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Journal of General Medicine and Clinical Practice
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Short Communication

Utility of Blood Culture Identification Syndromic Panel of Multiplex PCR to Detect Anti-Microbial Resistant (AMR) Genes Amongst Septicemic Patients

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Received date: December 11, 2023; Accepted date: February 20, 2024; Published date: March 16, 2024

Citation: Humaira Zafar, Irfan Ali Mirza, Muhammad Fayyaz, (2024), Utility of Blood Culture Identification Syndromic Panel of Multiplex PCR to Detect Anti-Microbial Resistant (AMR) Genes Amongst Septicemic Patients, *J. General Medicine and Clinical Practice*, 7(2); **DOI:10.31579/2639-4162/136**

Abstract

Background & Introduction: The published report by 'Lancet' for the year 2022, showed 4·95 million deaths due to AMR especially in intensive care units (ICU) of hospitals. The same statistics for high mortalities due to AMR were reported from Pakistan as well. This situation forced the researchers, infectious disease specialists, clinicians and microbiologists to identify good quality, accurate, rapid and cost effective microbiological diagnostic options to combat AMR.

Objectives: Therefore, the current short commentary was planned to identify the utility of blood culture identification (BCID) panel of multiplex PCR via biofire filmarray amongst septicemic patients.

Methodology: The latest published data from authentic websites and reputed journals was included to identify the evidence regarding utility of BCID syndromic panel in septicemic patients.

Results: The results of study had provided significant evidence regarding incorporation of BCID syndromic panel of multiplex PCR for rapid identification of microbial etiology along with the detection of AMR genes. The pros and cons of cost versus benefits were sorted out from published data. It was identified that that due to rapid and accurate diagnosis of AMR cases, hospital stay in ICU was reduced. The resultant will be decreased morbidity and mortality rates amongst AMR cases.

Conclusion: BCID syndromic panel of multiplex PCR via biofire filmarray harbours great significance to rapidly detect microbial etiology and AMR genes in septicemic patients. Hence, accurate management can be helpful to reduce morbidity and mortality rates in such cases.

Kew Words: filgrastim; filgrastim biosimilar; granulocyte-colony stimulating factor; hospital resource management; lenograstim

Introduction

The term bacterial antimicrobial resistance (AMR) implies to changing in bacterial genetic characteristics and ultimately making them less effective. [1] A report by world health organization (WHO) disclosed that mortality rate from AMR by the year 2050 might reach to 10 million people annually. Which will become true especially if same current statistics be continuing. Thus, a consequence is necessitating an urgent and vigilant attention at Global level to formulate a strong action plan in view to combat AMR. [2]

Around the Globe, management of AMR [multidrug resistant (MDR) and extensively drug resistant (XDR)] cases are becoming a challenge for the clinicians. [3] Every day, it is bringing up a new delinquent, adding up to the severity of situation. The highlighted ones include delayed recovery, high costs for management of patients having AMR, prolong hospital stays, increased morbidity and mortality rates. [1]

A combination of sepsis and AMR along in intensive care units (ICUs) imparts a high rate of morbidity and mortality amongst all age brackets. [4] Only available option to reduce this high incidence is provision of timely and accurate anti-microbial management. Hence to improve patient's morbidity and mortality rates. Therefore, the appropriate diagnosis, based upon clinical and laboratory assessment are the only way out to improve patient's survival rate. [3]

Sepsis is defined as a condition having dysregulated host response to infection, ultimately causing life- threatening organ dysfunction. [4] In 2016 a combine effort by Society of Critical Care Medicine and European Society of Intensive Care Medicine was made to finalize definitions of sepsis and septic shock. Hence, laid the third international consensus definitions for 'sepsis and septic shock', which are called as Sepsis-3 guidelines. It has replaced systemic inflammatory response syndrome i.e. SIRS and have good sensitivity and specificity. [5]

Comparatively with advancement in science and technology, new efforts were made by establishing sequential organ failure assessment (SOFA) and quick Sequential Organ Failure Assessment (sofa) scoring. But it's successful usage to confirm sepsis is still a debate and remained a reason for controversy. Therefore, the accuracy of sepsis -3 guidelines still ranks superior. [6]

Literature Review

A published report from Hong Kong revealed that sepsis imparts high morbidity and mortality in critical care setting and ranges between 30% to 80% of all mortalities. However, blood stream infections (BSIs) are 30% to 40% of all those cases. [7] Six resistant bacteria responsible for BSIs were Escherichia coli, followed by Staphylococcus aureus, Klebsiella pneumoniae, Streptococcus pneumoniae, Acinetobacter baumannii, and Pseudomonas aeruginosa. Analyzing the drug wise incidence of mortality, methicillin-resistant Staphylococcus aureus (MRSA), caused 100,000 deaths in the year 2019. [6]

In the same year i.e 2019, a published report showed that 50,000 to 100,000 deaths were due to multidrug-resistant tuberculosis. Next in sequence for high mortality were third-generation cephalosporin-resistant Escherichia coli. This was followed by carbapenem-resistant Acinetobacter baumannii, fluoroquinolone-resistant Escherichia coli, and carbapenem- resistant Klebsiella pneumoniae. Lastly were the third-generation cephalosporin-resistant Klebsiella pneumonia. [1]

In view of existing scenario of AMR, a new diagnostic modality i.e multiplex or array-based PCR was introduced. The test facilitates simultaneous identification of multiple pathogens along with their resistant genes. Thus, helps in rapid diagnosis. [8] A published report for the year 2021, by United State (US) Food and Drug Administration (FDA) had approved the usage of blood culture identification (BCID) panel of Bio Fire Film Array. It was labelled as a rapid, multiplex PCR for the identification of microbial genetics along with AMR genes. [7] Though the proceedings were carried out on positive blood cultures, but still it is considered to save the processing time. [9]

A published study from Hong Kong, for the year 2021, had correlated septic shock with increased mortality in critically ill patients. It was clarified that delay in diagnosis and delayed management of condition are the main contributors for said condition. Hence, rapid diagnosis and accurate management are the only things to improve patient's outcome. [7]

Upon comparison with the results of conventional methods, the rapid provision of accurate results by Film Array i.e. Bio Fire, are considered to provide an aid for modifying empirical antimicrobial therapy in approximately 32% of patients. 9 Simultaneously it is of good utility in infection prevention and control practices especially for patients with multidrug resistant pathogens. Thus, also playing a contributing role to reduce AMR. [1]

A combination of sepsis, AMR and delay in getting culture results are responsible for high morbidity and mortality rates in ICU patients. Multiplex PCR via Bio fire Film Array has been introduced as a rapid and advanced technology to serve the purpose. This modality helps in simultaneous identification of microbial etiology and their AMR genes. Besides its many syndromic panels, blood culture identification panel (BCID) is notorious for rapid diagnosis of blood stream infections. Therefore, the current short commentary was planned to identify the utility of blood culture identification (BCID) panel of multiplex PCR via bio fire film array amongst septicemic patients. Thus, rapid diagnosis and hence accurate management can be life saving for the AMR and septicemic sufferers.

Conclusion:

BCID syndromic panel of multiplex PCR via biofire filmarray harbours great significance to rapidly detect microbial etiology and AMR genes in septicemic patients. Hence, accurate management can be helpful to reduce morbidity and mortality rates in such cases.

Recommendations:

1. Multiplex PCR via bio fire film array should be the first line microbiological diagnostic modalities amongst septicemic patients.
2. Comparative efficacy of Multiplex PCR via bio fire film array with conventional microbiological techniques can be the way forward research topics
3. The statistic of rare microbial etiology for AMR in septicemic patients should be used to review and formulate infection prevention and control strategies.

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DOI:10.31579/2639-4162/136