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Evaluation of febrile neutropenic patients hospitalized in a hematology clinic

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ABSTRACT

Objective: To evaluate the febrile neutropenic patients with hematological malignancies hospitalized in hematology clinic with poor hygiene standards.

Methods: A total of 124 patients with hematological malignancies (69 male, 55 female) hospitalized in hematology clinic with poor hygiene conditions depending on hospital conditions, between January 2007 and December 2010, were evaluated, retrospectively.

Results: In this study, 250 febrile neutropenia episodes developing in 124 hospitalized patients were evaluated. Of the patients, 69 were men (56%) and 55 women (44%). A total of 40 patients (32%) had acute myeloid leukemia, 25 (20%) acute lymphoblastic leukemia, 19 (15%) non-Hodgkin's lymphoma, 10 (8%) multiple myeloma, and 8 (8%) chronic myeloid leukemia. In our study, 56 patients (22%) were diagnosed as pneumonia, 38 (15%) invasive aspergillosis, 38 (15%) sepsis, 16 (6%) typhlitis, 9 (4%) mucormycosis, and 4 (2%) urinary tract infection. Gram-positive cocci were isolated from 52% (n = 20), while Gram-negative bacilli 42% (n = 16) and yeasts from 6% (n = 2) of the sepsis patients, respectively. The most frequently isolated Gram-positive bacteria were methicillin-resistant coagulase-negative staphylococci (n = 18), while the most frequently isolated Gram-negative bacteria was *Escherichia coli* (n = 10).

Conclusions: Febrile neutropenia is still a problem in patients with hematological malignancies. The documentation of the flora and detection of causative agents of infections in each unit would help to decide appropriate empirical therapy. Infection control procedures should be applied for preventing infections and transmissions.

1. Introduction

Febrile neutropenia is the most important cause of morbidity and mortality in patients with malignancies [1]. Intensive chemotherapy programs, successful applications of stem cell transplantation, platelet transfusions, usage of colony-stimulating factors, developing diagnostic techniques and broad spectrum antimicrobials have led to prolonged survival. A large number of infectious complications can lead to mortality and morbidity in hematologic malignancy patients. Iatrogenic manipulations or damage of mucosal barriers due to chemotherapy or mucositis can cause opportunistic infections. In these patients, initiation of empirical antibiotic treatment within the first hour of the infection is life saving [1]. Other factors affecting mortality on febrile neutropenic patients are underlying hematologic malignancy type, stage of disease, and comorbid diseases. The medical hygiene practises including isolation or quarantine of infectious persons, private rooms for each patients or materials to prevent spread of infection, sterilization of instruments used in surgical procedures, the use of protective clothing and barriers, such as masks, gowns, caps, eyewear and gloves, proper bandaging and dressing of injuries, and hand-washing are very important for the prevention of infections developed in these patients [1–4]. Therefore in this study, we aimed to evaluate the febrile neutropenic patients

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with hematological malignancies hospitalized in hematology clinic with poor hygiene conditions depending on hospital conditions.

2. Materials and methods

2.1. Sample collections

A total of 124 patients with hematological malignancies (69 male, 55 female) hospitalized in Department of Hematology, Faculty of Medicine, Dicle University, between January 2007 and December 2010, were evaluated, retrospectively. Hematology Clinic of Dicle University Hospital had poor hospital infection control practices depending on hospital conditions (the lack of a private room for each patient). Diagnosis of febrile neutropenia was based on axillary temperature measurement and peripheral blood neutrophil count. Measurement of oral or axillary temperature as $\geq$ 38.3 °C or of 38.0–38.2 °C for 1 h were defined as fever. If the neutrophil count was lower than 500/mm^3, or 500–1 000/mm^3 but expected to fall < 500/mm^3 in 48 h were defined as neutropenia. Profound neutropenia was defined as neutrophil count of < 100/mm^3 [1–4]. Patients included in the study were divided into three groups: diagnosed microbiologically, clinically, and radiologically. The age, sex, admission date, length of stay, clinical diagnosis, duration of neutropenia, count of neutropenia, duration of fever, hemoglobin, leukocytes, platelets, prothrombin time/international normalized ratio, alanine aminotransferase, aspartat aminotransferase, alkaline phosphatase, gamma-glutamyltransferase, total bilirubin, albumin, globulin, lactate dehydrogenase, C-reactive protein, erythrocyte sedimentation rate, blood culture, urine culture, sputum culture, blood smear, posteroanterior chest X-ray, thorax, upper and lower abdominal computed tomography results were recorded. In the diagnosis of invasive aspergillosis, European Organization for Research and Treatment of Cancer criteria were used [4].

Outpatients with febrile neutropenia, patients with lung cancer, breast cancer, colorectal cancer and solid organ tumors, and febrile neutropenic patients hospitalized in hematology clinic but unclassified clinically, microbiologically and radiologically were excluded from the study.

2.2. Statistical analysis

SPSS program for Windows 7 was used in statistical evaluation of the data obtained in this study. Statistically, mean ± SD, SE, minimum and maximum values were calculated. Odds and percentages were determined. Frequency distributions were created. *Chi*-square test was applied. Student's *t*-test was used in comparisons of the binary. Pearson correlation analysis was performed. Significance level was considered as $P < 0.05$.

3. Results

A total of 250 febrile neutropenia episodes of 124 hospitalized patients were evaluated. Of the patients, 69 were men (56%) and 55 women (44%). The mean age of the patients was (45.0 ± 19.4) years. The average length of hospital stay was (22.7 ± 15.8) days, average duration of fever was (11.1 ± 6.8) days, while duration of neutropenia was (8.2 ± 5.9) days.

A total of 40 patients (32%) were diagnosed as acute myeloid leukemia (AML), 25 (20%) acute lymphoblastic leukemia (ALL), 19 (15%) non-Hodgkin's lymphoma (NHL), 10 (8%) multiple myeloma, and 8 patients (8%) chronic myeloid leukemia. Among the patients 7 patients were defined as unclassified leukemia, 6 patients were chronic lymphoblastic leukemia (Figure 1). Gender, age and the number of attacks in AML, ALL and NHL patients were shown in Table 1.

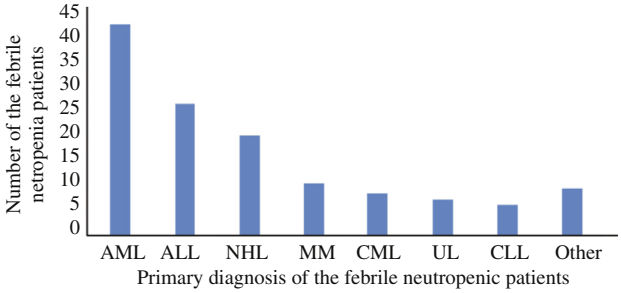

Figure 1. Distribution of primary diagnosis of the patients with febrile neutropenia.
MM: Multiple myeloma; CML: Chronic myeloid leukemia; UL: Unclassified leukemia; CLL: Chronic lymphoblastic leukemia.

Table 1
Gender, age and the number of attacks in AML, ALL and NHL patients.

Characteristics	AML	ALL	NHL
Sex (male/female)	18/22	13/12	10/9
Mean age of all patients	43.8 ± 16.9	34.3 ± 18.7	38.3 ± 13.4
Mean age of female	45.2 ± 19.1	36.7 ± 20.9	35.3 ± 13.1
Mean age of male	42.1 ± 14.2	29.3 ± 15.6	41.0 ± 13.8
Mean number of FN attacks	2.4 ± 1.9	2.4 ± 1.9	2.1 ± 1.8

FN: Febrile neutropenia.

In our study, 56 patients (22%) were diagnosed as pneumonia, 38 (15%) invasive aspergillosis, 38 (15%) sepsis, 16 (6%) typhlitis, 9 (4%) mucormycosis, and 4 (2%) urinary tract infection.

In 250 episodes of febrile neutropenia, 129 (51.6%) cases were diagnosed clinically, 104 (41.6%) radiologically and 71 (28.4%) microbiologically.

Of 56 cases with pneumonia, 42 cases had radiological diagnosis, 25 clinical diagnosis and 9 microbiological diagnosis. Two of them died. Mean hospitalization duration of patients with pneumonia was (20.1 ± 12.7) days, duration of fever was (9.9 ± 4.7) days and neutropenia duration was (6.9 ± 3.9) days.

Of 38 cases with invasive aspergillosis, 35 had radiological diagnosis, 10 clinical diagnosis and 5 microbiological diagnosis. The mortality was detected in 8 of 38 cases. Of cases with invasive aspergillosis, mean duration of hospitalization was (38.9 ± 20.6) days, while of fever and neutropenia were (20.1 ± 8.4) and (15.7 ± 8.7) days, respectively.

Of 38 cases with sepsis, mean duration of hospitalization, fever and neutropenia were (26.6 ± 17.6), (14.1 ± 8.3) and (9.4 ± 7.3) days, respectively.

Of 212 cases without sepsis, mean duration of hospitalization, fever and neutropenia were (22.0 ± 15.4), (10.6 ± 6.4) and (8.0 ± 5.6) days, respectively. The mean age of sepsis cases was (43.6 ± 16.6), while of cases without sepsis was (42.9 ± 19.8). No significant difference was found between the sepsis cases and non-sepsis cases in terms of the mean age (P = 0.869), duration of hospitalization (P = 0.098) and the duration of