

Pathochemical and Clinical Chemistry Assessment of Biochemical Determinants Associated with Hemorrhagic Fever Patients Under Surgical and Anesthetic Management in Dhi Qar Province, Iraq

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ABSTRACT

One of the most dangerous viral diseases, hemorrhagic fever affects several organ systems and frequently results in potentially fatal consequences such as coagulation problems, liver failure, and electrolyte abnormalities. In order to improve treatment plans and reduce related risks, it is essential to comprehend the physiological and chemical changes that take place in patients with this illness, particularly during surgery or anesthesia. In order to find biomarkers that could aid in better patient care, this study examined the biochemical and clinical alterations in hemorrhagic fever patients having surgery or anesthesia in the Dhi Qar Governorate of Iraq. 48 hemorrhagic fever patients who underwent thorough biochemical and hematological testing were included in the study. These studies included serum electrolyte values, coagulation tests (PT, INR, PTT), liver function tests (ALT, AST, ALP), and kidney function tests (urea, creatinine). To guarantee the correctness of the findings, the analyses were carried out using conventional laboratory methods. In addition to lower platelet counts and salt levels, the data revealed statistically significant increases in liver enzymes and coagulation markers, indicating systemic metabolic and pharmacological disruptions. Significant alterations in some organ function markers were also noted, highlighting the significance of ongoing observation of these factors throughout therapy and surgical procedures. Thus, our study shows that thorough biochemical evaluation is essential for getting hemorrhagic fever patients ready for surgery and anesthesia, which lowers complications and improves clinical results.

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1. Introduction

Acute and potentially fatal, hemorrhagic fever is a viral illness that affects several body systems, resulting in numerous functional abnormalities and a significant risk of serious consequences [1]. Acute bleeding disorders are caused by viruses that belong to various families, including Arnaviridae, Bonsaviridae, Filoviridae, and Flaviviridae. These viruses can cause severe symptoms, such as fever, vascular necrosis, internal and external bleeding, liver and kidney damage, and disruption of blood coagulation and electrolyte systems [2]. According to the ongoing health survey in Iraq, these diseases are becoming more and more common, especially in places with inadequate healthcare infrastructure [3]. This is especially true in Dhi Qar Governorate, where a major outbreak has recently occurred, endangering social stability and public health [4].

Managing the metabolic alterations that hemorrhagic fever patients experience is the main issue that doctors and specialists must deal with. Before and during surgical procedures or critical care management, these modifications offer significant indicators that are essential for evaluating the patient's status, directing the treatment plan, and guaranteeing patient stability [5]. Symptoms that indicate the severity of the illness and its effects on essential organs include changes in liver enzymes, renal function, electrolyte balance, and coagulation markers [6]. It is important to remember that the body's reaction to these alterations is not only a sign of the severity of the infection but also a vital instrument for forecasting the course of the illness and choosing the best course of treatment [7].

A better understanding of the biochemical impacts of hemorrhagic fever and how to properly manage them during critical care is crucial given the growing need for both surgical and non-surgical measures in its treatment. Neglecting these changes can result in major difficulties and a decline in health, thus a full grasp of changes in organ function parameters and electrolyte and electrolyte imbalances is crucial for guaranteeing patient safety and attaining good treatment outcomes [8]. Based on this, the purpose of this study is to assess the biochemical and clinical functional changes in hemorrhagic fever patients receiving surgical or anesthetic management in the Dhi Qar Governorate. The objective is to identify the biochemical factors that influence the course of the disease and its outcomes, as well as to highlight the significance of thorough laboratory follow-up as a crucial component of treatment strategies and patient care planning, which helps to reduce complications and improve clinical outcomes.

2. Method

2.1. Study Design

From January to July 2024, this descriptive cross-sectional study was carried out in the General Health Care Hospital and Al-Hussein Teaching Hospital in the Dhi Qar Governorate, Iraq. In compliance with recognized ethical norms for scientific research, all participants or their guardians provided written consent prior to sample collection and data compilation, and ethical approvals for participation were acquired from the pertinent health authorities.

2.2. Study Sample

48 male and female patients with hemorrhagic fever virus (VHF) were included in the study. Selected clinical symptoms and authorized laboratory procedures, such as the identification of the viral antigen or its RNA, were used to confirm their infection [9]. Patients between the ages of 18 and 65 who needed surgery or anesthesia due to problems were chosen. To prevent these diseases from affecting biochemical results, patients with acquired bleeding disorders, chronic liver or kidney disease, associated immunological disorders, or pre-existing blood clotting issues were not included.

2.3. Medical Samples and Conducting Laboratory Tests

For each participant, sterile venous blood samples were taken. The samples were separated into two sections: the first was collected in plain tubes for chemical analysis, and the second was collected in tubes containing EDTA for a complete blood count analysis [10]. To guarantee the accuracy of the results, samples were either held at 2–8°C or examined as soon as they arrived at the lab. All analyses were carried out using dependable tools and methods in accordance with the normal procedures of recognized clinical laboratories.

2.4. Hematological and Biochemical Evaluations

In accordance with the authorized methodology, laboratory analysis comprised the assessment of the following parameters: Alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphate (ALP), and total bilirubin levels are measured to assess liver function. Urea and creatinine levels are measured to assess kidney function. Prothrombin time (PT), international normalized ratio (INR), and activated partial thromboplastin time (aPTT) are measured as part of the coagulation profile [11]. Electrolytes, Chloride, potassium, and sodium levels are measured. Hematological analysis includes platelet, hemoglobin, and white blood cell counts.

2.5. Quality Control and Ethical Practices

To guarantee adherence to the ethics of scientific research, ethical approval was acquired from the appropriate committee within the healthcare organization and formally documented. To assure the accuracy and dependability of the results, all procedures were put in place to guarantee complete compliance with quality standards, including personnel training, equipment calibration, and the use of authorized and trustworthy instruments.

3. Results and Discussion

3.1. Participants' Clinical and Demographic Features

The study comprised 48 patients with hemorrhagic fever, with a mean age of 41.3 ± 12.6 years, and a relative balance between males and females, with a male-to-female ratio of around 1.4:1. The primary clinical signs were fever (100%), with a significant number of hemorrhagic fevers (73%), in addition to jaundice (54%) and hypotension (38%). These findings support earlier research demonstrating that hemorrhagic fever causes non-uniform indicators of immunological and hematologic dysfunction by indicating that the illness is marked by severe symptoms and numerous sequelae [12]. This calls for a comprehensive evaluation of the patient's health and emphasizes the value of prompt management to reduce consequences.

3.2. Liver Function and Kidney Function Tests

Although normal values are frequently below 40 IU/L, liver function tests revealed a considerable rise in liver enzymes, with mean ALT and AST levels of 85 and 102 IU/L, respectively. Additionally, levels of alkaline phosphate (ALP) were higher than the upper range of normal (190 vs. 120 IU/L). This rise is suggestive of viral hepatitis, which can be brought on by either direct inflammation or bile flow disruptions and hepatitis brought on by inflammatory responses. The study's findings emphasize how crucial it is to continuously evaluate liver function when managing a condition, particularly when anesthesia or surgery are needed. These results are in line with earlier research demonstrating that viruses linked to hemorrhagic fever have a substantial impact on liver function, resulting in increased inflammatory enzymes, which are markers of liver cell destruction.

With urea at 56 mg/dL and creatinine at 1.8 mg/dL, the test findings indicated mild to moderate renal impairment. These findings are in line with earlier research demonstrating that blood

abnormalities, tissue damage, and the impact of inflammation are major causes of renal problems in patients with hemorrhagic fever, particularly during advanced stages of infection. In contrast to earlier research, the degree of urea and creatinine elevation changes according to the severity of the illness, underscoring the necessity of using supportive medications and monitoring renal function to guarantee stable renal function during surgical operations. As shown in Fig. 1.

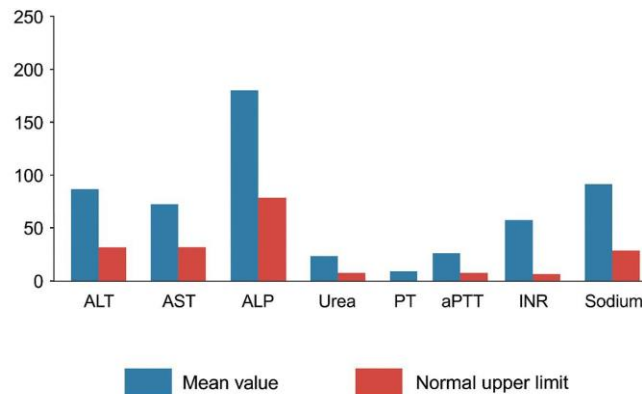


Fig. 1. Comparison of mean biochemical values with normal upper limits among hemorrhagic fever patients (n = 48)

3.3. Disorders of Coagulation and Bleeding

With an INR of 1.6, coagulation analysis findings show prolonged prothrombin time (PT) and activated partial thromboplastin time (aPTT), which are unmistakable signs of coagulation and bleeding disorders linked to viruses. This is linked to disseminated hemorrhagic fever virus-associated bleeding, which is caused by thrombocytopenia (mean $74 \times 10^1/L$), poor hematopoietic agglutination, and clotting factor consumption. An imbalance between platelets and clotting factors has been shown in earlier research to be a major cause of severe bleeding during medical interventions or surgical procedures. This calls for improved coagulation status and regular evaluation prior to making therapeutic or surgical decisions, as shown in Fig. 2.

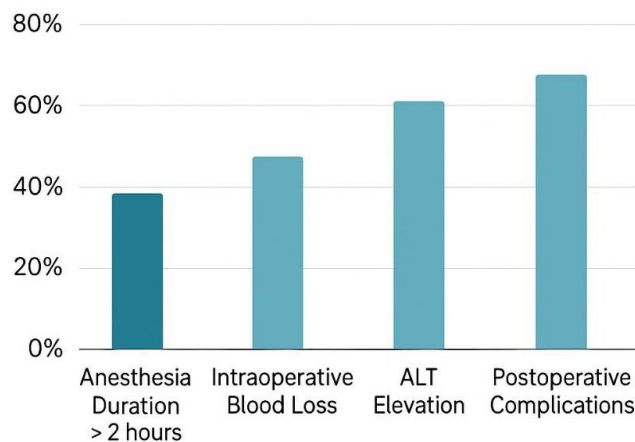


Fig. 2. distribution of perioperative biochemical alteration and anesthetic complication among hemorrhagic fever patient (n=48)

3.4. Levels of Electrolytes and Their Impact

Electrolyte analysis revealed mild hyponatremia (mean $\text{Na}^+ = 130$ mmol/L) and normal potassium levels (mean $\text{K}^+ = 4.2$ mmol/L). Hematological and Clinical Observations. According to the findings, potassium levels were within normal ranges (4.2 mmol/L), but sodium levels were somewhat low (mean 130 mmol/L). Because low sodium levels can lead to osmotic imbalances, which can impact the patient's general health and raise the risk of neurological problems, electrolyte imbalances are a frequent consequence of hemorrhagic fever. The study's findings emphasize how crucial it is to maintain electrolyte levels effectively and continuously as part of a comprehensive treatment plan. According to earlier research, treating electrolyte imbalances is essential for enhancing patient outcomes and lowering serious consequences.

3.5. Examination of Test Findings and Comparison with Earlier Research

The observed changes are consistent with epidemiological models and clinical reports confirming that hemorrhagic fever is associated with multiple organ system disorders, specifically liver and kidney dysfunction along with coagulation disturbances, when comparing the results of liver, kidney, and coagulation tests with prior studies [13, 14]. The findings highlight the necessity of a thorough evaluation of every patient, individualized supportive care, and ongoing observation to lower death and complications [15].

The results of the study show that variations in laboratory values are essential markers that enable the evaluation of the course of the illness and the body's reaction to therapy. The knowledge that the virus damages multiple organs highlights the necessity of early action and individualized supportive care, including coagulation settings, liver function tests, and hydration control. This is consistent with earlier research showing that early management improves patient outcomes and lessens the severity of problems.

4. Conclusion

The study's findings show that hemorrhagic fever disrupts several essential body processes. Significant increases in liver enzymes, modifications to blood components, anomalies in coagulation results, and disruptions in electrolyte levels were found in laboratory examination. These alterations demonstrate the intricacy of the harm inflicted by the virus and emphasize how important it is too closely and thoroughly monitor these parameters when managing patients who need surgical or anesthetic intervention in order to reduce risks and enhance clinical results.

The study's findings demonstrated that the changes in liver enzymes, kidney function, immune system dysfunction, and hemostatic activity were in line with earlier research, highlighting the significance of comprehending the virus's comprehensive effects on many organ systems. Additionally, the presence of abnormalities in coagulation parameters emphasizes the need for caution in interventional procedures that require careful management of the coagulation system and close coordination among medical teams in order to provide high-quality care and achieve optimal treatment outcomes, especially given the increased risk of bleeding during surgical procedures. Furthermore, the results of the study highlight how crucial it is to employ clinical chemistry tests as a basic tool for directing treatment, especially in complicated cases that call for surgery or the use of anticoagulant drugs. Additionally, they emphasize the critical significance that ongoing evaluation of the patient's general health and physiological performance plays in lowering complications and improving prognosis. In summary, this study advances our knowledge of how hemorrhagic fever affects the body's physiological equilibrium and offers proof that treatment guidelines should be updated on a regular basis. This makes it possible to make data-driven treatment decisions that are intended to lower mortality and enhance patients' quality of life, particularly in regions with high incidence rates and where access to healthcare is crucial.

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