

Isolation and Identification of Aerobic Bacterial Pathogens from Septicaemic Cancer Patients in Khartoum, Sudan

Yagoub Hamadt Allah Elhaj Abd Elseed^{1, *}, Mohamed A. E. M. Ibrahim², Waled Amen Mohammed Ahmed³

¹Department of Laboratory Medicine, Faculty of Applied Medical Sciences, Albaha University, Al-Baha, Saudi Arabia

²Faculty of Applied Medical Sciences, Albaha University, Al-Baha, Saudi Arabia

³Nursing Department, Faculty of Applied Medical Sciences, Albaha University, Al-Baha, Saudi Arabia

Abstract

The cancer is usually minimizing the immunity, which make the patients with cancers at risk for many microbial infections and even septicaemia. This study was done to identify and isolate aerobic bacterial septicaemic pathogens among cancer patients. This study was performed in Radiation and Isotopes national Centre of Khartoum Hospital (previously Alzarra) during the period of May to July 2013. Thirty two blood samples were collected from cancer patients suspected to septicemia. All samples were initially inoculated in brain heart infusion broth and diphasic brain heart infusion. The study showed that eleven (34%) of this samples were showed growth, while twenty one (66%) showed no growth. After subculture on Blood agar, MacConky agar and Chocolate agar, all isolated pathogens were subjected to essential bacteriological biochemical tests and identified as *Staphylococcus aureus* N= 9 (72.7%), *Klebsiella pneumoniae* N= 2 (18.2%), and *Bacillus* species N=1 (9.1%). Septicaemia in patients with cancer was mainly caused by *Staphylococcus aureus* and it commonly in patients using chemotherapy.

Keywords

Septicaemia, Cancer, Pathogens, Isolation, Bacteria

Received: April 18, 2015 / Accepted: May 18, 2015 / Published online: June 23, 2015

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1. Introduction

Despite septicaemia usually appear as transient and asymptomatic bacteraemia, it is sever and often fatal condition and the sepsis of the blood usually complicated from localized infection as wound infection, pneumonia and other bacterial infections ⁽¹⁾.

Microorganisms present in the circulating blood, whether continuously, intermittently, or transiently, are a threat to every organ in the body. Transient bacteremia may occur spontaneously or with such minor events as brushing teeth or chewing food. Other conditions in which bacteria are only

transiently present in the bloodstream include manipulation of infected tissue, instrumentation of contaminated mucosal surfaces, and surgery involving non-sterile sites. This circumstance leads to septicaemia. In septic shock, bacterial endocarditis, and other endovascular infections, organisms are released into the blood stream at a fairly Constance rate (continuous bacteremia) ⁽¹⁾.

Septicaemia is a systemic inflammatory disease associated with the presence and persistence of pathogenic microorganism or their toxin in the blood ⁽²⁾. The spectrum of clinical disease range from hypotensive shock and

* Corresponding author

E-mail address: yagvac@gmail.com (Y. H. A. E. A. Elseed)

disseminated intra vascular coagulation with a high mortality rate, to transient bacteremia⁽³⁾.

The increase risk of septicemia in patients with cancer may be due to chemotherapy, radiotherapy treatment and other treatment weakening the immune system, and also due to surgical incision or any septic wound⁽⁴⁾. Patients treated with chemotherapy may face a high risk for developing infection, and the body may be less able to fight infection once develop, this is because chemotherapy hurts the immune system by lowering the number of white blood cells produced in the body by destroying it and also destroy other cells in the body that grow rapidly as well as cancer cells⁽⁵⁾.

In addition, the chemotherapy may induce gastritis with antacid or with histamine type 2 (H2) antagonist which associated with a seven fold increase in risk (P<.001). Then the infection may result from over growth of organisms in an antacid or H2 antagonist induced alkaline environment with gastrointestinal tract ulceration caused by antineoplastic therapy providing a portal of entry⁽⁵⁾. Therefore, there are no traced studies investigating the bacterial septicemia pathogens in cancer patients. Thus, this study aims to identify and isolate the aerobic bacterial septicemic pathogens among patients with cancer.

2. Materials and Methods

This descriptive study was conducted in Isotopes and Radiation National Centre of Khartoum Hospital in Khartoum state - Sudan. It included thirty two blood samples those were collected from patients with cancer.

The collected samples were cultured immediately on blood culture bottle by change the syringe by other sterile syringe after decontamination of the rubber part by alcohol, after the blood were added mix gently, the bottles must be avoided from direct sun light by covering the bottle with aluminum foil, blood culture bottle transported in ice to reach laboratory for incubation, after incubation (at least 2 days) subculture by using sterile syringe and calibrated loop (500mm in diameter) on to blood agar, chocolate agar, and MacConky agar to primary isolation. The inoculated plates were then incubated for 24 hours at 37°C⁽⁶⁾. All bacteria isolated were purified by several sub-culturing from single well-separated colony. The purity of the culture was checked by examining gram stained smear. The pure culture was then used for studying cultural and biochemical characteristics of the isolates⁽⁶⁾. This included staining reaction, organism morphology, growth condition, and the colony characteristics on different media and biochemical tests characteristics⁽⁶⁾.

The data were then analyzed by computerized method; (Statistical Package for Social Sciences) (SPSS version 20). P

values less than 0.05 were considered significant with level of confidence 95%.

3. Results

The commonest bacteria was *Staphylococcus aureus* which gave 72.7% in comparison with *Klebsiella pneumoniae* (18.2%), and *Bacillus* species (9.1%) (Figure 1). Bacteria isolated from 11 of 32 samples this represented 34% as shown in (Table 1).

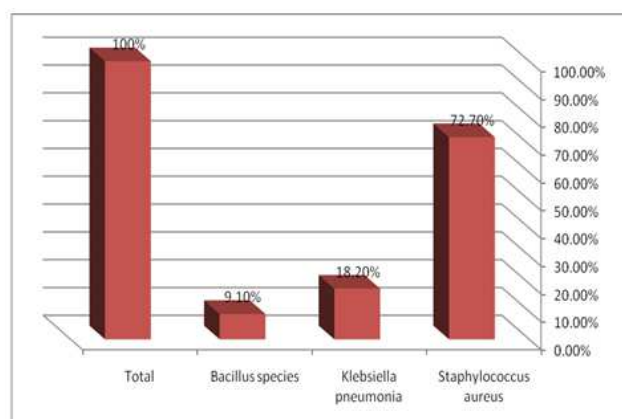


Figure 1. Results of isolated pathogens of cancer patients.

Table 1. Percentage of total clinical isolates of cancer patients.

Clinical isolate	Frequency	%
Positive (growth)	11	34%
Negative (no growth)	21	66%
Total	34	100%

According to the age, septicemia was appearing in cancer patients commonly over fifteen year of age. Eight of these eleven samples (72.7%) isolated from patients treated with chemotherapy, in the other hand 5 of patients (54%) had surgical incision, three samples (27.3%) showed septicemia although the patients did not receive chemotherapy and did not have surgical incision (Table 2).

Table 2. Association between septicemia of cancer patients and sex, chemotherapy administration and surgical incision.

Parameters	Positive n (%)	Negative n (%)	p-value	
Age (Male only)	10-30	2(18.2%)	5 (23.8%)	0.12
	30-50	2(18.2%)	6(28.6%)	
	50-70	5(45.4%)	8(38.1%)	
	Over 70	2(18.2%)	2(9.5%)	
Chemotherapy administration	Yes	8(72.7%)	15(71.4%)	0.02*
	No	3(27.3%)	6(28.6%)	
Surgical incision	Yes	5(45.5%)	11(52.4%)	0.06
	No	6(54.5%)	10(47.6%)	

* (significant, level of confidence 95%)

4. Discussion

Blood stream infection (BSI) remains one of the most important causes of morbidity and mortality throughout the world. Approximately 200,000 cases of bacteremia occur annually with mortality rates ranging from 20-50% worldwide⁽⁷⁾. Blood stream infection (BSI) accounts for 10-20% of all nosocomial infections and is the eighth leading cause of mortality, in the United States some 17% of result in death⁽⁸⁾. In sub Saharan countries including Ethiopia septicemia is an important cause of illness and death in children, the mortality rate approaches 53% which makes it a significant health problem in developing countries⁽⁹⁾.

The bacterial pathogens isolated from cancer patients were identified by cultural characteristics, microscopic examination and biochemical tests as *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Bacillus* species, previous study done by Zenebe et al 2011 and Ali et al 2008 showed that *S. aureus*, *Klebsiella* spp., *E. coli*, *Salmonella* spp., *S. pyogenes*, *P. aeruginosa*, *Acinetobacter* spp. And *Enterobacter* spp. were the nine most common noteworthy bacterial pathogens causing Blood stream infection (BSI). More or less similar observations have been made in cases of bacteraemia in different countries, however, the proportion and predominance of the organisms varied^(10, 11).

In this study, it was found that the common cause of septicaemia in patients with cancer was *Staphylococcus aureus*, this result was in agreement with the study result of Kardos⁽¹²⁾ who stated that septicaemia in cancer patients was commonly caused by gram positive bacteria.

Gram negative bacteria isolated less frequency, only *Klebsiella pneumoniae* represented as 17%. In this study, also isolate bacillus species but only from one sample agree with all previous studies. This agreed completely with the category of Weil et al⁽¹³⁾ since gram negative bacilli function primarily as opportunistic pathogen. Moreover our study was sustains by Several studies in different countries, Jimma Ethiopia, (60.9% and 39.1%) Gondar Ethiopia (70.2% and 29.8%), Zimbabwe (71.9% and 28.1%) Addis Ababa Ethiopia (62.6% and 37.4%), have shown marginally higher prevalence of Gram-positive and lower prevalence of Gram-negative organisms, respectively^(10, 11, 14). In addition in the past two decades the major changes have been seen in bacteria causing infection in cancer patients. A shift from predominant of gram negative bacteria to gram positive bacteria has been observed. European Organization for Research and Treatment of Cancer (EORTC) is an international organization. The organization conducts large numbers of clinical trails on cancer patients including laboratory research in Europe. Randomized controlled trials conducted by this organization reflected changing pattern of infection in cancer patients. The incidence of bacteria in cancer

patients has changed considerably over past four decades⁽¹⁵⁾.

Seventy two percent of cancer patients in this study received chemotherapy suffering from septicaemia specially those over 50 year of age, this assert that chemotherapy hurts the immune system and cause over growth of bacteria in gastrointestinal tract by providing an alkaline environment in the article of Moran et al⁽⁵⁾. While 27.7% of patients subjected to surgical eradication.

5. Conclusion

It could be concluded that septicaemia in patients with cancer was commonly caused by *Staphylococcus aureus* although other bacteria were isolated as *Klebsiella pneumoniae* and *Bacillus* species but in less frequency.

Competing of Interest

We declare that this study is one of our works. It is not submitted for any other journal. We declare that no competing interests related to this study. We declare that this study has not been funded by anybody, institution nor agency.

Acknowledgement

The authors acknowledge all patients participated in the study and special for workers at Isotope Nuclear Hospital.

Authors' Contributions

YHE is the Chief Investigator with overall responsibility for the study and study design and he is the Principal Investigator. MAE, WAA have the responsibility for data collection and statistics procedures.

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