

Monitoring HIV through sentinel surveillance in Morocco

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رصد فيروس العوز المناعي البشري بالترصد المخفري sentinel في المغرب
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الخلاصة: تهدف هذه الدراسة لتحديد معدلات انتشار فيروس العوز المناعي البشري ورصد اتجاه العدوى به في مجموعات مختارة من جميع أنحاء المغرب من خلال عملية الترصد المخفري. وقد أجري الترصد المخفري لفيروس العوز المناعي البشري في خمس ولايات عام 1993، ثم وسع ليشمل عشر ولايات عام 1996، وقد أجري بواسطة عمليات اختبار مع إغفال الأسماء وعدم اعتبار الروابط، وتم تحليل المعطيات للسنوات 1993-1999، وقد كانت المجموعات المشمولة بالدراسة من المصابين بالأمراض المنقولة جنسياً ومراجعي العيادات والحوامل والمصابين بالسل الرئوي. وقد أوضحت النتائج أن المعدل العام للانتشار في كامل الفترة وفي عشرة ولايات بلغ 0.10% (45 من أصل 44 233). وكان المعدل في الدار البيضاء أكثر ارتفاعاً 0.39% (10 من أصل 2567). وقد ظهر لدى المصابين بالسل الرئوي أعلى معدل انتشار 0.36% (9 من أصل 2530). وتؤكد هذه المعطيات الافتراض بأن وباء فيروس العوز المناعي البشري يستدعي تعزيز الإجراءات الوقائية للحد من انتشاره بين عامة السكان.

ABSTRACT HIV sentinel surveillance was performed in five provinces of Morocco in 1993, expanded to 10 provinces in 1996. The activity was done by unlinked anonymous testing procedures. We analysed the data from 1993 to 1999. The groups studied were sexually transmitted infections, clinic attendees, pregnant women and patients with pulmonary tuberculosis. The results show that overall HIV prevalence rate over the whole period in 10 cities was 0.10% (45/44 233). Casablanca had a significantly high rate with 0.39% (10/2567). The patients with pulmonary tuberculosis displayed the highest prevalence with 0.36% (9/2530). These data confirm the assumption that the HIV epidemic is low in Morocco. However, the increase of HIV prevalence lately calls for reinforcing preventive measures to limit its spread.

Surveillance du VIH au Maroc par la surveillance sentinelle

RESUME La surveillance sentinelle du VIH a été effectuée dans cinq provinces du Maroc en 1993, puis étendue à 10 provinces en 1996. Cette activité a été réalisée à l'aide de procédures de test anonyme non corrélé. Nous avons analysé les données de 1993 à 1999. Les groupes étudiés étaient les personnes atteintes d'infections sexuellement transmissibles, les personnes consultant dans les dispensaires, les femmes enceintes et les patients atteints de tuberculose pulmonaire. Les résultats montrent que le taux de prévalence global dans 10 villes durant toute la période était de 0,10 % (45/44 233). Avec 0,39 % (10/2567), Casablanca avait un taux significativement plus élevé. Les patients atteints de tuberculose pulmonaire présentaient la prévalence la plus élevée avec 0,36 % (9/2530). Ces données confirment l'hypothèse selon laquelle l'épidémie de VIH au Maroc est limitée. Toutefois, la récente augmentation de la prévalence du VIH nécessite un renforcement des mesures préventives afin de limiter sa propagation dans la population générale.

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Introduction

The HIV epidemic represents a serious world-wide challenge. Consequently, many tools have been developed throughout the world to survey the spread of this infection. An HIV sentinel surveillance programme is such a tool. This epidemiological approach consists of analysing the prevalence and monitoring the trend of HIV infection over time and place in selected groups in a given population. The data obtained are of great value for assessing the impact of the strategies already implemented as well as elaborating more efficient policies to limit the spread of the HIV virus [1-5].

Morocco, by its geographical location, which is between Europe and sub-Saharan Africa, is exposed to HIV infection. Until 1993, except for HIV prevalence in blood donors, there were no data on incidence or prevalence in the Moroccan population. Such information is crucial for planning and assessing the preventive measures. In this context, the Moroccan Ministry of Health has established a network of sentinel surveillance in order to assess the HIV prevalence and to monitor its trend in targeted groups in many regions of Morocco. The sites were created in cities according to their population size, the existence of risk for HIV infection and local infrastructure. This HIV sentinel surveillance network was set up in the following sequence.

In 1993, HIV sentinel surveillance was established. The activity was restricted to five sites created in the cities of Agadir, Marrakech and Tangier (main tourist areas in the south and the north of Morocco respectively), Rabat (the capital), Casablanca (the largest city). The group of patients attending primary health care centres for sexually transmitted infections

(STI) was the only one studied. In 1994, the HIV sentinel surveillance activity was expanded to another group: pregnant women (PW) who attend antenatal care units. In 1996, this activity was extended by adding five sites in cities of Oujda (eastern Morocco), Tétouan (north Morocco), Fés, Meknès and Safi (central Morocco). Meanwhile a third group was added: patients suffering from pulmonary tuberculosis (PTB). From this date, the sentinel surveillance became an ongoing activity, carried out in the 10 sites each spring, except for 1998 due to logistic difficulties.

Every year, intensive training takes place before the process started so as to train all the personnel involved in the HIV sentinel surveillance activities. After each round, the results are collected, analysed and disseminated in a national meeting. In addition, each site receives feedback information.

Methods

The Laboratory of Immunology and Virology at the National Institute of Hygiene in Rabat is a national reference centre for HIV diagnosis and follow-up which was created by the Moroccan Ministry of Health in 1991. The programme of HIV sentinel surveillance begins each spring from 21 March till 21 June in all sites. The samples are collected from all patients attending for the STI, PW and PTB clinics during this period. The sera are tested in an anonymous unlinked procedure. Any data that might identify the patients are removed. Only age, group, sex and site number are recorded.

From 1993 up to 1996, all the samples collected in sentinel sites were shipped to the national reference centre for diagnosis and follow-up of HIV. Sera are tested by

ELISA (Genelavia Mixt, Sanofi, France) and by particle agglutination test (PAT) (Serodia HIV, Fujerebio, Japan).

From 1997 to 1999 samples were tested in the provincial laboratory in each site by ELISA (Genescreen HIV1+2, Sanofi, France) and by PAT (Serodia HIV, Fujerebio, Japan). Only positives and equivocal sera are sent to the national reference centre for diagnosis and follow-up of HIV, to be confirmed. All positive and equivocal sera in screening are tested by western blot (Newlav Blot, Sanofi, France). The western blot is interpreted according to WHO criteria. [6]. Statistical analysis were performed by computer. The confidence interval at 95% was given for each HIV prevalence. In addition a chisquared test for linear trend was performed using *Epi-Info*. The rise is considered significant if $P < 0.05$.

Results

Table 1 shows the level of HIV infection over time in urban sentinel sites of Morocco.

The results show that overall prevalence rate over the whole period in 10 cities was 0.10% (45/44 233). Casablanca, the largest city in Morocco, had a significantly high rate with 0.39% (10/2567). The HIV rate was 0.24% (5/2054) in Agadir. However due to technical problems, HIV sentinel surveillance was cancelled in 1999 in this site. In the other cities, the HIV rate did not exceed 0.16%.

With respect to the HIV trend in groups, combining the result of all sites (Figure 1), HIV prevalence in STI was around 0.10% from 1993 to 1996, then rose in 1997 to reach 0.25% and stabilized in 1999. There is no significant increase in the global trend ($P = 0.17$). Among pregnant women, the

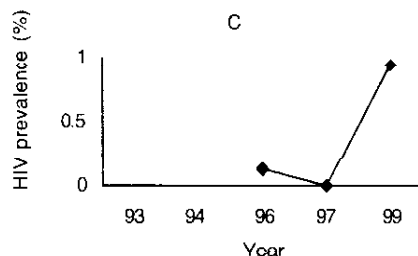
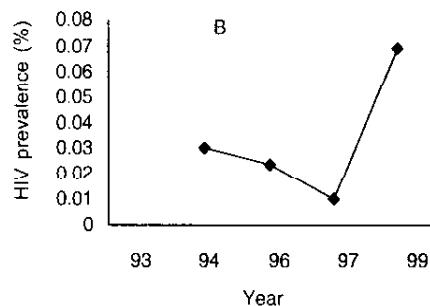
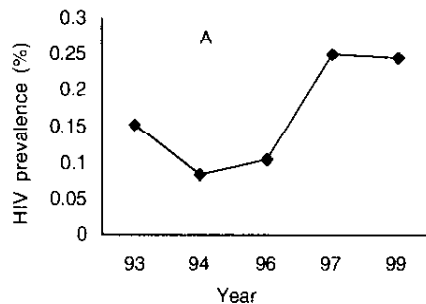


Figure 1 HIV trends in 10 HIV sentinel sites in Morocco from 1993 to 1999 in the following groups: sexually transmitted infections (A), pregnant women (B) and pulmonary tuberculosis (C)

Table 1 HIV prevalence in percentage in 10 sentinel sites in Morocco, 1993 – 1999

Sentinel sites	Sexually transmitted infections		Pregnant women		Pulmonary tuberculosis	
	No. tested	% HIV positive	No. tested	% HIV positive	No. tested	% HIV positive
<i>Targier</i>						
1993	283	0.35	—	—	—	—
1994	137	0.00	865	0.11	—	—
1996	368	0.00	688	0.00	—	—
1997	282	0.35	518	0.00	—	—
1999	431	0.46	704	0.14	138	0.72
<i>Rabat</i>						
1993	197	0.00	—	—	—	—
1994	453	0.22	1245	0.00	—	—
1996	385	0.00	1256	0.00	314	0.00
1997	425	0.23	1180	0.09	284	0.00
1999	829	0.12	1633	0.12	246	0.00
<i>Casablanca</i>						
1993	125	0.00	—	—	—	—
1994	168	0.00	207	0.00	—	—
1996	132	0.00	348	0.00	100	0.00
1997	113	0.88	549	0.00	60	0.00
1999	145	1.34	543	0.74	72	4.17
<i>Agadir</i>						
1993	404	0.25	—	—	—	—
1994	201	0.00	447	0.00	—	—
1996	267	0.75	489	0.20	—	—
1997	104	0.96	142	0.00	—	—

Marrakech												
1993	294	0.00	0.00-1.25	-	-	-	-	-	-	-	-	-
1994	231	0.00	0.00-1.58	532	0.00	0.03-0.69	-	-	-	-	-	-
1996	101	0.99	0.02-5.39	716	0.00	0.00-0.51	-	-	-	-	-	-
1997	62	1.62	0.04-8.66	230	0.00	0.00-1.59	-	-	-	-	-	-
1999	785	0.25	0.03-0.92	646	0.00	0.00-0.57	62	3.22	0.39-11.17	0.00	0.00	0.00-3.18
Tétouan												
1996	525	0.00	0.00-0.70	1054	0.00	0.00-0.35	114	0.00	0.00-3.18	0.00	0.00	0.00-2.24
1997	300	0.67	0.08-2.39	862	0.00	0.00-0.43	163	0.00	0.00-2.24	0.00	0.00	0.14-4.21
1999	776	0.26	0.03-9.28	1107	0.00	0.00-0.33	169	1.18	0.14-4.21	0.00	0.00	0.00-10.00
Oujda												
1996	160	0.00	0.00-2.28	1011	0.10	0.0-0.55	-	-	-	-	-	-
1997	135	0.74	0.02-4.06	587	0.00	0.0-0.63	-	-	-	-	-	-
1999	207	0.00	0.00-1.77	1031	0.00	0.0-0.36	35	0.00	0.00-10.00	0.00	0.00	0.00-10.00
Saïf												
1996	393	0.00	0.00-0.93	719	0.00	0.00-0.51	-	-	-	-	-	-
1997	532	0.00	0.00-0.69	719	0.00	0.00-0.51	72	0.00	0.00-4.99	0.00	0.00	0.00-14.25
1999	503	0.40	0.04-1.43	763	0.00	0.00-0.48	24	0.00	0.00-14.25	0.00	0.00	0.00-4.15
Fès												
1996	146	0.00	0.00-2.49	1527	0.00	0.00-0.24	87	0.00	0.00-4.15	0.00	0.00	0.00-9.02
1997	263	0.00	0.00-1.39	1273	0.00	0.00-0.29	39	0.00	0.00-9.02	0.00	0.00	0.00-4.56
1999	253	0.00	0.00-1.45	2101	0.00	0.00-0.17	79	0.00	0.00-4.56	0.00	0.00	0.00-12.77
Méknès												
1996	366	0.00	0.00-1.00	340	0.00	0.00-1.08	189	0.53	0.0-2.91	0.00	0.00	0.00-1.43
1997	990	0.00	0.00-0.37	1057	0.00	0.00-0.35	256	0.00	0.00-1.43	0.00	0.00	0.00-12.77
1999	550	0.00	0.00-0.67	1607	0.00	0.00-0.23	27	0.00	0.00-12.77	0.00	0.00	0.00-12.77

CI = 95% confidence interval.

- indicates that the sentinel surveillance is not yet established.

HIV rate was about 0.02% from 1994 to 1996, then decreased in 1997 to 0.01% and rose in 1999 to 0.07%. But the global trend did not show a significant rise ($P = 0.16$). Among PTB, the overall HIV prevalence was 0.36% (9/2530).

The HIV prevalence was 0.12% in 1996, then 0 in 1997. It was 0.94% in 1999. There is a significant increase in the global trend ($P < 0.05$). All HIV-positive cases confirmed in the surveys are HIV-1.

Discussion

An HIV sentinel surveillance programme is a useful tool for tracking the trend of HIV infection over time in groups of a given population. In this study we have reported data on HIV infection rate as well as the trend in urban sentinel sites throughout Morocco from 1993 to 1999. The results show that the HIV prevalence remains low, below 1%. On the other hand the HIV infection slightly increased over the last two years of the study.

Casablanca, the largest city in Morocco displayed the highest rate of HIV prevalence with 0.1% (10/2567). It should be noted that 90% of HIV cases were recorded in 1999. This could mean the start of a serious epidemic in Casablanca. On the other hand, it may be just an isolated case and monitoring the epidemic by the mean of sentinel surveillance system over time will give the right explanation of this situation. Figure 1 shows the trend of HIV infection stratified by target groups. The sharp increase seen in Figures 1b and 1c is due to the rise of HIV cases observed in Casablanca in 1999. The analysis of trend at present time seems to be misleading since we have just some cases detected here and there. Over more time the measure of trend through this sentinel surveillance system will be of great interest.

In the STI group the prevalence did not exceed 0.25%. There are no data available for the neighbouring north African countries.

STI continues to be a health problem in Morocco. According to the Ministry of Health, the number of notified STI cases was 276 750 in 1999. However because of underreporting, the real magnitude of these infections is estimated at 600 000 cases a year [8]. This situation represents a favourable basis for HIV infection. Indeed, many studies have shown that STIs facilitate and boost efficiently the transmission of the HIV virus. Furthermore, it has been reported that the treatment of STIs not only reduces their transmission but also decreases the likelihood transmission of HIV [9,10]. To affect STIs and therefore HIV, Moroccan health officials decided to adopt the symptomatic management of STIs. This strategy is intended to manage STI patients without requiring laboratory tests, which are costly and time-consuming in many developing countries with poor or limited resources. In other words the diagnosis and treatment of attendees are made on basis of their symptoms [11]. As a result, they are managed at the first consultation. In Morocco two studies have shown a huge deficiency in managing STIs. The need for a new approach to make rapid and effective management widely available was underscored [12,13]. In Morocco, this strategy has been implemented since 1998. Studies to assess its relevance in managing STIs are under way.

Even the highest HIV prevalence in pregnant women observed in these surveys remains low [14,15]. On the other hand, the data reported suggest that HIV is spreading in the country, above all in the last two years of the study, which means that the epidemic is gaining ground in the general population.

The pulmonary tuberculosis group seems to be a high-risk group since the HIV rate was 0.36% (9/2530). However the trend needs to be monitored over more time. The association between *Mycobacterium tuberculosis* and HIV has been intensively studied in many African and European countries. It is known that HIV-infected persons have a great risk of reactivation of latent tuberculosis. Furthermore, there is a predisposition to rapid progression in recent exogenous infection. Consequently, the frequency of tuberculosis in HIV patients rises with the advance of immunodeficiency [16].

Tuberculosis is the most frequent AIDS-defining disease, not only in African countries but also in Europe. The overlap of the two epidemics is problematic. If the HIV epidemic has reversed the decline in tuberculosis incidence over the past decade, tuberculosis has contributed to the rapid emergence of AIDS. In many African countries, tuberculosis is the leading cause of morbidity and mortality among HIV-infected people. It is recommended that programmes for fighting the two epidemics should be developed and strengthened in close collaboration, with a priority on curing tuberculosis [17-19].

With respect to geography, Casablanca is the most affected by HIV infection, followed by Agadir and Marrakech, tourist cities in the south of Morocco.

All the HIV positive cases were HIV-1. There was no case of HIV-2. We have shown in a previous study that the HIV pattern occurring in Morocco is made up of 93.5% subtype B, 1% subtype A and 0.5% subtype F. This HIV subtype profile is similar to the European one rather than the African one [20].

An HIV sentinel surveillance process is of great value for determining the HIV

prevalence and trend in a given population. Its cost is low and allows recruiting the maximum number of patients by minimizing the participation and selection biases. However it has some disadvantages. The change in the composition of the population may affect the result [21]. Furthermore it is impossible to follow-up the HIV-positive individuals. Despite these drawbacks, the information provided is sufficient to assess the outcome of the strategies used as well as to target and prioritize groups and regions in need of preventive intervention.

Until now, these surveys have been carried out in urban sentinel sites. There is no rural site. Because of limited resources, the health care system remains very poor in these settings. Despite these financial difficulties, rural sites will be created. The 2000 HIV sentinel surveillance includes for the first time a semi-urban site in a region near Marrakech. This site and others will give valuable data on HIV infection in rural Morocco.

As stated above, HIV incidence in Morocco is low. It is not fully understood why HIV prevalence is still low despite the occurrence of high-risk behaviours. For instance, prostitution, even though legally forbidden, exists throughout the country.

Since it was reported that a deletion within the CCR5 gene that encodes for the main HIV-1 coreceptor might confer protection to persons who are exposed to this infection [22]; we have investigated the possibility of such natural resistance through CCR5 gene defect in the Moroccan population. As a matter of fact this speculation was ruled out, since we had found that the frequency of this mutation in Moroccans did not exceed 1.5% [23].

Circumcision, which is systematically performed on male children before the age of 7 years old, as a Muslim practice in

Morocco, may play a role in reducing the rate of transmission. To explain the low prevalence in regions where HIV and risk behaviour cohabit, many authors have reported a strong association between circumcision and HIV protection [24]. It has been suggested that ulcers caused by STIs in the intact foreskin drive the HIV infection [25].

Furthermore the relatively recent introduction of HIV into Morocco, as stated above, could account for this low level of propagation of the epidemic.

The present work confirms the assumption that the HIV infection in Morocco is low. Nevertheless it witnesses its

spread among the general population. It is still time to act so as to slow its course.

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References

1. Wendler I et al. Seroepidemiology of human immunodeficiency virus in Africa. *British medical journal*, 1986, 293:782-5.
2. Mertnes TE et al. Global estimates and epidemiology of HIV infections and AIDS. *AIDS*, 1994, 8 (suppl.): S361-S372.
3. WHO Global Programme on AIDS. *Field guidelines for HIV Sentinel surveillance: a manual for national AIDS control programmes*. Geneva, World Health Organization, 1989.
4. *The HIV/AIDS pandemic: 1993 overview*. Geneva, World Health Organization, 1993.
5. N'gaby B, Bertozzi S, Ryder RW. Obstacles in the optimal management of HIV infections/AIDS in Africa. *Journal of acquired immune deficiency syndrome*, 1990, 3:430-7.
6. World Health Organization. Proposed WHO criteria for the interpretation of western blot for HIV-1, HIV-2 and HTLV1/HTLV2. *Weekly epidemiological record*. 1990, 65:281-3.
7. Borgoff M et al. Sentinel surveillance for HIV-1 infection: how representative are blood donors, outpatients with fever, anemia, or sexually transmitted diseases, antenatal clinic attenders in Mwanza Region, Tanzania? *AIDS*, 1993, 4: 567-72.
8. Programme national de Lutte contre les IST/SIDA. *La prise en charge syndromique des infections sexuellement transmissibles. Guide du prestataire*. Direction de l'Epidémiologie et de Lutte contre les Maladies, Ministère de la Santé, Maroc, 1999.
9. Hoffman I et al. *Effects of urethritis therapy on the concentration of HIV1 in seminal plasma*. Paper presented at the Eleventh International Conference on AIDS, Vancouver. July 1996 [abstract M0.C. 903].
10. Grosskurth H et al. Impact of improved treatment of sexually transmitted disease

- ses on HIV infection in rural Tanzania: randomised controlled trial. *Lancet*, 1995, 346:530-6.
11. Mayaud P, Ka-Gina G, Grosskurth H. Effectiveness, impact and cost of syndromic management of sexually transmitted diseases in Tanzania. *International journal of STD & AIDS*, 1998, 9 (supp.1):11-14.
 12. Zidouh A et al. *Baseline evaluation of the quality of care for sexually transmitted diseases in Morocco by expanded PI 6 and PI 7*. Paper presented at the Twelfth World AIDS Conference, Geneva, Switzerland 28 June to 3 July, 1998 [Abstract N33 226].
 13. Zidouh A et al. *Evaluation of quality of sexually transmitted diseases STDs case management in Morocco*. Paper presented at the Twelfth World AIDS Conference, Geneva, Switzerland 28 June to 3 July, 1998 [Abstract N33 232].
 14. Mulanga-Kabeya C et al. Evidence of stable HIV seroprevalence in selected populations in the Democratic Republic of Congo. *AIDS*, 1998, 12:905-10.
 15. Balter V et al. High HIV1 incidence in young women masked by stable overall seroprevalence among childbearing women in Kinshasa, Zaire: estimating incidence from serial seroprevalence data. *AIDS*, 1994, 8:811-7.
 16. Delamo J et al. Does tuberculosis accelerate the progression of HIV disease? Evidence from basic science and epidemiology. *AIDS*, 1999, 13: 1151-8.
 17. Castilla J et al. Pulmonary and extrapulmonary tuberculosis at AIDS diagnosis in Spain: epidemiological differences and implication for control. *AIDS*, 1997, 11:1583-8.
 18. Abouya I et al. The Côte d'Ivoire national HIV counselling and testing programme for tuberculosis patients implementation and analysis of epidemiological data. *AIDS*, 1998, 12:505-12.
 19. Pozniak AL, Miller R, Ormerod LP. The treatment of TB in HIV-infected persons. *AIDS*, 1999, 13:435-45.
 20. Elharti E et al. Diversity of HIV-1 in Morocco. *AIDS*, 1997, 11:1781-3.
 21. Strikler H, Hoover D, Dersimonian R. Problems in interpreting HIV sentinel seroprevalence studies. *Annals of epidemiology*, 1995, 5:447-54.
 22. Samson M et al. Resistance to HIV-1 infection in caucasian individuals bearing mutant alleles of CCR-5 chemokine receptor gene. *Nature*, 1996, 382:722-5.
 23. Elharti E et al. Frequency of the CCR5delta32 in the Moroccan population. *AIDS research and human retroviruses*, 2000, 16:87-9.
 24. DeVincenzi I, Merttens TE. Male circumcision: a role in HIV prevention? *AIDS*, 1994, 8:153-60.
 25. O'Farrell N, Egger M. Circumcision in men and the prevention of HIV a "meta-analysis" revisited. *International journal of STD & AIDS*, 2000, 11:137-42.