The Importance of Laboratory Testing for the AIDS Virus: With Reference to Saudi Arabia

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Abstracts

For the developing country like Saudi Arabia, HIV infection is can be curse as because the society there is facing a taboo in the regard and the infected people generally do not accept that they are infected. In the rural areas the situation is even more problematic as the medical facilities are least available there and in some of the urban areas people are not willing to undergo the HIV testing. This present study will evaluate the scenario of HIV infection and detection of the same, this can be done only when long term and complete enumeration is done. This is not that easy in a country like KSA. This present study checks the situation and present the process of HIV testing. Study is based on secondary data and results are evaluated thereof.

Keywords: HIV infection, Testing of HIV, Saudi Arabia.

1. Introduction

HIV infection is something which is still a taboo for the society and the only method of confirming the same is laboratory testing, now in such a case it is require that the testing has to be accurate. The detection and confirmation of HIC is most important to the health of people, control of the same and even for the clinical management. In the last few years i.e., about 10-12 years the emergence of HIV infection became more sensitive in terms of laboratory testing in the developing countries like Saudi Arabia. Further, there have been substantial changes in the epidemiology of HIV in Saudi Arabia, in the context of contemporary biomedical treatment and prevention strategies.

KSA (Kingdom of Saudi Arabia) and international guidelines currently recommend early initiation of antiretroviral therapy (ART) regardless of CD4+ count. 3–5 In addition, over the past decade, many effective strategies to prevent HIV infection using antiretroviral drugs have been developed, including Treatment Pain-Based Prevention (TasP), Treatment-Based Prevention (TasP), Post-exposure prophylaxis (PEP) and preventive measures (PrEP). Therefore, ART is now widely used in people living with HIV (PLHIV) and in high-risk groups. The country has met the UNAIDS 2020 targets of 90% of people living with HIV being diagnosed, 90% of people diagnosed receiving antiretroviral therapy and 90% of people on antiretroviral therapy receiving antiretroviral therapy by 2020. However, the use of biomedical contraceptives and early ART creates new challenges for laboratory diagnosis of HIV, as use of ART (such as PrEP) during initial infection may alter the HIV immune system and the immune system, leading to increased infection and long-term seroconversion. Therefore, this review aims to provide new information on current issues related to HIV testing and confirmation, including: (1) new diagnostic tests and updated methods; and (3) recently updated guidelines and rules. In particular, recent changes to given guidelines provide an opportunity to harmonies national HIV testing.

Laboratory Testing of HIV:

HIV can be diagnosed with immunoassays that target the p24 antigen or HIV antibodies. HIV immunoassays are often described as “generation” tests, with multiple generations representing improved performance. The nomenclature has recently been updated to describe tests based on target analysis (IgG sensitivity, IgM sensitivity, antigen/antibody) and laboratory (laboratory or laboratory). In reputable laboratories, including Saudi Arabia, HIV testing is usually an antibody/antiviral (4th generation) sandwich test using chemiluminescence detection technology; Western blot (WB) (First generation) testing is the diagnostic standard now in use. A recent technological development, known as “fifth generation” testing, is the development of HIV antibodies that can detect and distinguish HIV-1 antibodies and high HIV-1 p24 antigen reactivity (BioPlex 2200 HIV Ag-Ab test; Biorad, France). The test has been available worldwide since 2015 but is not registered with the Saudi Registry of Therapeutic Goods (ARTG) and is therefore not available for treatment in Saudi Arabia.

Important advances in HIV testing have been the independence of HIV immunoassay testing from clinical laboratories and the rapid development of HIV testing. Rapid HIV testing can be categorized as point-of-care tests (PoCTs), which are administered by a healthcare worker in close proximity to the patient with a discussion or care session tests are defined as 18, while self-tests, are defined as tests . . intended for use by persons living in a home or similar facility. HIV PoCTs have been available in KSA since 2015, and HIV self-tests have been available since 2018. In addition to being available in a laboratory setting, these tests take 30 minutes or the It has the advantage of having a fast conversion rate of less than 10 and the ability to test large numbers of samples, including whole blood and cerebrospinal fluid.

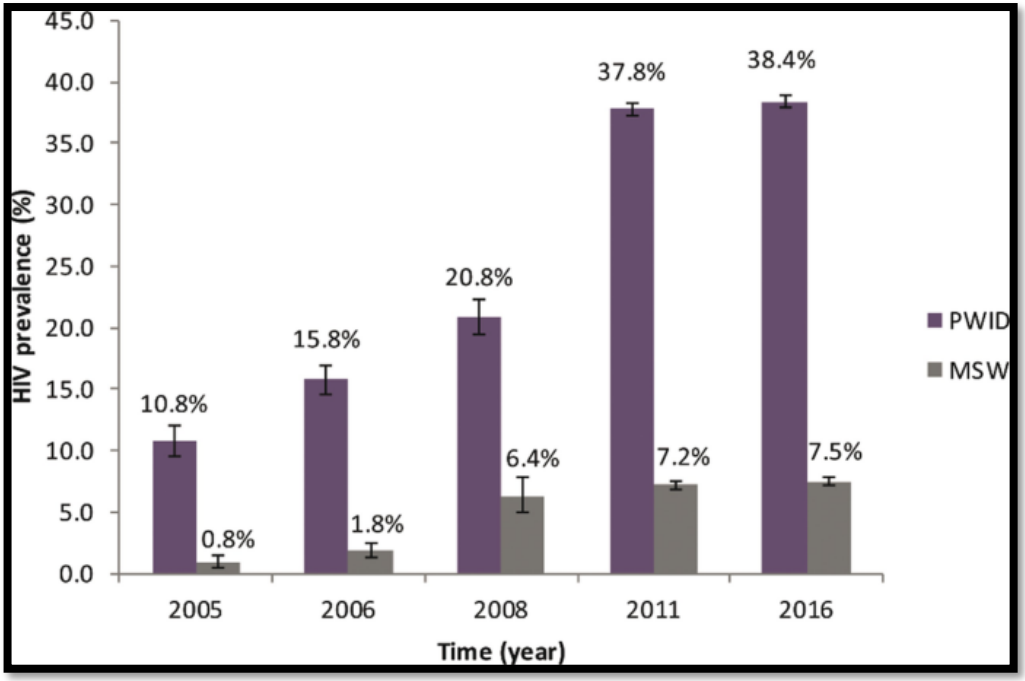
The rapid HIV tests available are lateral flow immunoassays. In brief, the patient specimen is added to a nitrocellulose strip and travels by capillary action toward a wicking pad at the opposite end of the strip which contains immobilized antigen to bind to patient antibodies (anti-HIV antibodies in the specimen are bound by immobilized HIV antigens in the test line, human immunoglobulin in the specimen is bound by immobilized anti-human antibodies in the control

line). Visual detection is achieved by the accumulation of protein a colloidal gold conjugate. Contemporary rapid HIV tests have demonstrated performance characteristics that are comparable to third-generation immunoassays. Although some HIV POCTS contain an HIV-1 p24 antigen detection component, these assays have reduced sensitivity compared to laboratory-based tests that detect HIV-1 p24 antigen. As such, a major limitation of these assays is the potential for false negative results in primary HIV infection, as the window period for these tests is longer than commonly used fourth generation laboratory-based tests in high income settings. It is also important to note that rapid HIV tests (POCTS or self-tests) are screening tests that require confirmation with diagnostic laboratory tests. Rapid HIV tests are one of a number of important developments in HIV testing that have significantly improved access to HIV testing in key populations. In particular, HIV POCTS have revolutionized HIV testing in resource-limited settings, where HIV diagnostic testing algorithms that incorporate a combination of two or three rapid tests.

Epidemiology and the prevalence of HIV infection in the Kingdom of Saudi Arabia:

The first cases of HIV were reported in the early 1980s, indicating that the reporting of the disease in the kingdom has been inadequate. Until 2004, the main source of information about the prevalence of HIV in the KSA was the UN-Aids annual report. Since 2011, the Saudi Ministry of Health (MOH) started releasing annual aids reports, which have greatly enhanced the accuracy and reliability of data collection and reporting. Table 1 provides an overview of the epidemiology and prevalence of HIV studies conducted since the first reported case in 1985. There was a noticeable absence of reported studies and interest between 1985 and 2004. In 2004, the first two studies that examined the prevalence of HIV in particular regions of KSA were conducted. A total of 410 people were diagnosed with HIV. A subsequent, more comprehensive study reported 85 cases of hiv infection in the kingdom of Saudi Arabia. In 2005, an additional survey was conducted to gather more data on hiv-1 infections, and the results revealed a consistent increase in cases, with a total of 7807 infections, with only 1743 of them being Saudi nationals. The majority of infected individuals were expatriates from Africa and Asia who resided in the western province of KSA, particularly in the cities of Jeddah and Mecca. A study conducted at KFSHRC between 1989 and 2010, involving 602 individuals infected with HIV-1, found that a significant number of patients were diagnosed with aids during their initial evaluation. The study found a rising trend in HIV infections compared to developing nations.

The first Global AIDS Response Progress Report (GARP) was released in 2010 by the National AIDS Program Manager for the KSA. It reported an increase of up to 10 % in new HIV-1 infections annually. However, the report highlighted a low HIV-1 prevalence, with approximately 1.5 new infections per 100,000 annually among Saudis and 12.5 per 10,000 among non-Saudis. From 1984 to the first reported HIV tests in 2013, 20,539 cases were reported, 5890 (28.7 %) in Saudi and 14,649 (71.3 %) in non-Saudi citizens. The majority of non-national HIV cases were amongst those with a higher opportunity for testing, including those tested for work permits (iqama, 34%), foreigners with suspected HIV (23 %), and prisoners (17 %).



Source: Mumtaz et al (2021)

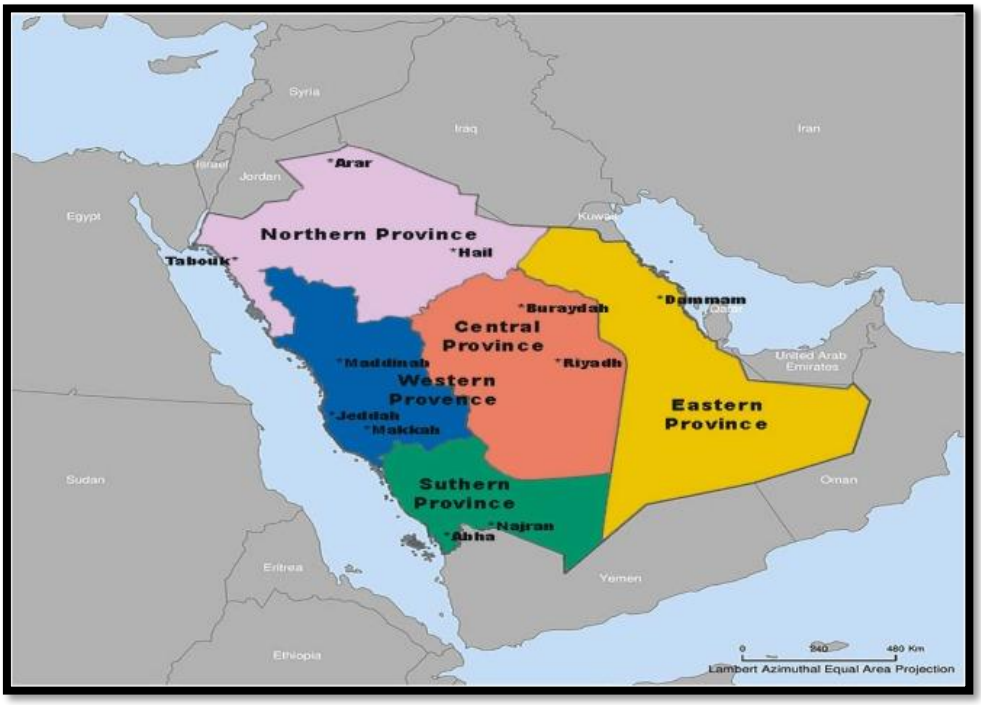
Figure 1: Record of HIV cases in KSA

There is limited information available regarding pediatric HIV cases in the Middle East and Gulf region. Only one Saudi Arabian study provides information on the range, features, and results of hiv infection in children. This research was conducted prior to the implementation of preventive measures like ARV prophylaxis, cesarean delivery, and abstaining from breastfeeding. Between the years 1986 and 2003, a total of 63 children who were either infected or exposed to HIV-1 were treated at KFSHRC. The source of infection could be attributed to either perinatal transmission (63.5% of cases) or the transfusion of contaminated blood or blood products (34.5% of cases). Furthermore, 90% of children who were infected with the virus were born naturally, while the remaining 10% were delivered through cesarean section. The majority (93 %) of infants who contracted the infection were breastfed during their early years. All patients were given art or HAART at the start of 1997. Among the individuals who received HAART, 79% adhered to the treatment and maintained a viral load below the detectable level. Regrettably, 75% of patients who were diagnosed before 1995 passed away, while only 7.7% of those diagnosed after 1995 met the same fate.

Early screening programs for HIV in the Kingdom of Saudi Arabia:

Recognizing vulnerable groups is crucial for ensuring that therapy, disease prevention, and counseling are accessible to all. Unfortunately, the current system of identification and provision

is not functioning properly. According to reports from KSA, blood and blood products were the main source of HIV infections since there was no proper testing of imported blood at that time. In the eastern part of the country, a research study revealed that out of 134,599 people who were tested, 10 cases of HIV infection were found to have originated from blood and blood product transfusions.



Source: Maha Al-Mozaini et al (2023)

Figure 2: Screening and Detection of HIV in KSA

Table 1 provides a summary of the collected data. A single study aimed to assess the occurrence of HIV and other blood-borne viruses in Saudi blood donors by conducting nucleic acid testing on 400 blood samples that tested negative for HIV and viral hepatitis through serology. The study revealed that only 381 samples tested negative for HIV. When the testing was conducted, the prevalence of HIV in the KSA was low and the understanding of the virus was limited. As a result, blood donors were tested using serology, which was found to be sufficient for screening purposes.

Current Challenges:

Highly effective biomedical HIV prevention strategies that use ART to prevent HIV transmission have been established over the past decade. TasP is a public health strategy of initiating ART at

HIV diagnosis regardless of CD4+ count, to suppress viraemia and prevent sexual transmission. 43 Studies have demonstrated the risk of sexual transmission of HIV from a virally suppressed person to an uninfected partner is negligible. 7,44 PEP is a short course of ART to reduce the risk of HIV acquisition after a significant exposure event. There are no randomized controlled trials studying the efficacy of PEP, however a case control study found that PEP after percutaneous exposure to HIV-infected blood, reduced transmission by 81%. 45 PrEP involves use of ART either daily or around the time of potential HIV exposure to decrease the risk of HIV acquisition. PrEP is associated with reduced risk of HIV infection in diverse populations including MSM, transgender women, heterosexual males and females and people who inject drugs (PWID). 10 In a systematic review of randomized controlled trials and observational studies including over 18,000 participants, PrEP was associated with a 56% reduction of HIV infection compared to placebo or no PrEP, which improved to a 73% reduction in a subgroup of over 7,000 participants when adherence was 70%. Understanding the impact of the use of HIV PEP, PrEP and early ART on the laboratory diagnosis of HIV is therefore an increasingly important consideration. This can be investigated by reviewing the virological and immunological responses of breakthrough infections in taking PrEP and people commencing early ART during primary HIV infection.

2. Conclusion:

Increasing evidence suggests that biomedical HIV prevention strategies and early initiation of HIV-specific ART can delay long-term transmission and increase the percentage of undiagnosed patients with HIV-RNA at the time of seroconversion. Clinics should be aware of the impact of these interventions on HIV diagnosis and plan to evaluate the impact of future interventions, such as long-term ART PrEP models. Technological advances in testing are also changing the landscape of HIV testing, including the availability of more accurate tests that can: (1) detect HIV early in the course of infectious disease; (2) reduce turnaround time; the upcoming reform of the PHLN HIV testing facility in 2022 represents a review of the HIV testing system in KSA. This provides an opportunity to reform the national HIV testing system. Environmental HIV testing can be developed across all institutions and organizations, which will lead to improved implementation and standardization of HIV testing in KSA. Internationally, many countries have recently updated their national HIV testing algorithms to exclude the World Bank test. There is also increasing interest in using HIV NAAT for the diagnosis of HIV infection. More research is needed on this idea. Future studies should combine multiple observational and longitudinal studies to determine the true prevalence of HIV infection. Importantly, comparative evaluation of time to transition, impact on ART initiation and cost analysis of new HIV tests are needed to inform effective HIV testing strategies.

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