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Elisa Technique to Detect HBV, HCV, and HIV among Healthy Blood Donors in the Blood Central Lab – Gezira State – Sudan

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Abstract

Blood transfusion is associated with many hazards, especially the exposition to blood transfusion-transmitted blood-borne infectious diseases considered one of the main causes of conflict worldwide, including hepatitis B (HBV) and C virus (HCV) and human immunodeficiency virus (HIV). In great countries blood-borne - pathogens are treated by human public health, so continuous monitoring of blood transfusions must be done to prevent transmitting diseases from healthy donors. All central blood labs led by WHO that licensed Elisa is one of the virological tools, which gives accurate results and has higher sensitivity and specificity compared with other diagnostic tools such as Rapid test immune chromatography (ICT) and radioimmunoassay (RIAs). In this present study, about 8000 samples were diagnosed in the blood central lab between 1/7/2023 -and 31/10/2023 by using the Elisa technique. Out of 8000 blood samples tested for viral infection, HBV, HCV, and HIV were detected in 442, 17, and 12 samples, respectively.

Keywords: Blood Transfusion, HB, HC, HIV, Elisa Technique.

Introduction

Blood transfusion services are an important part of the human healthcare program, which is an important and essential life-saving treatment and part of the World Health Organization's list of fundamental or primary medicines [1]. The main way to transmit the most infectious diseases worldwide such as hepatitis B virus (; HBV) or hepatitis C virus (HCV) and immunodeficiency virus (HIV) is blood transfusions from healthy donors that do not show signs and is considered a crime for human public health [2]. One-fifth of the world's population about 500 million people that chronically infected with hepatitis B virus (HBV) or hepatitis C virus (HCV) and immunodeficiency virus (HIV), which are transmitted through blood fusion [3, 4], and also about 1.5 million people die from HBV- and/or HCV annually. In developing and great countries blood-borne - pathogens are treated in human public health due to facilities with scarce resources and a shortage of staff members [5].

ELISA technique is the preferred method of examination for the blood bank due to its effectiveness, which gives accurate results and has higher sensitivity and specificity compared with other diagnostic tools such as Rapid test immune chromatography test (ICT) and radioimmunoassay (RIAs) [6]. Chronic hepatitis B (CHB) is facing human public health and conflicts with over 350 million people worldwide [7]. The late-stage of chronic liver diseases lead to cirrhosis and hepatocellular carcinoma (HCC) [8]. Hepatocellular carcinoma (HCC) is one of the most common cancers worldwide [9]. Previous studies reported that (HBV, and HCV) have been responsible for at least half a million of these cancers [10].

Virological methods are important in diagnosing chronic HBV and HCV diseases, they may be useful to establish their prognosis, but they have found their standard application in guiding treatment determinations and assessing the virological responses to therapy.

Objective

The purpose of using the ELISA technique for detecting HBV, HCV, and HIV infection among healthy blood donors to avoid the spread of the diseases due to the threat affected by blood-borne pathogens is significantly high, especially in developing countries, so to avoid this dilemma, it is best to follow continuous monitoring of blood transfusions to prevent transmitting diseases.

Materials and Methods

A cross-sectorial study was achieved on 8000 healthy blood donors and recipients coming to the central lab in Sudan- Gezira state –Wadmedani.

ELISA Technique

Sandwich enzyme immunoassay to detect viral diseases in the blood serum (antibody detection). First, the whole blood from participants was collected, and sera were separated and tested for HBV, HCV, and HIV viral legends or epitopes. The detection of specific antibodies in body fluids is based on the use of sandwich enzyme immunoassays (EIAs). Recombinant antigens are used to capture circulating antibodies. The presence of antibodies is revealed by anti-antibodies labeled with an enzyme that catalyzes the transformation of a substrate into a colored compound. The optical density (OD) ratio of the reaction (sample OD/internal control OD) is proportional to the number of antibodies in the sample. Elisa's methods are cheap, easy to use, can be fully automated, and are well adapted to large-volume testing.

Result

A total of 8000-blood donors was checked for HBV, HCV, and HIV infectious diseases from healthy blood donors and recipients participated in this study. About 75% (6000) were males most of them were donors, while 25% (2000) were females (nearly all were recipients. When the samples were tested using the ELISA technique, there were 442 positive samples for HBV, 17 positive samples for HCV, and 12 for HIV (Table 1). In addition, figure 1 shows the differentiation between the infectious diseases (HBV, HCV, and HIV), the positive result of HBV is 5.5% while HCV is .21% and HIV is .15%.

Table 1:

Total	HIV	Hepatitis C	Hepatitis B	Month
2000	2	4	110	July
2000	4	3	107	August
2000	3	6	114	September
2000	3	4	111	October
8000	12	17	442	Total

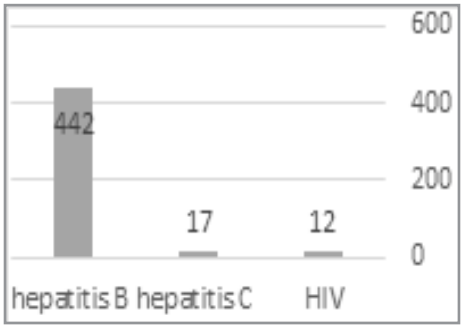

Figure 1: ELISA technique to detect HBV, HCV, and HIV- among healthy blood donors.

Discussion

Blood transfusion leads to many risks, especially exposure to a transfusion-transmitted infection (TTI), including HBV, HCV, and HIV [11]. In great countries, there is a low risk of transfusion-transmitted infection by avoiding non-idealist blood transfusion by using regular screening for donors with highly sensitive screening such as ELISA and nucleic acid testing (NAT). Many studies used the Elisa technique to compare the results with four rapid tests for detecting HBV, HCV, and HIV they confirmed that the Elisa technique is more sensitive and gives more accurate results than other techniques [12]. This study used the Elisa technique due to its preferred effectiveness. The spread of viral epitopes or legends among donors attending the blood central lab using the ELISA technique was 442 (5.5%), 17 (.21%), and 12 (0.15%) for HBV, HCV, and HIV, respectively. In general, the Sero evidence survey of transfusion-transmitted infections (TTIs) in this study was about 471/8000 (6%), which is comparable to other studies in that it was recognized about 2.35% and 3%.

The Sero evidence survey of HBV is similar to that of Nabehi et al., who confirmed the spread of HBV in Yemen at 2.7% and 1.8% in Sana'a and Taiz, respectively among donors and recipients [13]. In addition, the similarity in some Arab countries of the spread of HBV is as follows 0.6% in Iraq, 1.3% in Morocco, 1.4% in Jordan, 1.6% in Lebanon, 2.4% in America, and 2.2% in Japan [16, 17]. Previous studies revealed the spread of hepatitis C about 2.4% in Yemen [13]. According to the World Health Organization, in some Arab countries, such as Saudi Arabia, the spread of HCV is 1–1.9% [1]. In Australia, we found that the rate of HCV among the adult population was 1.3% [16]. The Sero evidence survey of HIV in our study was 0.15% (Figure 1), similar to studies in Yemen but differed from other studies, where it was 1.19% in 2000 [17].

Conclusion

Elisa is the preferred perfect technique in diagnosis the blood transfusion-transmitted blood-borne infectious diseases (HBV-

HCV-HIV). All central blood labs led by WHO that licensed Elisa is one of the virological tools, which gives accurate results and has higher sensitivity and specificity compared with other diagnostic tools such as Rapid test immune chromatography (ICT) and radioimmunoassay (RIAs). Our results go with many results throughout the world.

Personal thanks

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