

Survey of Enteric Pathogens Causing Bacteremia in Cancer Patients

Enayatollah Kalantar^{1,2}; Maryam Aghabarari^{3,4}; Esfandiar Asgari⁵; Mojan Assadi⁶; Seyed Mahmoud Amin Marashi²; Shiva Hatami²; Alireza Shakib^{7,*}

¹Dietary Supplement and Probiotic Research Center, Alborz University of Medical Sciences, Karaj, IR Iran

²Department of Microbiology and Immunology, School of Medicine, Alborz University of Medical Sciences, Karaj, IR Iran

³Department of Nursing, School of Nursery and Midwifery, Alborz University of Medical Sciences, Karaj, IR Iran

⁴Nursing and Midwifery Care Research Center, Tehran University of Medical Sciences, Tehran, IR Iran

⁵Educational Supervisor Cancer Institute, Imam Khomeini Hospital, Tehran University of Medical Sciences, Tehran, IR Iran

⁶Department of Oncology, Madani Hospital, Alborz University of Medical Sciences, Karaj, IR Iran

⁷Vice-Chancellor Office, Alborz University of Medical Sciences, Karaj, IR Iran

*Corresponding author: Alireza Shakib, Vice-Chancellor Office, Alborz University of Medical Sciences, Karaj, IR Iran. Tel/Fax: +98-2632555000, E-mail: shakibalireza@yahoo.com

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Background: Symptomatic bacteraemia, is a frequent condition among cancer patients with a significant morbidity and mortality all over the world.

Objectives: The aim of this study was to determine the burden of enteric pathogens causing bacteremia among cancer patients.

Patients and Methods: Ten ml blood samples were withdrawn from the cancer patients under aseptic conditions. The blood specimens were added to the blood culture bottles and incubated at 37°C. The bacterial isolates from these samples were identified by routine biochemical reactions.

Results: During the study period, 68 blood samples from cancer patients were analyzed for bacteremia. Of these patients, six were female (8/82%) and 62 were male (91.18%); with age ranging from under 40 years to 85 years old (mean, 63 years). Gastro-intestinal cancer and cancers of head and neck were the most frequent cancer types in the studied group, accounting for 51 (75%) and 15 (22.1%) cases, respectively. The mean weight of patients was 69.18 Kg (range: 49-100 Kg). Similarly, the mean length of hospital stay was 8 days (range: 4-12 days). Positive blood cultures were detected in only 12 (17.65%) and 11 (91.7%) blood specimens from the Cancer Institute, Tehran, compared with one (08.33%) from Shahid Kamali hospital, Karaj. From these patients, 15 bacteria were isolated; *E. coli* alone outnumbered other species and accounted for 33.33% of the episodes of bacteremia.

Conclusions: In conclusion, our investigation revealed that cancers of GI tract are the most common cancer types causing bacteremia and also we identified that most common bacteria causing bacteremia in Cancer Institute, Tehran and Shahid Kamali Hospital, Karaj, are *E. coli* and *S. aureus*

Keywords: Bacteremia; *Escherichia coli*; *Staphylococcus aureus*

1. Background

One of the most serious medical complications causing significant morbidity and mortality among cancer patients is bacteremia (1, 2). Therefore, rapid diagnosis of this kind of bacterial infections can lead to better treatment; as a result, the morbidity and mortality of patients will decrease. Many investigations have reported that among blood born infections, gram-negative bacteria are associated with more mortality than gram-positive bacteria (3, 4). On the other hand, many scientists also report that the causative agents of bacteremia are changing (5, 6); therefore, obtaining a better understanding of the spectrum of pathogens causing bacteremia is vital for prompt treatment.

2. Objectives

The aim of this study was to determine the burden of enteric pathogens causing bacteremia among cancer patients in Cancer Institute, Imam Khomeini Hospital, Tehran University of Medical Sciences, Tehran, Iran and Shahid Kamali Hospital, Karaj during April 2013 to October 2013.

3. Patients and Methods

All patients with various kinds of cancer and different types of chemotherapy/radiotherapy prescribed by attending physicians were enrolled in this study after written informed consent. The study proposal was approved

Implication for health policy/practice/research/medical education:

As several scientists reported bacteremia as a serious and common complication among cancer patients, our investigation revealed that cancers of GI tract are the most common cancer types causing bacteremia and also we identified that most common bacteria causing bacteremia in Cancer Institute, Tehran and Shahid Kamali Hospital, Karaj, are *E. coli* and *S. aureus*

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by the Ethical Committee of Alborz University of Medical Sciences. From most of the patients, two 10 ml blood samples were withdrawn under aseptic conditions. The blood specimens were added to the blood culture bottles and incubated at 37°C. The bacterial isolates from these samples were identified by routine biochemical reactions (7).

4. Results

During the study period (April 2013 to October 2013), 57 and 11 blood samples from cancer patients were taken from Cancer Institute, Tehran and Shahid Kamali Hospital, Karaj, respectively and analyzed for bacteremia; overall, 68 cancer patients participated in this study; of which, six were female (8.82%) and 62 were male (91.18%); ages ranged from under 40 year to 85 years (mean, 63 years).

Gastro-intestinal cancers and cancers of head and neck were the most frequent cancer types in the studied group, accounting for 51 (75%) and 15 (22.1%) cases, respectively (Table 1). The mean weight of patients was 69.18 Kg (range: 49-100 Kg). Similarly, the mean length of hospital

stay was 8 days (range: 4-12 days). Positive blood cultures were detected in only 12 (17.65%) and 11 (91.7%) blood specimens from the Cancer Institute, Tehran, compared with one (08.33%) from Shahid Kamali hospital, Karaj.

From these patients, 15 bacteria were isolated; *E. coli* alone outnumbered other species and accounted for 33.33% of episodes of bacteremia (Table 2).

5. Discussion

Bacteremia among cancer patients has considerable impact on health care costs (4). In our study 17.65% of all blood cultures yielded positive results; of which 08.33% were from Shahia kamali hospital. This low rate can be explained by the fact that most patients probably received clinical care (and antibiotic therapy) from Tehran which is very close to Karaj City. In an another Iranian study (8) the rate of positive blood culture among cancer patients was 23.5%, in contrast to the findings of the present study; however, also a high rate of positive blood cultures were seen in Meidani et al. study (9). Studies from the neighboring

Table 1. Demographic Characteristics of Cancer Patients with Bacteremia

Patient Characteristic	NO. (%)
Sex	
Male	62 (91.18)
Female	06 (8.82)
Age, Y	
Range	40-85
Mean	63
Weight, kg	
Range	49-100
Mean	69.18
Days admitted to hospital, d	
Range	4-12
Mean	08
Cancer type	
GI	51 (75)
Lung	02 (2.9)
Head and Neck	15 (22.1)
Total	68 (100)

Table 2. Frequency of Isolation of Bacteria Species from 60 Cancer Patients with Bacteremia

Bacteria	No. (%)
<i>E. coli</i>	05 (33.33)
<i>Staphylococcus aureus</i>	03 (20)
<i>Bacillus cereus</i>	03 (20)
<i>Kelebsiella pneumonia</i>	03 (20)
<i>Micrococcus spp</i>	01 (06.66)

countries report that the rate of positive culture is more than our study (10, 11) which could probably be because of different healthcare and sanitation systems.

Like other microbial systemic infections, the rate of bacteremia increases with age, decreasing immune system response, consuming specific antimicrobial drugs and is influenced by a variety of factors. For example, our study also reports that bacteremia is significantly more frequent in males than in females which is consistent with another study (6). Like other studies from Iran, the most common type of cancer in our study was gastric cancer (12, 13).

In our study, *E. coli* was recovered most frequently from blood cultures which is consistent with other studies from Iran (14, 15). Of interest, *S. aureus*, *B. cereus* and *K. pneumonia* were also found with the same frequency (20%). Although our study revealed that *B. cereus* accounted for 20% of the isolated bacteria which is a relatively uncommon cause of blood stream infections among cancer patients; recently, many investigations reported that *B. cereus* has emerged as one of the 'new' Gram-positive pathogens causing serious infections in cancer patients particularly among neutropenic patients (16, 17).

In conclusion, our investigation revealed that cancers of GI tract are the most common cancer types causing bacteremia and also we identified that most common bacteria causing bacteremia in Cancer Institute, Tehran and Shahid Kamali Hospital, Karaj, are *E. coli* and *S. aureus*.

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Authors' Contribution

All authors have participated in the study.

Financial Disclosure

There is no financial disclosure

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