

UNCONFIRMED REACTIVE SCREENING TESTS AND THEIR IMPACT ON DONOR MANAGEMENT

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ABSTRACT

Objective: To determine the percentage of false positive testing for transfusion transmitted infections (TTIs) using immunochromatographic test (ICT) as first line of screening tests and its effect on loss of volunteer blood donors.

Methodology: Over a period of three months, samples from blood bags of donors undergoing phlebotomy at teaching hospital blood banks in Lahore were screened for human immunodeficiency virus (HIV), hepatitis B (HBV) and hepatitis C (HCV) by immunochromatographic tests. Those found positive on initial screening were re-tested by ELISA method at the screening laboratory of the Institute of Haematology & Blood Transfusion Service, Punjab, Lahore.

Results: Out of a total of 62090 voluntary blood donors, 469 donors were found to be initially reactive for either HIV, HBV or HCV. Amongst these 96(0.15%) blood donors were found to have tested falsely positive for HIV, HBV or HCV as compared to testing by ELISA.

Conclusions: False positive testing rate of 0.15% or 96 out of a total of 62090 donors is rather small in terms of loss of voluntary donors and appropriate utilization of available resources. Although immunochromatographic testing is not the gold standard, however it serves an important purpose of initial donor screening.

KEY WORDS: ICT & TTIs, FP testing, Loss of volunteer blood donors.

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INTRODUCTION

The screening of blood donors for transfusion transmissible infections (TTIs) is the cornerstone in assuring safety in blood

transfusion. Each transfusion service has to prioritize, the diseases it can screen according to its resources and the prevalence of the disease. The blood transfusion service, Punjab, is currently screening all blood donors for human immunodeficiency virus (HIV), hepatitis B (HBV) and hepatitis C (HCV) as a matter of routine; screening for malaria and syphilis has yet to be started. Due to a number of constraints, principal among them, lack of human and financial resources, it has not been possible to employ gold standard tests for screening blood donors at all levels of blood banks. The service initially utilizes quick, inexpensive and easy to perform rapid screening tests in order to detect possible infectious donors.

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A major concern in utilizing rapid screening tests is that they should have a high degree of sensitivity and a reasonable level of specificity so as to minimize false positive or false negative results. A high number of false positive donors leads to a large number of voluntary donor deferral; while false negative testing may jeopardize blood safety. False negative testing can also occur with some of the most sophisticated state of the art tests if the donor is in the window period and has not yet seroconverted. Strict hemovigilance and quality control systems need to be put into place to prevent such errors.¹

False positive tests on the other hand create a different set of problems for the transfusion service. Apart from psychosocial issues at the time of donor testing, it may also cause shortage in the supply of less common blood groups like Rh (D) negative groups. It may create logistic problems due to loss of volunteer blood donors and may exhaust already meagre resources. Each service designs its own testing algorithms to prevent such problems and selects kits considered best for use in the local scenario. This may generate a certain amount of criticism, which may be justified. However such decisions necessarily take into account not only safety issues but also the judicious use of resources.² This is important especially for a service like the Punjab blood transfusion service, where its network of blood banks are spread right up to tehsil levels.

The issue of false positive testing is further exacerbated if these donors test negative on repeat testing by enzyme linked immunosorbent assay (ELISA) or polymerase chain reaction (PCR). Multiple studies have reported that such donors are rarely infected

with a transmissible agent.^{3,4} Causes of false positive testing include difference in constituent reagents, antigens, testing formats and personnel errors. Cross-reactivity of HIV-1 and Hepatitis B has been reported as well as vaccination for influenza flu has also been incriminated as a cause of false positive testing.³ Human leukocyte antigen (HLA) antibodies can also be a cause of false positive reactions.⁴ Nonetheless biologic false positivity leads to increased donor loss and a certain amount of wastage of resources.

The Blood Transfusion Service, Punjab faced a huge dilemma with regard to the choice of the kits to be employed in screening blood donors in this large transfusion service extending even into the rural areas. The objective of this study, therefore, was to estimate the prevalence of false positive testing for HIV, HBV and HCV by repeat testing all those donor samples which tested initially reactive by rapid screening tests on ELISA.

METHODOLOGY

Study Population: Over a period of three months, voluntary blood donors, most of the first time directed or replacement donors, who donated blood at the blood banks located at the major teaching hospital blood banks in the city of Lahore were tested for HIV1&2, HBV and HCV by ICT. A total of 62090 donors donated blood at the designated blood banks. All blood banks were given codes and a blind re-assessment of TTIs testing was carried out. The Screening coverage for HIV1&2, HBV and HCV during the study period was 100%. Samples and blood bags testing initially reactive for any of the screened TTIs at the blood banks, were brought to the Institute.

Table-I: Results of HIV, HBV, HCV testing of blood donors by ICT & ELISA

<i>Diseases</i>	<i>No. initially reactive by rapid kits</i>	<i>No. repeat reactive by ELISA</i>	<i>No. non-reactive</i>	<i>% False positive</i>
HIV/AIDS	12	02	10	0.016
HBV	184	121	63	0.101
HCV	273	250	23	0.037
Total	469	373	96	0.154

Testing Algorithm: At the screening laboratory of the Institute of Haematology & Blood Transfusion Services, Punjab, re-testing on ICT devices of the same batch and manufacturer were repeated in order to rule out personnel errors. All samples were also re-tested by ELISA in an attempt to evaluate false positive testing and resultant loss of donors due to use of ICT devices as an initial screening test.

RESULTS

A total of 62090 donors were bled at the different teaching hospital blood banks during the study period. A total of 469 donors tested initially reactive for either HIV1&2, HBV or HCV. They were all found to be repeat reactive by ICT at the Institute. However, 96 donors on re-testing by ELISA were found to be non-reactive. The false positive test percentage was 0.15% (Table-I).

DISCUSSION

Whenever newer testing methodologies are employed for donor testing, it is realized that there is so much to learn about the application of such tests, in particular the proportions of false positive and false negative results. Although licensed screening tests are highly sensitive and reasonably specific, the likelihood of false positive result cannot be ruled out. It has been estimated that even for a test with 95% sensitivity and specificity, the predictive value among blood donors of a positive test will be only 2%.⁴ Consequently, a number of modifications need to be employed such as changes in cut off value or changing the methodology to make it more effective for donor screening.⁵

In this study, we attempted to evaluate false positive results by ICT as compared to retesting by ELISA for the HIV/AIDS, HBV and HCV in blood donors. It was found that HBV B showed the highest false positivity 0.1%, followed by HCV and HIV. The overall false positive testing incidence in our study population was 0.15%. The consequent voluntary donor loss was also negligible. Our findings are in agreement with that of other workers.^{6,7}

False positive result could be due to cross reactivity with anti HLA antibodies, multi-party, recent vaccination, multiple transfusions, autoimmune diseases, alcohol use, malaria and dengue virus infections.^{2,3}

Several assays give false positive results due in part to differences in the constituent antigens and procedural errors. The overlap is often variable; in our study, it was small (0.15%). The target overlap should no doubt be minimal and rechecking and reconfirmation should be carried out before permanent deferral in order to minimize voluntary donor loss and better donor pool management.

CONCLUSIONS

In view of our socio-economic environment, initial large scale donor screening with ICT seems to be a good choice due to a variety of reasons, some of them being costs, manpower and available infrastructure. As our systems develop, a continuous effort for moving to better testing methodologies will have to be pursued to ensure blood safety and better donor pool management.

REFERENCES

1. Narayan S. Microbes and blood transfusion. *Indian J Med Microbiol* 2001;19(3):119-26.
2. Kitchen A. Hepatitis B and blood safety. *Vaccine* 1998;16(4):34-7.
3. Wai CT, Tambyah PA. False-positive HIV-1 ELISA in patients with Hepatitis B. *The Amer J Med* 2002;112(9):737.
4. Sayers MH, Beatty PG, Haensen JA. HLA antibodies as a cause of false-positive reactions in screening enzyme immunoassays for antibodies to human T-lymphotropic virus type-III. *Transfusion* 1986;26(1):113-5.
5. Kleinman SH, Busch MP. The risk of transfusion-transmitted infection: direct estimation and mathematical modeling. *Baillieres Best Pract Res Clin Haematol* 2000;13(4):631-49.
6. Ownby HE, Korelitz JJ, Busch MP, Williams AE, Kleinman SH, Gilcher RO, et al. Loss of volunteer blood donors because of unconfirmed enzyme immunoassay screening results. *Transfusion* 1997;37(2):199-205.
7. Choudhury LP, Tetali S. Ethical challenges in voluntary blood donation in Kerala. *India J Med Ethics* 2007;33(3):140-2.