

## Original Research

### Assessment of Etiology and Outcome of Fever and Neutropenia in Children

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#### ABSTRACT:

**Background:** The present study was conducted to assess the etiology and outcome of fever and neutropenia (FN) in children. **Materials & Methods:** The present study was conducted on 56 children age ranged 8- 16 years of both genders. Fever was defined as a single oral temperature of  $\geq 38.3$  °C or an oral temperature of  $\geq 38.0$  °C that persists for over one hour. Neutropenia was defined as an ANC  $\leq 500$  cells/mm<sup>3</sup>. The etiology and outcome of fever and neutropenia was recorded. **Results:** Out of 56 patients, males were 30 and females were 26. Etiology of fever was bacteremia in 25, viral URI in 13, GI infection in 4, pneumonia in 7, fungal infection in 4 and others in 3. The difference was significant ( $P < 0.05$ ). The mean duration of fever in males was 1.5 days and in females was 1.8 days, duration of hospitalization in males was 4.2 days and in females was 3.7 days, mortality within 2 weeks in males was 5 and in females was 2. The difference was significant ( $P < 0.05$ ). **Conclusion:** Authors found that bacteremia was main etiology of neutropenia in both gender. There was male predominance of mortality rate.

**Key words:** Bacteremia, Fever, Neutropenia

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#### INTRODUCTION

Despite a considerable reduction over the past decades in infection-related mortality in patients with cancers who present with fever and neutropenia (FN), infections remain a major cause of morbidity and mortality in this susceptible population. The strategy of using empiric antibiotics has greatly influenced the outcome of fever in a neutropenic host.<sup>1</sup>

Neutrophils or polymorphonuclear leukocytes develop from the stem cells in the blood marrow. These cells are involved in acute inflammation and host defense against bacterial infections and phagocytosis occurs in these cells. 1-1.5x10<sup>9</sup>/kg neutrophils are produced daily in the human body and they are found in the storage pool in the bone marrow.<sup>2</sup> Only 2-5% enter the circulation. A portion of these cells are located on the vascular wall. The lower limit of neutropenia in newborns is 6 000/mm<sup>3</sup>. As the baby grows up, this limit reduces to 1 000/mm<sup>3</sup> by the second week and this level is accepted to be normal up to the age of one year. After the age of one year the lower limit is 1

500/mm<sup>3</sup>. In the black race, this limit is accepted to be 1200/mm<sup>3</sup>.

In neutropenic patients an overall shift from gram-negative to gram-positive bacteria has been well documented, there are considerable site- and region-specific differences in incidence of resistant organisms such as methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant Enterococcus (VRE); differences that would influence the initial choice of empiric antibiotic therapy.<sup>4</sup> The present study was conducted to assess the etiology and outcome of fever and neutropenia (FN) in children.

#### MATERIALS & METHODS

The present study was conducted in the Pediatrics department. It comprised of 56 children age ranged 8- 16 years of both genders. The study was approved from ethical committee. Parents were informed regarding the study and written consent was obtained.

Data such as name, age, gender etc. was recorded. In all patients, a through clinical and blood investigation was

performed. Fever was defined as a single oral temperature of  $\geq 38.3$  °C or an oral temperature of  $\geq 38.0$  °C that persists for over one hour. Neutropenia was defined as an ANC  $\leq 500$  cells/mm<sup>3</sup>. The etiology and outcome of fever

and neutropenia was recorded. Results were subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of patients**

Total- 56		
Gender	Male	Female
Number	30	26

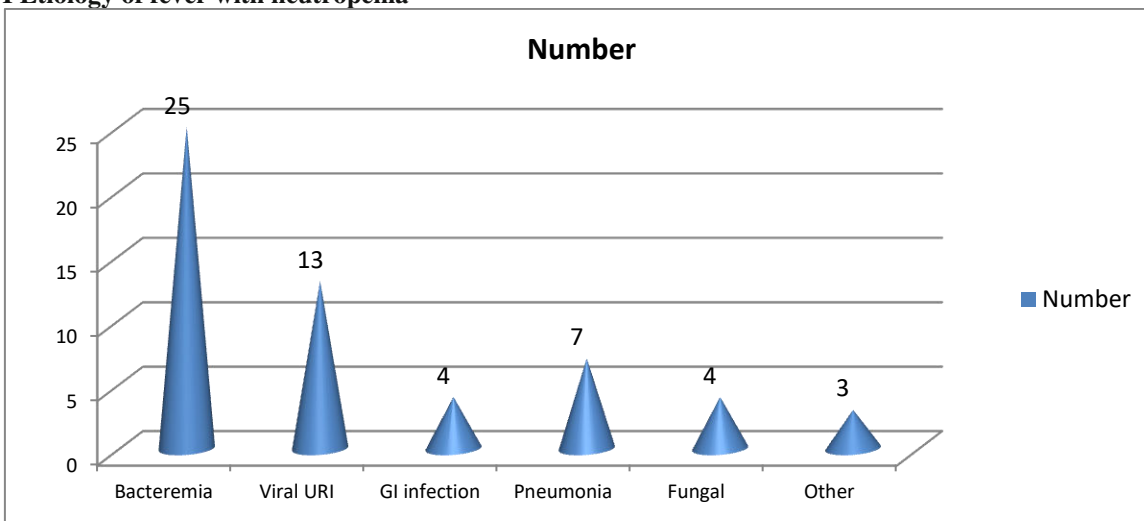
Table I shows that out of 56 patients, males were 30 and females were 26.

**Table II Etiology of fever with neutropenia**

Etiology	Number	P value
Bacteremia	25	0.01
Viral URI	13	
GI infection	4	
Pneumonia	7	
Fungal	4	
Other	3	

Table II, graph I shows that etiology of fever was bacteremia in 25, viral URI in 13, GI infection in 4, pneumonia in 7, fungal infection in 4 and others in 3. The difference was significant (P< 0.05).

**Graph I Etiology of fever with neutropenia**

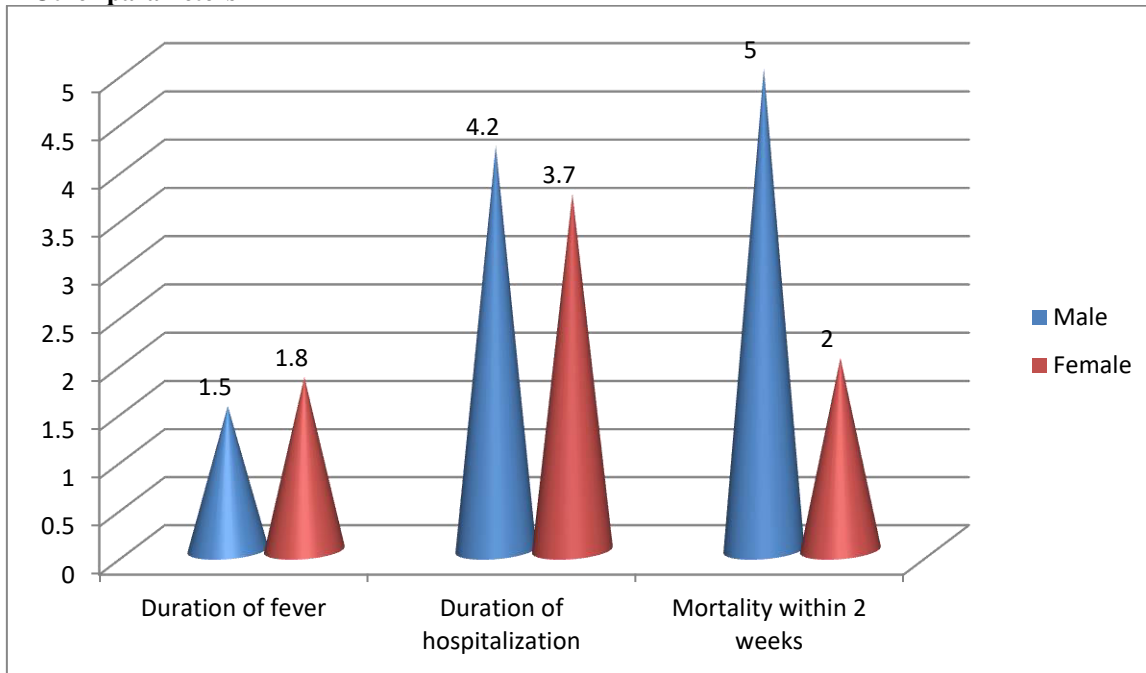


**Table III Other parameters**

Parameters	Male	Female	P value
Duration of fever	1.5	1.8	0.72
Duration of hospitalization	4.2	3.7	0.14
Mortality within 2 weeks	5	2	0.01

Table III shows that mean duration of fever in males was 1.5 days and in females was 1.8 days, duration of hospitalization in males was 4.2 days and in females was 3.7 days, mortality within 2 weeks in males was 5 and in females was 2. The difference was significant (P< 0.05).

**Graph II Other parameters**



**DISCUSSION**

The average lifespan of neutrophils is 7-10 days. Maturation stages in the bone marrow are as follows: stem cell, myeloblast, promyelocyte, myelocyte, metamyelocyte, band and neutrophil. The cells do not divide after the stage of myelocyte.<sup>5</sup> Generally, half of the cells in the bone marrow are composed of white blood cells. The majority of these cells include metamyelocytes and the following mature cells. The band cells and neutrophils in the bone marrow constitute 50% of the granulocyte series. Mature neutrophils are transferred to the tissues after staying in the circulation for 3-12 hours and live there for 2-3 days.<sup>6</sup> For neutrophils to function adequately, they should primarily be produced in adequate numbers in the bone marrow, should be transferred to the peripheral circulation in adequate numbers, migrate rapidly to the area of infection and engulf and kill microorganisms. One of the most important one among these necessary features is adequate number of neutrophils.<sup>7</sup> The present study was conducted to assess the etiology and outcome of fever and neutropenia (FN) in children.

In present study, out of 56 patients, males were 30 and females were 26. Griffin et al<sup>8</sup> found that Of 337 FN episodes, infection was proven in 86 (25%) and probable in 75 (22%). 177 episodes (53%) were judged fever of unknown origin (FUO). Bacteremia accounted for most (41) of the proven bacterial episodes, with viridans streptococci (13), Pseudomonas spp (6) and E. coli (6) the most frequently isolated organisms. The median time to positivity of blood cultures was 12 hrs (range 5.4 – 143.7) with 93% positive within 24 hours of incubation. Viral pathogens were identified in 29 (34%) episodes. Compared

to other patients, those with FUO had shorter median duration of fever (0.5 vs. 2.0 days; p<0.0001) and hospitalization (3 vs. 6 days; p<0.0001), longer median duration since last chemotherapy (6.0 vs. 4.0 days; p=0.01) and were less likely to have a diagnosis of acute myelogenous leukemia (AML) (11% vs 22%; p=0.009) or develop a clinical complication

We found that etiology of fever was bacteremia in 25, viral URI in 13, GI infection in 4, pneumonia in 7, fungal infection in 4 and others in 3. The mean duration of fever in males was 1.5 days and in females was 1.8 days, duration of hospitalization in males was 4.2 days and in females was 3.7 days, mortality within 2 weeks in males was 5 and in females was 2.

Since infections are observed commonly in children, the most common cause of neutropenias observed in this period is also infections. Acute transient neutropenias most commonly occur after viral infections. Acute transient neutropenia starts in a few days before the onset of infection and continues until viremia ends.<sup>9</sup> Viral infections including varicella, measles, rubella, hepatitis A and B, influenza, cytomegalovirus, Epstein-Barr virus, parvovirus B19, adenovirus and coxsackie lead to neutropenia by causing to a reduction in production and increase in destruction. In “human immunodeficiency virus infection”, immune mechanisms in which anti-neutrophil antibodies and hypersplenism are involved are also effective.<sup>10</sup> Neutropenia may also be observed in bacterial infections including S. aureus, brucella, rickettsia and tuberculosis. Use of G-CSF may be beneficial in patients with neutropenia caused by depletion of storage pools in the bone marrow and inadequate production in severe sepsis.

## CONCLUSION

Authors found that bacteremia was main etiology of neutropenia in both gender. There was male predominance of mortality rate.

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