

HIGH FREQUENCY OF FALSE POSITIVE RESULTS IN HIV SCREENING IN BLOOD BANKS

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Background: This study was carried out to determine the frequency of false - positive results during serological screening for the presence of antibodies against HIV-1/2 in blood banks. **Methods:** A cross-sectional study was conducted from January - December 1999 as screening of voluntary non-remunerated blood donor pool for HIV in the public sector blood banks, in all the six divisions of Balochistan. 5000 subjects were screened for the presence of antibodies against HIV-1/2. The subjects were all males between the age group 18-50 years, attending the public sector blood banks as non-remunerated blood donors. Strategy I was adopted for initial screening, Strategy II and III were observed in retesting on ELISA, as recommended by UNAIDS/WHO for blood banks. **Results:** Out of 5000 subjects, 48 (0.96%) were positive for HIV-1/2 on Strategy I, 37 (77% of 48) met the criteria of false positive, while only 11 (0.22% of 5000) were found to be true positive. **Conclusion:** In blood banks, screening for HIV antibodies is performed for intervention of the positive donations. UNAIDS / WHO Strategy-I is observed on a smaller workload blood banks where donations are less than 20 per day. A high rate of false positive results in serological HIV screening on Strategy-I depicts that the test is highly sensitive but not highly specific. Labeling someone with HIV positive, when actually he is not, forces the health authorities to find other ways of HIV screening in blood banks, which should be much more specific and therefore reliable.

Key Words:- False positive results, HIV/AIDS, Screening, Balochistan

INTRODUCTION

We are a testing culture: we test our urine for drugs: we test our sweat for lies. It is not surprising that we should also test our blood for the acquired immunodeficiency syndrome (AIDS). But before we screen low-risk groups for antibody to the human immunodeficiency virus (HIV), we should consider what the results would mean. Serologic tests for HIV antibodies appear to be characterized by extra-ordinarily high false – positive results in a low risk screening setting of voluntary blood donation¹ Furthermore, any increase in false positive rate could turn a screening program into a social catastrophe. A false positive result may label an infant, born to HIV positive mother, as HIV positive where as the same infant may actually be HIV negative.² The false positive result regarding HIV in a neonate can lead to very serious problems.

Whatever its scientific merits, widespread HIV antibody testing is becoming a political reality.³ Blood banks screen potential donors; false positive test results in blood banks is a global issue. Significantly high false positive test results have recently been reported in a well-organized blood transfusion service of the world.⁴ The armed forces test recruits and personnel on active duty: the State Department tests Foreign Service Officers and their dependents. Soon, screening of immigrants, prisoners and veterans will begin. Pregnant women have been advised to undergo testing in both the first and third trimesters.⁵

Plans to test low-risk populations for HIV antibody generally ignore the possibility of false positive results⁶. Screening of blood donations for HIV is to produce intervention for all HIV positive blood donations. All such blood bags or blood components are discarded as per rule. Confirmation of these cases is not the jurisdiction of blood

banks. The only doable job at their part is to refer such donors to the relevant sectors. If the false positive rate is not virtually zero, screening a population in which the prevalence of HIV is low will unavoidably disturb many healthy people.

This study was conducted as screening for the presence of antibodies against HIV-I/2 in the province of Balochistan and to determine the frequency of false – positive results during screening in blood banks in public sector.

MATERIAL AND METHODS

The study was conducted in all the six divisions of Balochistan, i.e. Sibi, Zhob, Quetta, Kalat, Makran and Naseerabad, from Jan-Dec, 1999. Five thousand subjects were screened for the presence of antibodies against HIV-1/2 during this period. The subjects tested were all males in the age group 18-50 years. These were voluntary blood donors. Screening was done observing Strategy I. All HIV positive cases on Strategy I were retested, in the referral laboratory in public sector, on ELISA observing Strategy II and Strategy III, as per guidelines of UNAIDS / WHO ^{7,8,9,10,11,12,13}. Strategy I was a rapid test and was performed on Capilus HIV I/2 by Cambridge, Ireland. Strategy II (ELISA) was performed on Lab System HIV I/2 Finland and Strategy III (ELISA) was undertaken as a confirmation test performed on Sanofi Pasteur HIV I/2 France. All the samples underwent the three strategic testing^{14,15}. Results were calculated as simple percentages.

Strategy I is used in serological HIV screening in Blood Bank. According to WHO recommendations blood banks having smaller workload, less than 20 donations per day, rapid test is to be adopted. Any sample giving a positive reaction is to be further tested in Strategy-II, which is ELISA, based in this study. The confirmation of the sample as having HIV antibodies is done observing strategy-III. This is done on ELISA techniques but the kits used in Strategy-II and Strategy-III should have different HIV-1/2 Antigen makeup as per instructions of WHO/UNAIDS (1998). Any sample giving a positive result to at least two out of the three strategies tests is labeled as HIV positive.

Any sample giving positive reaction to one out of three strategies, test is reported as HIV negative. In such cases follow-up quarterly tests for one year are recommended and is the protocol.⁴

RESULTS

Of 5000 subjects, 3000 were screened in Makran, 1000 in Quetta, 350 in Sibi, 300 in Naseerabad, 250 in Zhob and 100 in Kalat, as shown in Table-1.

Table 1: Results of Screening for HIV

| Areas Screened | No. of Subjects | Positive on Strategy I | Positive on Strategy II & III* | False positive |
|----------------|-----------------|------------------------|--------------------------------|----------------|
| Mekran | 3000 | 25 (0.83%) | 3 (0.1%) | 22 (0.73 %) |
| Quetta | 1000 | 10 (1.0%) | 3 (0.3%) | 7 (0.70 %) |
| Sibi | 350 | 4(1.1%) | 2 (0.57%) | 2 (0.53 %) |
| Naseerabad | 300 | 5 (1.6%) | 1 (0.33%) | 4 (1.27 %) |
| Zhob | 250 | 3 (1.2%) | 2 (0.8%) | 1 (0.40 %) |
| Kalat | 100 | 1 (1%) | Nil | 1 (1.0 %) |
| Total: | 5000 | 48 (0.96%) | 11(0.22%) | 37 (77.0 %) |

Key:- * Strategy I, II & III as recommended by UNAIDS / WHO.

In Makran, 25 (0.83%) subjects were labeled HIV positive on Strategy 1 while only 3 (0.1%) actually came out to be positive on Strategy 2 and 3. In Quetta, 10 (1.0%) were found positive on Strategy 1 but only 3 (0.3%) were truly positive on ELISA. In Sibi 4 (1.1%) subjects were labeled as positive on rapid testing while 2 (0.57%) showed positive results on Strategy II and III. In Naseerabad, there were 5 (1.6%) subjects who were found to be positive on Strategy 1. Only one, (0.33%), showed persistent positive results on Strategy 2 and 3. In Zhob, 3 (1.2%) subjects had the label of HIV positive on rapid testing, while only 2 (0.8%) were truly positive on ELISA. In Kalat, only one (1%) subject had HIV positive result on Strategy 1. It later proved to be a false positive.

While summarizing, there were 48 (0.96%) subjects who were picked up as having HIV antibodies on Strategy 1 but only 11 (0.22%) were actually infected. Thirty seven (77%) subjects did not have the infection but were falsely labeled as HIV positive, as shown in Table.

DISCUSSION

The central issue is the high frequency of false positive tests for HIV infection. Current screening programs use a sequence of tests, starting with a rapid testing. Serum samples yielding positive results are subjected to more complicated and expensive confirmatory testing, typically with ELISA. A positive confirmatory test is considered evidence of HIV infection.

Bayes' rule allows us to calculate the probability that a person with positive tests is infected⁶. Imagine testing 100,000 people, among whom the prevalence of disease is 0.01 percent. Of the 100,000, 10 are infected: 99,990 are not. A combination of tests that is 100 percent sensitive will correctly identify all 10 who are infected. If the joint false positive rate is 0.005 percent, the tests will yield false positive results in 5 of the 99,990 people who are not infected. Thus, of the 15 positive results, 10 will come from people who are infected and 5 from people who are not infected, and the probability that infection is present in a patient with positive tests will be 67 percent. The joint false positive rate may rise if only single-stage testing is used; a false positive rate of 0.6 percent has been reported for single stage screening test.^{17,18}

The recommendation of using high sensitivity kits in blood banks bears the logic that it minimizes the possibility of false negative results. It is the necessity in blood banks to have screening kits of high sensitivity especially for HIV. But it is also mandatory that the kits used should have high specificity rate too. False negative test result is another important issue. Since tests that are negative during blood screening are not repeated, and the decision to declare a unit of blood suitable for transfusion is based on that single result.¹⁹

The study concluded with the result that the presently used kits in blood banks in public sector have high sensitivity but are not of very good specificity, resulting in high false positive screening results.

A blood bag containing whole blood or any blood component, which is discarded because of a screen positive result in any of the mandatory screening carries a substantial cost. The bag was procured, the blood group established, HBV, HCV and HIV screening was compulsory done, and components, if made, must have gone through extensive procedures. A lot of energy, time and cost were incorporated. Now if it was discarded because of a false positive result, the losses on just one bag can be evaluated and multiplied by the number the incidence happens each year in each blood bank in public sector. It creates other problems too; non- remunerated blood donors are the backbone of any blood transfusion service. HIV false positive screening results create a panic in this pool. The approach of the positive labeled donor for confirmation is natural and ethical. When the confirmation is contrary to the screening results there is a breach of confidence of the donors on the blood bank. The retention of blood donor in this scenario is difficult and the donor strength is lost significantly. The psychological stress to the particular donor, who suddenly hears that his donated blood has given reactivity to one of the screening tests and he is to see a physician for the next step, is self-explanatory.

It is not clear how many of the few infected persons identified would have transmitted the virus to their sexual partners and children, or that testing will substantially reduce the transmission rate.^{20,21,22,23,24,25} Screening blood donors prevents transmission because we do not transfuse the blood. As pretest counseling for HIV is not the rule in blood transfusion services, by no means all sero-positive persons are persuaded to practice "safer sex"^{26,27,28}. Apparently only a minority abstains from childbearing.²⁹

If we want to test each other, we should make a deliberate choice of the threshold probability of infection above which we will screen. We should make explicit the trade-offs implicit in any testing program. How many engagements should end to prevent one infection? How many jobs should be lost? How many insurance policies should be cancelled or denied? How many fetuses should be aborted and how many couples should remain childless to avert the birth of one child with AIDS?

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