

## Review

# Some characteristics of the HIV epidemic in Morocco

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**SUMMARY** The first case of AIDS in Morocco was declared in 1986 and since then the number of AIDS cases has steadily increased. According to the Ministry of Health, the cumulative number of AIDS cases in December 2002 was 1085. HIV in Morocco is acquired mainly through heterosexual intercourse. Individuals aged between 30 and 39 years and in the regions of Marrakech and Agadir have been the most affected. Monitoring of the trend of the epidemic by sentinel surveillance surveys indicates that Morocco is still a low prevalence zone, since prevalence among pregnant women is less than 1%. The estimated number of HIV-infected people in Morocco is around 15 000. It is not clear why the epidemic here has not evolved as it has in the sub-Saharan countries where it is spreading at an alarming rate. Late introduction of HIV-1 subtype B in Morocco, which is relatively less transmissible, circumcision and reduced risk behaviours of Muslims may explain this. Nonetheless, because prevalence has increased in recent years, unless preventive measures are strengthened, the HIV epidemic will worsen in Morocco.

## Introduction

The HIV/AIDS pandemic is a threat to humanity. According to the July 2002 report of the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization (WHO), approximately 62 million people have been infected with the HIV virus since the onset of the epidemic. Among them, more than 20 million have died and approximately 42 million are living with HIV/AIDS [1]. As a result, the epidemic has been disastrous to demography, economy and development especially in Africa, which has more than 70% of the HIV/AIDS cases [1]. The rate of spread of the virus in sub-Saharan countries is the highest in the world. In contrast, the HIV epi-

demic has been less widespread in North African countries [1]. Epidemiological data are generally scarce for this region of the African continent but the HIV epidemic in Morocco is the perhaps the most thoroughly studied among the North African countries.

This article is a review of data compiled about the HIV epidemic in Morocco.

## Epidemiological data on HIV/AIDS in Morocco

### Officially recorded HIV/AIDS cases

The first case of AIDS in Morocco was recorded in 1986 and, from then until December 2002, the cumulative number of

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AIDS cases was 1316 cases (Dr H. Khattabi, personal communication, 2004). The regions of Agadir and Marrakech had 34% of these AIDS cases; Casablanca and Rabat had 17% and 12% respectively. Heterosexuality was the main route of transmission for 77% of cases (Dr H. Khattabi, personal communication, 2004). Women have become more vulnerable to HIV/AIDS as the male-female sex ratio was 5.2 from 1986-1990 and 1.5 from 1996-2001 (Dr H. Khattabi, personal communication, 2004). Of the AIDS cases recorded, 95% were Moroccan, 97% of whom were Moroccan residents (Dr H. Khattabi, personal communication, 2004).

#### **HIV/AIDS data for a population at risk**

In a previous study, we analysed 12 981 samples of patients at risk for HIV/AIDS who were tested for HIV serology from 1991-1999 at the National Centre of Diagnosis and for follow-up of HIV infection at the National Institute of Hygiene [2]. People at risk for HIV/AIDS were those who had symptoms that evoked HIV/AIDS or who reported risky behaviours such as unprotected sex. The overall rate of HIV positivity in the population at risk for HIV/AIDS was 5% (655/12 981) [2]. An increase in the HIV positivity rate from approximately 5% for 1991-1998 to 8% in 1999 was noticed [2]. This rise in the HIV positivity rate might be due to an increase in HIV testing or an increase in HIV prevalence.

Among HIV positive patients, 72% were heterosexual, 11% used intravenous drugs, 7% were homosexual and 5% were bisexual. Vertical transmission and transmission by transfusion accounted for 4.63% and 0.62% of cases. The ratio of males to females was 1.6%. Of the HIV positive patients, 93% were Moroccan, 6%

were foreigners and 1% were Moroccan immigrants, who were residing in Europe and tested in our laboratory during their vacation in Morocco [2]. Among individuals at risk for HIV/AIDS who were tested for HIV, more than 70% of the HIV positive cases had symptoms suggesting advanced stages of the infection [2]. Such late diagnosis limits appropriate management of the infection. Furthermore, infected individuals who are unaware of their seropositivity can infect other persons, thus contributing to the spread of the virus. The reasons for such late diagnosis are unknown, although perhaps some people ignore risks and symptoms.

#### **Data from the sentinel surveillance system**

Collecting HIV infection prevalence data, for example, is useful in the implementation and the adjustment of preventive strategies. Likewise, it is important to identify areas that might constitute the epicentre of the epidemic. Within this framework, a national sentinel surveillance network has been in place since 1993 [3,4].

As recommended by the World Health Organization (WHO), sentinel surveillance is a powerful tool in monitoring the HIV epidemic. The goal of surveillance is to determine prevalence and follow its trend over time in a given region and within a defined population. It allows appropriate management of resources to fight the epidemic.

The Ministry of Health has progressively developed its sentinel surveillance system to reach regions where HIV/AIDS risks occur. Studied groups include pregnant women, patients presenting with sexually transmitted infections (STIs) and people with tuberculosis. Among pregnant women, overall HIV prevalence was 0.04% (11/28 676) between 1993 and 1999 and

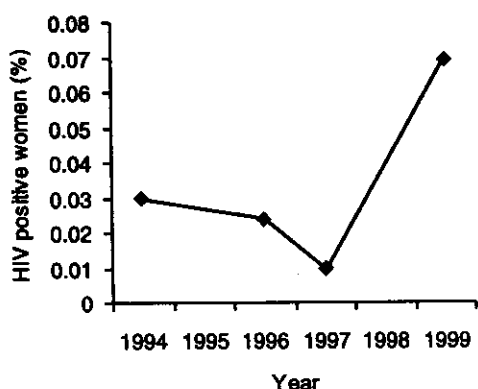


Figure 1 HIV infection among pregnant women in Morocco from 1994–1999 (data were not collected in 1995 and 1998)

varied from 0.02% in 1993 to 0.08% in 1999 (Figure 1) [3]. In 2002, the prevalence reached 0.12%. This indicated that Morocco was a low HIV epidemic zone as HIV prevalence among pregnant women was less than 1% [3–6]. On this basis the estimated number of HIV infected individuals is approximately 15 000 cases. In Agadir and neighbouring regions, HIV prevalence among pregnant women was nearly 1% in 2002. The data also indicated that the epidemic in this area was evolving from low HIV prevalence towards a concentrated epidemic according to WHO epidemic grade classification. As the system of surveillance expands to other sites and to other groups such as prostitutes, the monitoring of the trend will give a clearer picture of the epidemic of HIV/AIDS in Morocco.

### HIV diversity in Morocco

HIV variability analysis is important for many reasons. HIV variation may impact the natural history of infection, diagnosis, follow-up and treatment [7]. HIV-2 infection, for example, evolves more slowly and

is less transmissible than HIV-1 infection [8]. Variability may also affect the reliability of HIV testing: the HIV group 'O', for example, is undetectable by some reagents used in the screening of anti-HIV antibodies [9]. Some diagnostic reagents may even miss some subtypes of HIV-1 [10]. As for treatment, HIV-2 is resistant to non-nucleoside transcriptase reverse inhibitors. Most importantly, the study of HIV variability is crucial for preparing a broad protective vaccine against the virus [7].

In a previous study we have shown that HIV-1 virus predominates in Morocco [5,6]. Thus far, our laboratory has identified only 2 cases of HIV-2 (1 male and 1 female). These 2 cases originated in Casablanca. One (a woman who was married to a Moroccan migrant in Europe) was diagnosed in 1994 [11]. The other (a student from Congo living in Morocco from 2001) was tested in 2002.

Morocco is located between sub-Saharan African countries and Europe. The patterns of HIV-1 subtypes are different in these regions. In Europe, HIV-1 subtype B predominates with low frequency of other subtypes such as A, C, D, E, F and G, whereas HIV-1 subtypes C, A, D, CRF\_02A/G and subtype E predominate in sub-Saharan countries [7]. Within this framework, 200 Moroccan HIV-1 positive samples were investigated. The results showed that 93.5% were HIV-1 subtype B, 1.0% subtype A and 0.5% subtype F [12], suggesting that the HIV-1 subtype B is predominant in Morocco. This is more similar to Europe and the United States of America than to sub-Saharan countries. Another study of 14 samples in Morocco identified 11 subtype B and 3 subtype A samples [13] which also suggests that HIV-1 subtype B is predominant in Morocco, although subtype A was more common than in our study. This might have been because the samples were diagnosed in Casablanca

only, whereas our samples were collected from different regions of Morocco; perhaps HIV subtype A is more prevalent in Casablanca.

There are no data on HIV diversity in the other countries of North Africa, except for Tunisia. In Tunisia, in a study of 21 HIV-1 positive samples, 20 samples were subtype B and 1 sample was CRF02\_AG [14]. Our results and the results of the Tunisian study indicate that HIV-1 subtype B predominates in North African countries. This is not surprising since cultural and economic relationships, especially tourism and migration, are more developed between these countries and Europe than between Europe and sub-Saharan countries. Other studies to further characterize HIV diversity in North Africa are needed.

### **Why hasn't HIV in Morocco spread as it has in sub-Saharan countries?**

HIV sentinel surveillance surveys have shown that Morocco is still a low HIV epidemic zone, because HIV affects less than 1% of pregnant women [2]. It is unclear why the HIV epidemic has not evolved as it has in sub-Saharan Africa. We hypothesized that a natural resistance through a mutation in the co-receptor of HIV-1, CCR5, exists in Morocco and thus affects the spread of the virus. In fact, CCR5 is the main co-receptor used by the HIV-1 virus to infect target cells. Studies have reported that a defect (deletion of 32 nucleotides) within the gene encoding the CCR5 co-receptor may confer resistance to infection when this mutation is homozygous [15]. Furthermore, the heterozygous state for this deletion may delay progression to the end stage of infection [16]. In this context, we analysed polymorphisms of the CCR5 gene in 167 samples from Moroccan indi-

viduals. The results demonstrated that the frequency of this mutation was low and it does not exceed 1.5% [17]. Therefore, resistance in the Moroccan population through this deletion was ruled out.

This has led us to consider other explanations of the epidemiology of HIV/AIDS in our country. Circumcision is routinely performed on male children in Morocco and may reduce the risk of acquiring the HIV virus. It has been reported that circumcision is associated with a reduced risk of HIV transmission [18]. The most conclusive study was in Uganda on discordant couples, i.e. women infected with HIV whose husbands were not. The study of 50 circumcised and 137 uncircumcised males for 30 months revealed no HIV infection among circumcised males and 40 cases of HIV acquisition among uncircumcised males [19]. In fact, the prepuce is very fragile and is easily injured during sexual intercourse. It can also trap microorganisms including causative agents of STDs that cause genital ulcerations and consequently increase the chances of HIV acquisition [20]. Circumcision leads to a keratinized layer surrounding the epithelium of the gland that is more resistant to STDs and ulceration. In this context, circumcision has been performed in some countries as a preventive measure to reduce the spread of HIV [21]. In Morocco, risky behaviours that expose to people to HIV infection, such as prostitution and homosexuality, do exist and it may be that circumcision limits HIV dissemination.

Another factor that should be taken into account is the nature of HIV-1 subtype, which is HIV-1 subtype B in Morocco [12,13]. It has been reported that HIV-1 subtypes C and E are spreading at an alarming rate [24]. Subtype C, which is the most prevalent in the world, is rapidly disseminating throughout sub-Saharan Africa. Subtype E is also spreading in Thailand, In-

dia and sub-Saharan Africa. HIV-1 subtype B, however, is less transmissible than the other subtypes [22–24].

Muslim behaviour may influence the slow spread of HIV in Morocco. Precepts of Islam forbid risky behaviours such as homosexuality, drug use and sexual intercourse outside marriage. In addition, anal intercourse and sexual intercourse during menstruation are prohibited even for married couples [25]. Observance of these behaviours would certainly reduce dissemination of HIV virus. However, these teachings are not always observed.

### National response to HIV/AIDS

With the identification of the first case of HIV/AIDS in Morocco in 1986, the Ministry of Health established a national plan to fight AIDS. Its main objective was to control the spread of HIV/AIDS in the general population. Its emphasis was on preventive programmes that alerted people to the devastating epidemic and changed behaviours that expose them to the virus. In parallel, HIV diagnosis and follow-up were encouraged. In this context, a process of HIV testing at the national level was adopted; this strategy has currently been implemented in 13 provincial laboratories (Figure 2).

The Moroccan strategy in HIV serological testing is based on screening for antibodies to HIV and confirming HIV infection by the Western blot test. Biological follow-up consists of CD4 cell counts by flow cytometry and quantification of the plasma viral load by polymerase chain reaction (PCR). Decentralization of CD4 cell count technology to provincial laboratories is underway; however, only the referral centre in Rabat has the facility to measure viral load [26]. Resistance testing will be available soon in the referral centre in Rabat.

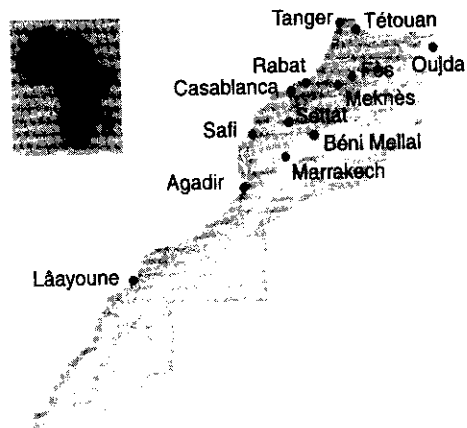


Figure 2 Map of Morocco showing 13 laboratories that function as HIV diagnostic centres and sentinel sites

The Ministry of Health has also implemented systematic HIV screening in blood centres so as to ensure the safety of blood for blood transfusions. Currently there are 45 centres that perform HIV screening of blood donations [26].

Management of STIs, which facilitate HIV transmission, is a crucial part of the national preventive programme. In 1998, the Ministry of Health adopted the 'syndromic approach' based on the treatment of patients who have STIs. This strategy allows infected persons with STIs to benefit from treatment without the delays that can be caused by biological diagnosis [26].

An anti-retroviral (ARV) programme for infected individuals is an essential component in the response to the HIV/AIDS epidemic in Morocco. In 1998, tritherapy was introduced in Morocco [27]. People eligible for tritherapy include those with clinical AIDS, persons having CD4 cell counts of  $200 \times 10^6$  cells/L or less and those with CD4 cell counts of  $350 \times 10^6$  cells/L with

paucisymptoms. Tritherapy improves the quality of life of those who are infected and reduces morbidity and mortality [28]. Nevertheless, due to its cost, the treatment is not yet available to all eligible individuals. Efforts are being made to reduce ARV cost and consequently to allow easy access to antiretrovirals.

The Mother-to-Child Transmission of HIV Programme consists of the therapeutic management of infected pregnant women by antiretrovirals during pregnancy to avoid or, at least, to reduce vertical transmission. This is also a part of the national response to HIV/AIDS.

Health workers also benefit from HIV treatment in cases of professional exposure to HIV/AIDS.

The sentinel surveillance system as described earlier is an important tool in the management of the epidemic. It constitutes an essential component of our response to HIV/AIDS in Morocco, because it allows monitoring of the trend of the epidemic in order to adjust preventive strategies.

Nongovernmental organizations are participating in the fight against HIV/AIDS

in Morocco by raising awareness of the dangers of the infection. These organizations encourage behaviour changes and recommend to people at risk for HIV/AIDS that they be tested in free and anonymous screening centres. In this context, HIV voluntary counselling and testing is becoming available in many regions of Morocco.

The promotion and protection of human rights is another essential component in preventing transmission and reducing the impact of HIV/AIDS. Violations of human rights lead to vulnerability to HIV acquisition and dissemination.

The estimated cost of the programme to fight AIDS in Morocco between 2002 and 2004 is approximately 193 million Moroccan dirhams (US\$ 19 million) [26].

It is obvious that HIV prevalence in Morocco is low; however, this should not mislead us since an increase has been noticed in recent years. Measures that limit the spread of HIV from high-risk groups to the general population must be implemented and adjusted to maximize control of the epidemic; otherwise, the situation may deteriorate and get out of control.

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