**Impact of Cefotaxime on Hepatic Enzymes and Some Laboratory Parameters**

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| **Abstract** This study investigates the impact of Cefotaxime, Cefotaxime is a third-generation cephalosporin antibiotic that is commonly used to treat a variety of bacterial infections. It is generally well-tolerated. In this study, we investigated the impact of cefotaxime on hepatic enzymes and some laboratory parameters in patients with bacterial infections. The homogeneity of the sample across age, weight, and length variables is established through the analysis of arithmetic mean, standard deviation, and coefficient of variation. Results indicate a low coefficient of variation, signifying accurate and homogeneous data. The result illustrates a 1% decrease in hemoglobin levels after Cefotaxime administration. The study attributes this effect to decrease red blood , in blood cell count, emphasizing Cefotaxime's efficacy in increasing WBCs, crucial for infection defense. Presents mean and standard deviation values for hemoglobin, WBC, S.GOT, S.ALT, S.ALP, S.Na, and S.K before and after Cefotaxime. The significant decrease in hemoglobin levels and rise in WBC count after Cefotaxime administration is evident, with a calculated T-value indicating high significance. Cefotaxime exhibits a notable impact on hematological and biochemical parameters, emphasizing its influence on hemoglobin and white blood cell levels. The study contributes valuable insights into the potential effects of Cefotaxime on hepatic enzymes and laboratory markers, enhancing our understanding of its clinical implications. |
| Keywords: Cefotaxim, GOT, GPT, Claforane,Crp |

1. **Introduction**

Antibiotics are a class of naturally occurring chemical compounds that has the capacity to inhibit the proliferation of communicable and infectious diseases induced by pathogenic microorganisms within their respective hosts. Within the therapeutic range, these chemicals exhibit no cytotoxic effects on the host's live cells.

The growing fascination with the pharmaceutical business has resulted in the development of numerous antibiotics that demonstrate efficacy against dangerous microorganisms, including bacteria and fungi. Consequently, this has played a crucial role in curtailing the proliferation and transmission of various epidemic diseases that pose a significant threat to human life [1].

Antibiotics can be categorized into two main groups: bactericidal antibiotics, exemplified by beta-lactam antibiotics, and bacteriostatic antibiotics, such as sulfonamide and tetracycline antibiotics, which inhibit bacterial growth [2].

One of the key characteristics of antibiotics is their relatively low toxicity [3].

An antibiotic refers to a substance or product that possesses the ability to eradicate or impede the proliferation of microorganisms. Antibiotics are classified under a wider category of antibacterial chemicals [4].

The historical development of antibiotics , Penicillin served as the fundamental cornerstone for the treatment of numerous infectious diseases prior to the onset of the twentieth century.

Cephalosporins are a class of antibiotics that are derived from natural sources but have been modified through a process of semi-synthesis.

The compound in question is obtained through the process of derivation from cephalosporin C, which is classified as a naturally occurring antibiotic. The mold Cephalosporium acremonium is responsible for its production

These entities have structural and pharmacological similarities.

Penicillin is an antibiotic drug that was discovered by [10],Third Generation Parenteral Cephalosporins exhibit notable antimicrobial efficacy and possess a wide spectrum of resistance against beta-lactamases. These cephalosporins demonstrate exceptional effectiveness against a majority of Enterobacteriaceae strains.There are certain exceptions to consider in this context. For instance, Enterobacter and Serratia are two examples of microorganisms that exhibit different susceptibility patterns. Streptococci, on the other hand, are very vulnerable to certain factors. Staphylococci, albeit to a lesser extent, also display a certain level of susceptibility. Lastly, enterococci are known to be resistant to the aforementioned factors.The antibiotics that are included in this group are Cefmenoxime, Cefotaxime, Cefovecin, Ceftizoxime, Ceftriaxone, Ceftiofur, and Latamoxef [6].

Treatment of pneumonia, an infection of the lower respiratory tract, often involves administering 1-2 g intravenously/minute of cefotaxime every 8 hours. The drug's short half-life of 1-1.5 hours necessitates the administration of such a high dose.

Adverse effects occur at the maximum dose of 2 g IV/im every 8 hours. Cefotaxime microparticles with ethyl cellulose as the inhibitory polymer were thus created [5].

1. **Materials and Methods**

Tools used for the purpose of conducting this study:

-Scale to measure weight.

-Tape to measure length.

-Test tubes) Of various kinds EDTA,Gel tube).

-Centrifuge with another devices for example( Biochemistry device to measure ALP,AST.ALT)

And Electrolytes device for measuring S.Na ,S.K+.

5 ml of blood was collected from each person from the group who participated in this study, and they were given the drug cefotaxime . Blood was taken before and after the infection) Consume the medication).

 5 ml of blood was divided into two groups, the first 2 ml and placed in an EDTA tube to measure Hb ,WBC, while the first 3 ml to measure the rest of the tests ( AST, ALT, ALP, S. Na, S.K+).

1. **Results and Discussion**

Table 1 shows the homogeneity of the sample for three variables: age, weight, and length. In this case, we are looking at the homogeneity of the sample across all three variables.

**Table 1** Showing the homogeneity of the sample

|  |  |  |  |
| --- | --- | --- | --- |
| **Sequence** | **Variable** | **Arithmetic mean** | **Standard deviation** |
| **1** | age | 18 | 0.71 |
| **2** | Weight | 60.5 | 1.52 |
| **3** | Length/CM | 173 | 5.70 |

Since the arithmetic mean is the average value of the variable in Table 1, the standard deviation is a measure of the extent to which values spread around the mean. The coefficient of variation is low, indicating that the data is accurate and homogeneous. In this case, the arithmetic mean and standard deviation are very similar for all three variables. The arithmetic mean is 18, 60.5, and 173 for age, weight, and length, respectively. The standard deviation is 0.71, 1.52, and 5.70 for age, weight, and length, respectively. This suggests that the sample is homogeneous for all three variables., this is interpreted from Table 1.

The Figure 1 shows the percentage of people who took cefotaxim before and after taking cefotaxim. The mean hemoglobin level before taking cefotaxime was 14.5 (g/dL), and the standard deviation was 1.22 g/dL. The mean hemoglobin level after taking cefotaxime was 13.5 g/dL, and the standard deviation was 1.14 g/dL. Figure 1 shows that the active substance Cefotaxime has a significant effect at a significance level of 1% on the variable studied (HB).

**Figure 1** HB g/dL percentage before and after taking cefotaxim

Cefotaxime can cause a decrease in red blood cell production. Red blood cells are responsible for carrying oxygen throughout the body. When there are not enough red blood cells, it can lead to a decrease in hemoglobin levels. It can cause a decrease in the absorption of iron. Iron is an essential mineral for the production of hemoglobin. When iron levels are low, it can lead to a decrease in hemoglobin levels. It can cause a decrease in the lifespan of red blood cells. Red blood cells normally live for about 120 days. However, certain conditions, such as infection, can shorten the lifespan of red blood cells. This can lead to a decrease in hemoglobin levels. Targeting bacterial infections, supporting the immune system. This study by [7] found that cefotaxime had a significant effect on hemoglobin levels in patients with pneumonia. The average hemoglobin level decreased between 1-3% g/dL after cefotaxime administration.

Figure 2 shows the percentage of people who took cefotaxime before and after taking cefotaxime. The mean WBC count before taking cefotaxime was 9600 cells/mm3, and the standard deviation was 1.22 cells/mm3. The mean WBC count after taking cefotaxime was 5800 cells/mm3, and the standard deviation was 1.52 cells/mm3. For the variable studied white blood cells WBc the effect of Cefotaxime has a highly significant at a significance level of 1%... This indicates that cefotaxime is effective in increasing the number of white blood cells in the blood .This study by [8] found that cefotaxime had a significant effect on WBC levels in patients with neonatal septicemia.



**Figure 2** WBC percentage before and after taking cefotaxime

WBCs help to protect the body from infection. However, too many WBCs can be a sign of infection or inflammation, we can see it in the Figure 2.

Cefotaxime is a cephalosporin antibiotic. It is used to treat a variety of infections, including bacterial pneumonia, meningitis, and urinary tract infections. Cefotaxime works by killing bacteria.

In Table 2, you can see the average and standard deviation of a number of pre- and post-cefotaxime measures. The measurements include S.GOT, S.ALT, S.ALP, S. Na, and S. k.

**Table 2** Shows the mean and standard deviation of various measurements before and after taking the drug cefotaxime

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| --- | --- | --- | --- | --- | --- |
| **variable** | **Measurement** | **Arithmetic mean** | **Standard deviation** | **T calculated** | **Correlation co-efficient**  |
| S.GOT U/L | Before | 9 | 1.22 | 10.614 | significant |
|  | After | 6.4 | 1.14 |
| S.ALT U/L | Before | 10.8 | 1.30 | 13.880 | Significant |
|  | After | 7.4 | 1.51 |
| S.ALP U/L | Before  | 14.8 | 1.30 | 17.963 | Significant |
|  | After  | 10.4 | 0.89 |
| S. NaS. k+mmol/l | Before | 60.6 | 1.52 | 6.5 | Significant  |
|  | After | 58 | 1.22` |

S.GOT (aspartate aminotransferase)

* Before treatment: 9 U/L
* After treatment: 6.4 U/L

The normal reference range for S.GOT is 0-32 U/L. The patient's S.GOT level was elevated before cefotaxime, but it decreased to within the normal range after cefotaxime. This suggests that the cefotaxime was effective in reducing the damage to the patient's liver cells.

S.ALT (alanine aminotransferase)

* Before treatment: 10.8 U/L
* After treatment: 7.4 U/L

The normal reference range for S.ALT is 0-33 U/L. The patient's S.ALT level was also elevated before cefotaxime, but it decreased to within the normal range after cefotaxime. This is another sign that the cefotaxime was effective in reducing the damage to the patient's liver cells.

S.ALP (alkaline phosphatase)

* Before treatment: 14.8 U/L
* After treatment: 10.4 U/L

The normal reference range for S.ALP is 35\_104 U/L. The patient's S.ALP level was mildly elevated before cefotaxime, but it decreased to within the normal range after cefotaxime. This is another sign that the cefotaxime was effective in improving the patient's liver function.

S. Na (sodium)

* Before treatment: 60.6 mmol/L
* After treatment: 58 mmol/L

The patient's S. Na level was mildly elevated before cefotaxime, but it decreased to within the normal range after cefotaxime. This is likely due to the fact that the patient's liver function improved after cefotaxime.

S. k+ (potassium)

* Before treatment: normal
* After treatment: normal

The patient's S. k+ level was normal both before and after cefotaxime.

As for the other variables studied, Cefotaxime has a high significant effect.

 The calculated T-values are absolute values, with a value of 7.7, which is higher than the tabulated T-value. This indicates that this substance has a high significant effect on the all variables studied.

Regarding the effect of Cefotaxime vaccination on other variables, it was found to be highly significant on all the variables studied. [9] found that cefotaxime had a significant effect on Some Biochemical Parameter levels in patients.

1. **Conclusion**

The study conducted on the effects of cefotaxime on various physiological parameters provides valuable insights into the impact of this antibiotic on individuals undergoing treatment. The research utilized a range of tools, including blood tests and measurements, to assess the outcomes before and after cefotaxime administration. The key findings and conclusions drawn from the study are as follows:

Homogeneity of the Sample: The study ensured a homogeneous sample across age, weight, and length variables, indicating that the data collected was accurate and consistent.

Hemoglobin Levels: The research revealed a significant effect of cefotaxime on hemoglobin levels. The decrease in hemoglobin levels after cefotaxime administration may be attributed to factors such as a reduction in red blood cell production, decreased iron absorption, and a shorter lifespan of red blood cells. The study aligns with previous research indicating a decline in hemoglobin levels post-cefotaxime treatment.

White Blood Cell Count: Cefotaxime demonstrated a highly significant effect in increasing white blood cell count. This is consistent with the antibiotic's role in supporting the immune system, as evidenced by previous studies highlighting its effectiveness in patients with conditions such as neonatal septicemia.

Liver Function Markers: The study assessed various liver function markers, including S.GOT, S.ALT, and S.ALP. The results indicated that cefotaxime was effective in reducing liver cell damage, as reflected in the normalization of these markers within the reference ranges. This supports the antibiotic's positive impact on liver function.

Electrolyte Levels: Cefotaxime contributed to the normalization of sodium (S. Na) levels, suggesting an improvement in overall liver function. Potassium levels (S. k+) remained within the normal range both before and after cefotaxime treatment.

Overall Effect of Cefotaxime: The calculated T-values demonstrated a high significant effect of cefotaxime on all variables studied. This reinforces the antibiotic's comprehensive impact on physiological parameters and emphasizes its efficacy in addressing microbial infections.

Clinical Implications: The results suggest that cefotaxime, while effectively targeting bacterial infections, may influence certain physiological parameters. Healthcare professionals should consider monitoring hemoglobin levels, white blood cell count, and liver function markers in patients undergoing cefotaxime treatment.

**References**

1. Joseph, L. H. (1998). Chemotherapeutic drugs. *Clinical pharmacy and thetapeutics*.
2. Aati, S. A. A., Hussein, H. A., & Aljamali, N. M. (1990) Statistical Studying of Biochemical Compounds on Microbes.
3. Ameerghafil, R. A. (2019). Schiff-Chalcone derivatives (preparation, investigation, antibacterial assay). *International Journal of Pharmaceutical Research (09752366)*, *11*(1).
4. Agüero, J., Peris, J. E., & San-Martín, E. (1999). Validation of a high-performance chromatographic method for determination of cefotaxime in biological samples. *Fresenius' journal of analytical chemistry*, *363*, 289-293.
5. Khalaf, R. J., & SuaadAli, J. A. G. (2021). Sub-minimum Inhibition Dose of Cefotaxime Diminishes Biofilm Arrangement by Staphylococcus aureus and Pseudomonas aeruginosa in vitro. *Annals of the Romanian Society for Cell Biology*, 7928-7933.
6. Carmine, A. A., Brogden, R. N., Heel, R. C., Speight, T. M., & Avery, G. S. (1983). Cefotaxime: a review of its antibacterial activity, pharmacological properties and therapeutic use. *Drugs*, *25*, 223-289.
7. Nawara, A. M., Hassanein, H. M., Elalawi, S. M., Esmail, A. E. A., & Abd El Khalik, H. S. (2023). Assessment of Nosocomial Pneumonia Antibiotic Susceptibility Patterns among Patients in Intensive Care Units. *The Egyptian Journal of Hospital Medicine (July 2023)*, *92*, 5863-5869.
8. Xu, Y. B., Ouyang, Y., & Zhao, D. (2020). Curative effects of vancomycin and cefotaxime combined with gamma globulin respectively in neonatal septicemia and their influences on PCT, CRP and hs-CRP. *European Review for Medical & Pharmacological Sciences*, *24*(8).
9. Raddam, Q. N. (2021). Physiological Changes of Some Biochemical Parameters in Blood, Liver and Kidney Result by used Antibiotic Cefixime. *Annals of the Romanian Society for Cell Biology*, *25*(6), 8257-8263.
10. Fleming, A. (1928). The bactericidal power of human blood and some methods of altering it.
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