Nosocomial Bacteremia in Leukopenic Patients with Leukemia in Baghdad Teaching Hospital

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ABSTRACT:

BACKGROUND:

The incidence of nosocomial bacteremia continues to increase despite antimicrobial therapy and supportive care; it remains a major cause of death in hospitalized patients who are undergoing chemotherapy. The prolonged survival of leukemia patients who have disturbance in their innate immune system increased the factors of risk.

OBJECTIVE:

This study was conducted to assess the epidemiological features of Bacteremia in adult patients with leukemia and the species distribution and antimicrobial susceptibilities of causative pathogens. In addition, nosocomial bacteremia was compared to community acquired bacteremia.

METHODS:

A total of (84) adult leukemic patients more than 15 years old, males and females, feverish or with hypothermia and leukopenic. Bacteremic cases were obtained by culturing blood samples aerobically and anaerobically. The identification of blood isolates and susceptibility testing were performed by the routine methods in use at the affiliated laboratories.

RESULTS:

It has been found that 15 out of 28 (53.57%) patients with bacteremia acquired the infection during hospitalization, while the 13 (46.42%) patients acquired the infection out side the hospital. Table (1)

CONCLUSION:

High incidence rate of nosocomial infection (hospital acquired infections) in leukopenic leukemic patients with bacteremia.

KEY WORDS: nosocoial, bacterimia, leucopenia, leukemia

INTRODUCTION:

Leukemia is a disease of a worldwide distribution, it occur in all ages and in both sexes [1]. Leukemia in Iraq is seventh in order of frequency among the commonest ten cancers from years 1986-1988 (200). Clark (1992); Marouf (2000) and Marouf (2001) showed that the use of the depleted uranium by many troops on Iraq had resulted in significant increase in the incidence of malignant disease; Leukemia is one of these diseases.

Leukemias are a heterogeneous group of neoplasms arising from the malignant transformation of haemopoietic cells. Leukemia cells proliferate primarily in the bone marrow and lymphoid tissues where they interfere with the normal haemopoiesis and immunity; then emigrate into peripheral blood and infiltrate other tissue. Leukemias are classified according to the cell types primarily involved (lymphoid or myeloid) and as acute or chronic based upon the natural history of the disease [1, 6].

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The specific drug which is used for treatment of leukemia generally aggressive act by affecting enzymes or substrates related to DNA or RNA synthesis. Their major antitumor effects are on actively dividing cells, so normal tissues with a high rate of cells proliferation are also affected by these agents leading too much of the toxicity associated with the chemotherapy [6, 7]

These drugs have many side effects; however bone marrow suppression and decreased immunity are on the top of these effects [9]. Leukopenia may occur as a result to this treatment. Leukopenia is defined as circulating leukocytes count are less than $4x10^9$ cell/litter). Leukocytes are normally the main producers of inflammatory cytokines. A quantitative relationships between circulating leukocytes and infection was established in patients with leukemia, in particular, the probability of being infected is proportional to the severity and duration of leukopenia [10].

MATERIAL AND METHOD:

Patients with leukemia included in this study were admitted to medical unite in the Baghdad teaching hospital. Eighty four adult patients, (more than 15 years of age) [11] were included in this study, they met the following criteria:

1-The diagnosis is leukemia proved by bone marrow study [12].
2-Clinical feature suggestive of infection at time the blood culturing.
3-Fever above 38 °C during 24 hours period, or single oral temperature above 38.5 °C [13], or in the absence of fever, hypothermia (body temperature <36°C) [14].
4-The blood were collected during a Leukopenia period following a course of chemotherapy, leukopenia was defined as leukocyte count of (4×10^9 / liter) [15].
The following rules were rigidly applied, when blood samples were collected for blood culture [16,17,18].

Blood was drawn for culture, whenever possible, before antimicrobial therapy was administered. Sterile equipments and strict aseptic technique were employed only. The skin at site of venous puncture was prepared by careful washing with soap and water then two percent aqueous solution of iodine was applied in a widening circles for one minute, then remove by seventy percent alcohol. Performed venopuncture and withdraw ten milliliter of blood, the sampling needle was discarded and another sterile needle fitted. Eight milliliters of blood was injected into a set of two bottles of media, one bottle containing forty milliliters of Brain-heart infusion broth for cultivation of aerobic bacteria; The second bottle contained forty milliliter of Thioglycolate broth for cultivation of anaerobes
Both media were warmed to 37°C in the incubator and the rubber top of the bottle was swabbed with iodine and alcohol to destroy contaminant before incubation of the sample, each bottle was labeled with patient's name, date and time of the sampling.
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The same procedure was repeated with another sample of blood (blood for culturing only) taking from different site over a period of ten minutes [16], the bottles were then incubated at 37°C for 18-24 hours, presence of macroscopical changes such as turbidity, haemolysis, gas bubbles, jelly like coagulum, cotton ball like colonies were checked next days [19]. Gram stain was performed irrespective to the macroscopic evidence of growth, and blind subcultures were carried out after 1,3,7,10,14 and 21 days, as the following:

1-Two blood agar plate, one incubated aerobically and the other anaerobically for 48 hours at 37°c, the anaerobic atmosphere was obtained by gas generating Kit-anaerobic system.
2-Chocolate agar plate incubated under 5-10% carbon dioxide atmosphere for 48 hours at 37°c, such atmosphere was obtained by using an airtight jar along with candle, which was lit before the lid is replaced, oxygen is reduced during combustion and amount of carbon dioxide is increased in the environment [20].
3-MacConky's agar plate incubated for 48 hours at 37°c for gram-negative rods.
All specimens used for sub cultures aspirated from the bottle by using disposable syringe for each bottle, after well-mixed broth and cleaning the cover with 2% iodine and 70% alcohol. The anaerobic system was checked periodically by inoculating a culture of Pseudomonas species (strict aerobe) on blood agar plate, which failed to grow anaerobically as a biological indicator [21, 22].
Data was analyzed statistically using SPSS program version 10. Results were expressed using simple statistical parameters such as, percentage, graphical presentation and statistical tables.

RESULT:

Bacteremia was considered as community acquired if the first positive culture of blood was obtained within 48 hours after the patient's admission and nosocomial bacteremia if ≥1 culture of blood sample obtained ≥ 48 hours after admission to the hospital yielded a pathogenic organism. If the blood stream isolate was a potential skin contaminant (e.g., diphtheroid, Bacillus species, coagulase-negative staphylococci, or micrococci), all of the following criteria were required for the diagnosis: The presence of canula, the initiation of antimicrobial therapy, and ≥ 1 of the following: temperature of > 38.0 °C or > 36.0°C, (Edmond et al., 1999).
It has been found that 15 out of 84 (53.57%) patients with bacteremia acquired the infection during hospitalization, while the 13 (46.42%) patients acquired the infection outside the hospital (Figure 1).
Table (1) shows the predominant microorganisms isolated in nosocomial bacteremia was Klebsiella (5isolates), while Escherishia coli (3 isolates) was the commonest isolates in community acquired infection.

Table (1): Type of microorganisms isolated from blood culture of leukemic patients with leukopenia according to place of acquiring

Microorganisms	No. of isolates	Community acquired	Hospital acquired Nosocomial
Klebsiella pneumoniae	6	1	5
Pseudomonas aeruginosa	4	2	2
E.coli	4	3	1
Proteus penneri	1	1	-
Citrobacter koseri	1	1	-
Salmonella typhi	2	2	-
Staphylococcus aureus	4	1	3
Streptococcus viridans	2	1	1
Staphylococcus epidermidis	2	-	2
Staphylococcus capitis	1	-	1
Staphylococcus xylosus	1	1	-
Total	28	13%	15%

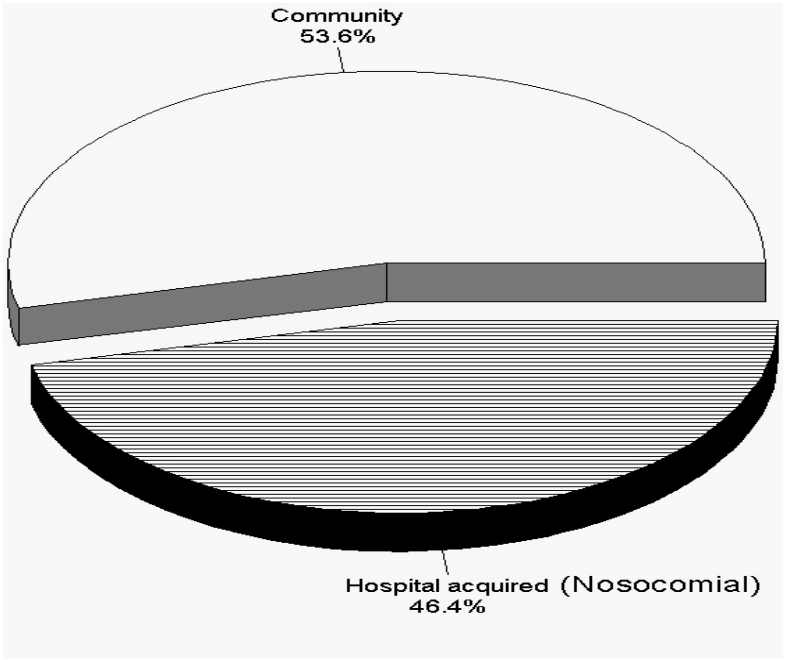

Figure (1): Percentage of bacteremia according to the site of acquiring

DISCUSSION:

Regarding nosocomial infection, 53.57% of the bacteremic cases in our study had acquired the infection in hospital figure (5), which is in agreement with the finding by Madani (2000), and Serody (2000), who reported that 11-38% of leukemic patents, had nosocomial blood stream infection. This finding could be explained by the fact that, patients with malignanancies and neutropenia are at high risk for the development of nosocomial blood stream infection [25].

Nosocomial bacteremia in our immunocompromised patients with leukemia may be due to that:

1- Our patients were neutropenic patients they had abnormalities in cell number in additional to defect in leukocyte function due to the disease it self [26].

2- Prolonged duration of staying in the hospital (1).

3- Equipment and material use in the hospital often become contaminated with resistance bacterial stains that may be transferred to immunocompromised patients.

4- The body flora of the hospital person which is usually resistance to antimicrobial agents.
5- Endogenous source which present as part of the patients normal flora.
6- Catheter-related infections that caused by certain strain of *S. epidermidis*. These infections due to their ability to produce a biofilm or "slim" that consist of complex sugars that are believed to help the organism adhere to the catheter's surface [(18)].

In our study the predominant microorganisms responsible for nosocomial bacteremia was Klebsiella table (8). This might be due to the emergence of resistant bacterial infection that spread among hospitalized patients [(27)].

In this study we found coagulase-negative staphylococci were the second in order of frequency among the most common microorganisms.

This finding disagrees with the finding of Wisplinghoff et al. (2003) who reported coagulase-negative staphylococci were most frequently isolated in neutropenic patients with hematological malignancy, this may be due to the fact that, Gram-positive organisms have become increasingly common in western countries while in our country Gram-negative organisms were the most frequently isolated from neutropenic patients with leukemia who had blood stream infection.

CONCLUSION:

High incidence rate of nosocomial infection (hospital acquired infections) in leukopenic leukemic patients with bacteremia.

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