaction %

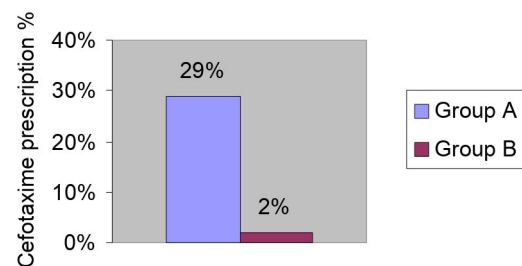


Fig 4: Reduction in cefotaxime prescription %

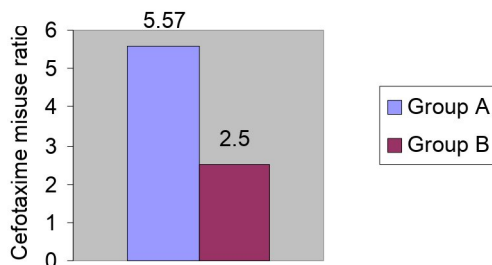


Fig 5: Reduction in cefotaxime misuse ratio

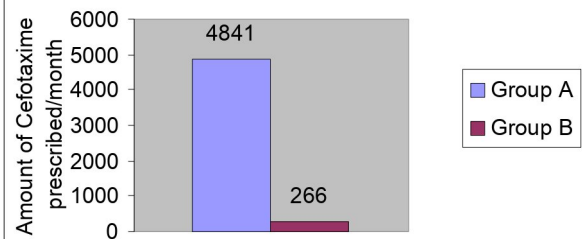


Fig 6: Reduction in total amount of cefotaxime prescribed/month

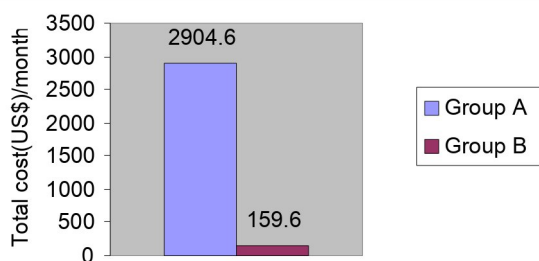


Fig 7: Reduction in total cost/month

Figures (1-7):

Group A: before depending on standard guidelines of antibiotic prescription.

Group B: after depending on standard guidelines of antibiotic prescription.

Discussion:

Antibiotics have been used since 50 years in clinical practice; these agents have revolutionized the treatment of bacterial infections and have been of great service to humanity. However, as the number of marketed antibiotics continues to proliferate, challenging problems related to their use have emerged. Effective utilization of these drugs is hampered by their frequent overuse and misuse, causing an increase in the frequency and speed of emergence of resistant bacterial strains and unacceptable adverse effects. Moreover, the unnecessary and extensive use of antibiotics has also placed a significant burden on national health budgets (Ozkurt et al, 2005).

In most of the Iraqi hospitals, antibiotics are among the most commonly used therapeutic agents accounting for a high percent of medical prescriptions, their use ranges from treatment of minor self-limited out patient symptoms to potentially fatal conditions in critically ill patients; the rational use of antibiotic in Iraqi hospitals remain a matter of great challenge (Genevieve et al, 2007).

Results obtained in this study as shown in table (1) and figures (1-7); showed that describing cefotaxime utilized standard guidelines for antibiotic prescription resulted in many significant and beneficial effects including the elevation of cefotaxime true dose % (fig 1) from 10% to 40%; elevation of this percent mean decrease the cost of treatment and decrease the adverse effect that the antibiotic may caused.

In contrast, table (1) and fig. (2), showed elevation in culture and sensitivity request % (C/S %) from 1% in group A to 10% in group B an indicator which mean that first step on the true way in prescribing antibiotic was done (Gums et al, 1999).

In addition to that, table (1) and fig.(3) clearly showed the reduction in the occurrence of drug interaction manifested as % reduction which give a good impression about the true method by which antibiotic were prescribed in case of group B, a result to which an other indicator may lead is cefotaxime prescription %, which reduced from 29% in group A to 2% in group B; the third parameter that assures this results is the significant reduction ($P < 0.05$) in

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cefotaxime misuse ratio from 5.57 in group A to 2.5 in group B (Davey et al, 2005) .

On the other hand, results obtained in table (1) clearly showed the reduction in total amount of cefotaxime prescribed from 4841 vials in to 266 vials; the interested thing is that amount of cefotaxime supplied from drug store to inpatient pharmacy over the period of study was 1960 vials only and the remaining 2881 vials patients get it from private pharmacy in local market; so the total cost of cefotaxime was 2904.6 US\$; of them 1728.6 US\$ paid from the patients because the drug was not available in the hospital at that time and patients obligated to buy it from outside the hospital.

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The amount of cefotaxime prescribed in group B was 266 vials and the total cost is 159.6 US\$ (fig.7) which is a significant ($P < 0.05$) reduction in the amount of cefotaxime prescribed and total cost which is a very important indicator to rational use of antibiotic in this hospital and to avoid the patients unnecessary overload regarding the cost treatment (McIsaac and Butler, 2000); (Classen et al, 1991)

It is of importance and interest to know that clinical pharmacy in the hospital activate its work and clinical pharmacist involved actively in the medical team that lead to rational use of antibiotic in hospital (von et al, 2007).

In conclusion, Results of this study clearly showed that prescription of cefotaxime depending on standard guidelines improve in the cefotaxime true dose %, reduce occurrence of drug interaction, reduce cefotaxime misuse ratio, and avoid the patient and hospital unnecessary expenditures.

Also this study clearly showed the vital and important role of clinical pharmacist regarding rational use of antibiotics.

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