COMMENTARY ARTICLE

Infection in the bloodstream in children with chemotherapy-induced febrile neutropenia.

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ABSTRACT

Febrile Neutropenia (FN) is a severe side effect of cancer treatment. The current investigation sought to uncover risk variables for reported infection in paediatric FN and cancer patients. From 2016 to 2018, patients under the age of 18 were included in this prospective cohort research. The Centers for Disease Control and Prevention standards were used to determine infection. There were 172 febrile neutropenic events investigated in all. Univariate analysis revealed the following risk factors: female gender; monocyte count 100 cell/mm, platelets 50,000, C-reactive protein (CRP) >90 mg/90dl, and hemoglobin 7 mg/7dl at the commencement of an episode; two or more episodes of FN, and fever onset; positive blood culture at fever onset. According to the multivariate analysis, the following variables were independent risk factors: CRP at the outset of a febrile episode > 90 mg/90dl, fever onset, and first positive blood culture. The lowest risk of infection was associated with the first episode and platelets more than 50,000 at the beginning of fever. A CRP >90 at the onset of a febrile episode, platelets 50,000, second episode or more, first fever episode during hospitalization, and positive first blood culture were found to be associated with a higher risk of infection and could be useful for establishing risk scores for infection in neutropenic children.

Key Words: *Neutropenia*

COMMENTARY

Febrile Neutropenia (FN) is a significant consequence of cancer treatment and an oncological emergency. In patients with impaired immune systems, fever may be the solitary symptom of an underlying illness. According to prior research conducted in the last 20 years, the prevalence of bacteremia in this group ranges from 6% to 60%. The lower respiratory tract, urinary tract, and gastrointestinal tract are the most common infection foci. Infections proven by clinical or microbiological tests account for fewer than half of all FN cases and the majority of children show no symptoms throughout therapy. Among children patients with FN, many risk factors for infectious complications have been identified, including cancer type, chemotherapy intensity, length and degree of neutropenia, platelet count, and C-reactive protein value. Nonetheless, depending on the demographic location, some of these characteristics may vary. Given that demographic location should be taken into account in the risk stratification of infectious complications among paediatric patients with FN2, the current study sought to identify risk factors for documented infection in children and adolescents with FN and cancer at a reference paediatric unit. A secondary goal was to characterize the clinical, laboratory, and microbiological profiles of paediatric cancer patients who were hospitalized and receiving cancer therapy during episodes of FN.

Because of a diminished inflammatory response produced by chemotherapy or cancer, the identification of an infectious focus, defined as documented infection, is limited. Similar to prior investigations, 58% of the incidents in this study did not have a clear infectious focus. Bakhshi hypothesized that the absence of clinical signs and symptoms at admission might suggest a mild infection and, presumably, a viral or noninfectious inflammation. Cough, runny nose, sneezing, and odynophagia were signs and symptoms of upper respiratory infection reported in 13 episodes and categorized as different illnesses in our descriptive analysis. According to Rondinelli et al., the lack of flu symptoms upon admission is an independent

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risk factor for severe infection (5.1 OR; 95% CI 1.7 - 15.0, p 0.001). Such features may impact the decision to allow early discharge following the initial observation. It would be fascinating to undertake viral identification tests to support the clinical impression of probable viral infections, but such tests are not accessible at the institution under investigation. Bloodstream infection was the most common recorded illness (15.6%), and gram-negative bacteria accounted for more than half (52%) of the pathogens detected.

In contrast to research done in industrialized nations, where gram-positive bacteria outnumber gram-negative bacteria, the cohort in this study reveals equivalent rates among these pathogens. This may be explained by the reduced use of long-term catheters in developing nations, implying that infections of the gastrointestinal tract remain a primary source of bacteremia. Despite the low frequency of central catheters, a study conducted in El Salvador, a developing country similar to Brazil, found higher rates of gram-positive bacteria than gram-negative bacteria, highlighting the importance of creating a local database that best defines the microbiological profile of each institution. Despite the fact that patients with chemotherapy-induced febrile neutropenia had mucosal damage, only 22 cases (10.4%) of MBI-LCBI have been recorded since the CDC sticks to a 7-day neutropenia period and identified gastrointestinal tract bacteria. As a result, not all episodes were labelled as MBI-LCBI. There was no study in the literature that linked bloodstream infection to a breakdown of the mucosal barrier.

The five factors independently associated with the infection outcome that remained in the model were also observed by other authors in previous studies. The variable with the highest statistical significance was fever onset during hospitalization. It increased the chance of documented infection by 5.88 times, compared to patients who had fever onset at home. Similarly, Rosenblum demonstrated that neutropenia patients hospitalized for more than 48 hours were more likely to have positive blood cultures throughout treatment. Inpatients are exposed to multiresistant pathogens and have a higher risk of infectious complications due to the manipulation of invasive devices and contact with other patients, which highlights the importance of identifying patients who can safely receive early discharge and outpatient treatment.

The presence of CRP > 90 mg/90L at the commencement of the episode was the second statistically significant factor (OR 3.18 95 percent CI 1.32; 7.68). In the literature, a high level of this acute phase reagent is a documented risk factor. Researcher used a cutoff point of 90 mg/90L to predict severe bacterial infection in conjunction with four other parameters: hypotension (RR 2.7 95 percent CI 2.3; 3.2), leukemia relapse (RR 1.8 95 percent CI 1.7; 2.3), last chemotherapy less than 7 days previously (RR 1.3 95% CI 1.1; 1.6), and platelet count 50,000/mm3 (RR 1.7 95 percent CI 1.4; 2.2). We used the same cutoff thresholds for CRP and platelets in our investigation since these levels have been replicated in previous studies throughout the years. Although CRP levels more than 90 mg/90L at the outset of the episode have been linked to an elevated risk of infection, it would be interesting to examine the dynamics of this acute-phase reagent throughout the neutropenia episode using the CRP curve in future research. A platelet count of 50,000/50,000mm3 raises the risk of infection by 2.32 times. This characteristic is an indirect risk factor since it signals myelosuppression and probably deeper neutropenia with a higher risk of infectious consequences. In the multivariate analysis, two variables were shown to be adversely linked with documented infection. The initial episode of febrile neutropenia had lowered the probability of identifying infectious foci, most likely due to less exposure to virulent hospital pathogens and less handling of invasive equipment, which may have indicated a lower risk of adverse evolution. Wicki shown that prior experiences of febrile neutropenia are an independent risk factor for bacteremia in a new episode (RR 2.10, 95% CI 1.68 - 2.63, p 0.001). These findings underscore the importance of more stringent clinical follow-up in patients who experience more than one episode of febrile neutropenia following chemotherapy treatment.

Patients in the current research were less likely to have reported infection during the neutropenia episode if their first blood culture from the feverish episode tested negative for a pathogen. According to Hakim, bacteremia was identified in 93% of cases within the first 24 hours after febrile neutropenia, with a mean positive time of 12 hours. These findings back with the US recommendations for paediatric febrile neutropenia, which advocate stopping antibiotics in clinically healthy kids with negative blood cultures after 48 hours, no fever for 24 hours, and signs of bone marrow healing. According to the accuracy indices (specificity = 84.4 percent and sensitivity = 63.7 percent), the model is helpful for identifying children on admission who are at low risk for recorded infection and has a reasonable capacity to forecast children who are at risk for the planned outcome.

The creation of risk stratification scores has become an essential aspect of the management of FN because it identifies patients who are candidates for therapies, resulting in enhanced quality of life and lower expenses. The current study discovered five factors associated with documented infection: CRP > 90 at the onset of the febrile episode, platelet count 50,000, second episode of febrile neutropenia or more, first fever spike during hospitalization, and positive first blood culture, all of which could be useful in establishing risk scores. It is critical to emphasize that the identified risk factors include clinical and laboratory indicators that may be found in everyday medical practice.