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HIV/AIDS Among Immigrants in Portugal: Socio-Demographic and Behavioural Correlates of Preventive Practices

Sónia Dias, Ana Gama and Maria O. Martins
*Instituto de Higiene e Medicina Tropical/Universidade Nova de Lisboa
Portugal*

1. Introduction

HIV infection remains a major public health concern in Europe, with evidence of continuing transmission of HIV. Surveillance data published by the European Centre for Disease Prevention and Control and the World Health Organization Regional Office for Europe indicate that, in 2009, 53 427 cases of HIV were diagnosed and reported by 49 of the 53 countries in the WHO European Region; the rate of HIV cases diagnosed was 8.5 per 100 000 population in this region (European Centre for Disease Prevention and Control/World Health Organization Regional Office for Europe [ECDC/WHO Regional Office for Europe], 2010). Migration has been acknowledged as a factor influencing the epidemiology of HIV in Europe (ECDC, 2010a). In 2005, 46% of all cases of heterosexually acquired HIV infection in Western Europe involved migrants from high prevalence countries (ECDC, 2009).

Portugal is one of the western European countries with the highest burden of HIV infection (European Centre for the Epidemiological Monitoring of AIDS [EuroHIV], 2007). Recent data estimates that, in 2007, Portugal presented one of the highest rates of new HIV diagnosis in the European Region (ECDC/WHO Regional Office for Europe, 2008). The epidemic has been mainly driven by injecting drug users, but recently sexually transmitted cases are on the rise.

The Portuguese epidemic is of the concentrated type, i.e. prevalence within the general Portuguese is inferior to 1% but specific groups present a high prevalence of HIV infection (National Coordination for HIV/AIDS Infection, 2007). The groups considered most vulnerable, characterized by a more intensive and frequent exposure and by a more difficult access to means of prevention, include the migrants (National Coordination for HIV/AIDS Infection, 2007). In fact, estimates indicate that immigrants represent approximately 20% of Portugal's diagnosed HIV cases, accounting for a disproportionate number of new heterosexually acquired infections (ECDC, 2010a).

In the last decades, immigrants' inflows have increased across most OECD countries (Organisation for Economic Co-operation and Development [OECD], 2011). Statistics on international migration in the European Union (EU) estimate that, in 2008, the total number of non-nationals (people who are not citizens of their country of residence) living on the territory of the EU Member States was 31.8 million, representing 6.4% of the EU's

population (Eurostat, 2010). Around two thirds of all non-nationals living in the EU were citizens of a third country (non-EU Member State).

The proportion of immigrants in Portugal has also continuously increasing. According to recent data, the total stock of foreign population (with a valid residence permit) reached 457 000 in 2009 (4.3% of the total population) (OECD, 2011). Most of these immigrants have come from Brazil, Ukraine and Cape Verde (OECD, 2011).

Migration places populations in situations of greater risk for poor health in general and HIV in particular (ECDC, 2010a; WHO, 2010). The linkages between migration and HIV/Aids are largely related to the conditions and structures of the migration process itself, as in the countries of origin, transit and destination (International Organization for Migration [IOM], 2006). In host countries specifically, factors like poverty, exploitation, lack of legal protection, social exclusion and discrimination may increase the risk of exposure to HIV and may reduce the individual's ability to protect him- or herself from infection (Fenton, 2001; Soskolne & Shtarkshall, 2002). Other potential risk factors for migrants include separation from families and partners, besides separation from the socio-cultural norms that guide behaviours in more stable communities. These circumstances may reinforce the adoption of risk behaviours such as consumption of injection drugs and sexual risk practices (Albarrán & Nyamathi, 2011). Additionally, immigration policies that make integration of migrants in host countries more difficult may have a negative impact on their health (Grove, 2006). In fact, health vulnerability of migrants has been associated to poor access to health care (Derosé et al., 2009; Politzer et al., 2001; Stronks et al., 2001). Barriers to health services, including legal, socioeconomic, linguistic and cultural constraints, may result in a reduced utilization of services, in particular for HIV/Aids prevention and care, which makes these groups more vulnerable to HIV and their related complications (Dias et al., 2004; Salama & Dondero, 2001).

Increasing the uptake of HIV testing has been acknowledgedly an important component of primary and secondary prevention strategies (Burns et al., 2005; ECDC, 2010b). Timely HIV testing may lead to improved clinical outcomes through early diagnosis and access to treatment as antiretroviral therapy makes individuals less infectious (Levy et al., 2007; Saracino et al., 2005). Moreover, awareness of positive serostatus may prevent ongoing transmission of disease as it enhances individual behavioural change toward reduced risky sexual behaviour (Ehrlich et al., 2007; Schwarcz et al., 2006).

Given the epidemiological situation in Portugal, national HIV prevention and control efforts targeted to groups most-at-risk as the migrant population have been a priority. During the last decade, one of the main strategies undertaken has been generalizing access to early detection of the infection and promotion of voluntary testing and counselling (National Coordination for HIV/AIDS Infection, 2007). Presently, HIV testing in Portugal is non-mandatory and can be done anonymously, confidentially and for free at the HIV Early Detection and Counselling Centres.

Despite the benefits of HIV testing upon the individual and the community, and the continued efforts to guarantee access to diagnosis and promote the uptake of HIV testing in Portugal, a high proportion of adults in this country remain so far untested (National Coordination for HIV/AIDS Infection, 2007). Since 2001, immigrants in Portugal are entitled to health care regardless of legal status, including free health care to pregnant women and recent mothers, users of family planning programmes and individuals with transmissible

diseases. Nevertheless, evidence on access and utilization of health services among migrants in Portugal suggests that barriers related to legal issues, economic constraints, lack of information of migrants on their health rights and negative attitudes of health professionals remain (Dias et al., 2008, 2010a).

Knowledge on HIV testing among immigrants is limited; nevertheless, the literature indicates that a proportion of these groups remain undiagnosed and tend to utilize HIV health services at a later stage of disease (Burns et al., 2007; Delpierre et al., 2007). A growing body of literature indicates that factors such as socio-demographic (sex, age, country of origin, education, immigration status), behavioural (perceived risk for HIV, risk behaviours) and structural (utilization of health services) are associated with HIV testing (Bond et al., 2005; Stein & Nyamathi, 2000; Stolte et al., 2003; Wang et al., 2010).

Understanding such factors among immigrants may contribute to developing strategies designed to effectively promote HIV testing and reduce undiagnosed infection. This paper aims to describe the proportion of HIV testing among an immigrant population in Portugal and identify demographic, socioeconomic, behavioural and structural factors.

2. Methods

Based on a participatory approach, a cross-sectional study was conducted with a sample of 1282 immigrants (35.7% from Portuguese-speaking African countries, 33.2% from Eastern European countries and 31.1% from Brazil) living in the Lisbon Metropolitan Area. This area has currently the highest concentration of immigrant population in the country. Official data indicate that, in 2010, 43% of the immigrant population in Portugal (around 189 220 immigrants) resided in the Lisbon region (Serviço de Estrangeiros e Fronteiras, 2011).

2.1 Sampling and data collection

Participants were selected through snowball sampling. This sampling method was used as the information available on immigrant population in Portugal does not allow constructing sampling frames for representative population based surveys.

Representatives of non-governmental organisations (NGOs) and associations of African, Brazilian and eastern European immigrants were contacted by the research team and invited to collaborate in the study. The investigators carried out several meetings with NGOs members to present the research' main objectives and procedures and ask their collaboration in publicising the study within the immigrant community and in identifying and recruiting potential participants. The inclusion criteria were being an immigrant, defined as a non-national person who migrated for settlement purposes (IOM, 2004) and being 18 years old or older. These potential participants were personally approached and invited to participate by the research team. After respondents finished filling the questionnaire they were asked to identify and recruit within their social networks other possible participants who met the study criteria.

Data was collected between May 2010 and January 2011 through a questionnaire applied in community based associations, governmental and non-governmental organizations working with immigrant populations. Data collection days were scheduled with these entities based on the availability of free rooms for that purpose. Given the sensitive nature of the subject

under investigation, the questionnaires were administered in a quiet room, in isolation, to ensure privacy and comfort of participants.

Questionnaires were applied by trained interviewers from immigrant communities, recruited and selected in collaboration with NGOs and immigrant associations. The interviewers training included information about the questionnaire, the data collection procedures and general interview techniques. A training manual was elaborated and provided to support interviewers in the field.

The questionnaire comprised closed-ended questions on sociodemographics, self-perception of HIV risk, knowing someone infected, number of sexual partners in Portugal in the last 12 months, having had a consultation on sexual and reproductive health, and HIV testing. The instrument of data collection was constructed along with feedback provided by partners of the study - community based associations, governmental and non-governmental organizations. After the questionnaire was developed, a pre-test was conducted with members of immigrant communities; few amendments were made to improve clarity of the questions and to make it better adapted to the study populations.

Anonymous participation and confidentiality of data was guaranteed. Informed consent was obtained. The study was approved by the Ethical Committee of the Institute of Hygiene and Tropical Medicine, New University of Lisbon.

2.2 Measures

Sociodemographic characteristics included sex, age (continuous variable), origin ('African', 'Brazilian', 'Eastern European'), educational level ('elementary education', 'secondary education', 'higher education'), immigration status ('legal status', 'irregular status'). Length of stay was a continuous variable measured in years.

Self-perception of HIV risk was measured using a dichotomous question on fearing to become infected with HIV ('yes'/'no'). Knowing someone infected (friend or relative) had also two response options: 'yes'/'no'. The number of sexual partners in Portugal in the last 12 months was a continuous variable; for descriptive analysis, this variable was recoded into a three-category variable: '1 sexual partner', '2-4 sexual partners' and '≥ 5 sexual partners'.

Having had a consultation on sexual and reproductive health, having ever been tested for HIV, having been tested in Portugal and having been tested in the last year were measured as dichotomous variables ('yes'/'no').

2.3 Data analysis

Descriptive analysis was conducted for background characteristics of participants; continuous variables are presented as mean \pm standard deviation. The associations between socio-demographic characteristics, fear of becoming infected, knowing someone infected, number of sexual partners, having had a consultation on sexual and reproductive health, HIV testing and the three immigrant groups were analysed using the Chi-Square test (for categorical variables) and the Kruskal-Wallis test (for continuous variables).

A logistic regression analysis was performed to identify factors associated with having ever been HIV tested. In the final model, all the variables that were found to be significantly

associated with HIV testing were included: age, sex, origin, educational level, fear of becoming infected, knowing someone infected, number of sexual partners and having had a consultation on sexual and reproductive health. The magnitude of the associations was estimated by means of odds ratios (OR) with 95% confidence intervals. The software SPSS 18.0 was used for all the data analysis.

3. Results

3.1 Socio-demographic characteristics of participants

Of the total sample, more than a half was female (Table 1). Eastern Europeans were significantly older than Africans and Brazilians. Differences on educational level were found across origin. Most participants reported to have legal status, more frequently Eastern Europeans than Brazilians and Africans. The mean length of stay was higher among Africans, compared to Eastern Europeans and Brazilians (Table 1).

	Total		African		Brazilian		Eastern European		<i>P value</i>
	n	%	n	%	n	%	n	%	
Sex									
Female	715	55.8	265	57.9	235	55.2	215	54.0	0.504
Male	567	44.2	193	42.1	191	44.8	183	46.0	
Educational level									
Elementary education	356	27.9	269	58.7	61	14.3	26	6.6	<0.001
Secondary education	480	37.6	116	25.3	258	60.6	106	27.0	
Higher education	441	34.5	73	15.9	107	25.1	261	66.4	
Immigration status									
Legal	1088	86.0	372	82.5	356	84.4	360	91.8	<0.001
Irregular	177	14.0	79	17.5	66	15.6	32	8.2	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Age (years)	35.4	10.6	35.5	11.0	33.8	9.8	37.1	10.8	<0.001
Length of stay (years)	7.9	10.2	11.6	10.2	4.1	6.1	7.8	11.9	<0.001

Table 1. Socio-demographic characteristics of participants

3.2 HIV risk perception, knowing someone infected and number of sexual partners

Most participants (59.6%) referred to fear becoming infected with HIV, more frequently Brazilians (69.7%) and Africans (65.8%) compared to Eastern Europeans (41.6%) (p<0.001) (Table 2). Differences were found across sex: a higher proportion of women feared becoming infected compared to men (63.2% vs. 55.0%, respectively) (p=0.003). Origin differences across sexes remained: Brazilian and African women reported more often to fear becoming infected compared to Eastern European women (73.1% and 68.1% vs. 46.2%) (p<0.001), as Brazilian and African men reported more often fearing to become infected than Eastern European men (65.6% and 62.6% vs. 36.1%) (p<0.001).

Almost 28% of participants had a friend or relative infected with HIV, more frequently Brazilians (35.7%) and Africans (25.9%) than Eastern Europeans (19.1%) (p<0.001) (Table 2). Knowing someone infected did not differ significantly between men and women.

The mean number of sexual partners in Portugal in the last 12 months was 1.6 ± 4.2 ; 70% of participants referred having had one sexual partner, 19% had between two and four and 11% had five or more sexual partners (Table 2). Brazilians reported more frequently to have had one sexual partner in the last 12 months (73.4% vs. 68.7% Africans and 67.4% Eastern Europeans); Africans reported more frequently having had between two and four partners (22.2% vs. 20.1% Brazilians and 14.5% Eastern Europeans); Eastern Europeans reported more frequently to having had five or more sexual partners (18.1% vs. 9.1% Africans and 6.5% Brazilians) ($p<0.001$) (Table 2). Differences by sex were also found, with women reporting more often to have one sexual partner than men (80.6% vs. 57.9%) and men reporting more frequently higher number of sexual partners than women (2-4 partners: 28.7% vs. 10.6%; ≥ 5 partners: 13.4% vs. 8.9%) ($p<0.001$). In each sex group, the number of sexual partners in Portugal in the last year differed across origins. Among women, more frequently Africans and Brazilians referred having one sexual partner (84.9% and 83.3%, respectively, vs. 71.9% Eastern Europeans), Brazilians having between two and four (13.1% vs. 9.8% Eastern Europeans and 8.4% Africans) and Eastern Europeans having more than four partners (18.3% vs. 6.7% Africans and 3.5% Brazilians) ($p<0.001$). In contrast, among men, more frequently Eastern Europeans and Brazilians reported having one sexual partner (63.1% and 60.9%, respectively, vs. 49.3% Africans), Africans having between two and four (38.7% vs. 28.8% Brazilians and 19.1% Eastern Europeans) and Eastern Europeans having more than four (17.8% vs. 12% Africans and 10.3% Brazilians) ($p=0.002$).

	Total		African		Brazilian		Eastern European		<i>P value</i>
	n	%	n	%	n	%	n	%	
Fear of becoming infected with HIV									
Yes	752	59.6	294	65.8	295	69.7	163	41.6	<0.001
No	510	40.4	153	34.2	128	30.3	229	58.4	
Knowing someone infected with HIV									
Yes	322	27.5	113	25.9	148	35.7	61	19.1	<0.001
No	850	72.5	324	74.1	267	64.3	259	80.9	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Number of sexual partners in Portugal in the last 12 months	1.6	4.2	1.9	6.0	1.5	2.4	1.2	2.8	0.094

Table 2. HIV risk perception, knowing someone infected and number of sexual partners

3.3 Consultation on sexual and reproductive health and HIV testing

Of the total sample, having been tested for HIV at least once was reported by 60%; more frequently among Brazilians (73.2%) and Africans (63.5%) than Eastern Europeans (41.9%) ($p<0.001$) (Table 3). Across sex, a significantly higher proportion of women had been HIV tested compared to men (63.4% vs. 55.8%) ($p=0.006$). Differences on having ever been tested for HIV across origins remained among women and men (women: 72.6% Brazilians and 70.2% Africans vs. 44.9% Eastern Europeans; $p<0.001$) (men: 73.8% Brazilians and 54.4% Africans vs. 38.5% Eastern Europeans; $p<0.001$). No differences were observed across immigration status.

Having ever been HIV tested was mainly due to routine medical screening (31.2%), pregnancy/partners' pregnancy (20.2%), curiosity (12.6%), requirement for mortgage or life/health insurance application (6.4%) and having engaged in risk behaviours (6%). Of those participants who were never tested, the main reasons were having never had risk behaviours (28.6%), not thinking about it (19.6%), not perceiving to be at risk (16.3%), feeling well (11.7%), not knowing where to do the test (9.3%) and not considering it important (6.9%).

Among those who have ever been tested for HIV, 54.6% had a test in Portugal; 77.4% of Africans versus 42.3% Eastern Europeans and 39.7% Brazilians ($p<0.001$) (Table 3). Having been tested in Portugal did not differ significantly between women and men.

Of participants who have ever been tested, 36.8% had their last test in the previous year (Table 3). Having been tested in the last year was more frequent among Africans (41.2% vs. 36.5% Brazilians and 29.7% Eastern Europeans) ($p=0.048$). Also, HIV testing was more frequent among women (39.7% vs. 32.7%) ($p=0.048$). In both sex groups, origin differences were not found regarding having been tested in the last year.

Approximately 23% of participants referred having had a consultation on sexual and reproductive health; no differences were found across origin (Table 3). According to sex, a higher proportion of women had a sexual and reproductive health consultation compared to men (32% vs. 12.4%) ($p<0.001$).

	Total		African		Brazilian		Eastern European		<i>P value</i>
	n	%	n	%	n	%	n	%	
Having ever been tested for HIV									
Yes	768	60.0	291	63.5	311	73.2	166	41.9	<0.001
No	511	40.0	167	36.5	114	26.8	230	58.1	
Having been tested in Portugal									
Yes	412	54.6	223	77.4	123	39.7	66	42.3	<0.001
No	342	45.4	65	22.6	187	60.3	90	57.7	
Having been tested in the last year									
Yes	282	36.8	120	41.2	113	36.5	49	29.7	0.048
No	484	63.2	171	58.8	197	63.5	116	70.3	
Having ever had a consultation on sexual and reproductive health									
Yes	295	23.3	105	23.1	90	21.2	100	25.9	0.288
No	969	76.7	349	76.9	334	78.8	286	74.1	

Table 3. HIV testing (ever, in Portugal and in the last year) and consultation on sexual and reproductive health

3.4 Factors associated with HIV testing

The logistic regression analysis allowed the identification of sex, origin, fear of becoming infected with HIV, knowing someone infected, number of sexual partners and having ever had a consultation on sexual and reproductive health as positively associated with having been tested for HIV.

After adjusting for potential confounding factors, having ever been tested was positively associated with being older (OR = 1.02, CI 95% = [1.01-1.03]), female (OR = 1.39, CI 95% = [1.05-1.84]), Brazilian (OR = 3.75, CI 95% = [2.56-5.50]) and African (OR = 2.60, CI 95% = [1.75-3.86]) compared to Eastern European, and having higher education (OR = 1.55, CI 95% = [1.04-2.31]) compared to elementary education (Table 4). HIV testing was also more likely among those reporting fear to become infected with HIV (OR = 1.28, CI 95% = [0.97-1.70]; $p<0.10$), knowing someone infected (OR = 1.97, CI 95% = [1.43-2.71]), having higher number

	Crude OR (CI 95%)	<i>P value</i>	Adjusted OR (CI 95%)	<i>P value</i>
Age	1.00 (0.99-1.01)	0.806	1.02 (1.01-1.03)	0.005*
Sex				
Male	1		1	
Female	1.37 (1.09-1.72)	0.006*	1.39 (1.05-1.84)	0.022*
Origin				
Eastern European	1		1	
African	2.41 (1.83-3.18)	<0.001*	2.60 (1.75-3.86)	<0.001*
Brazilian	3.78 (2.82-5.07)	<0.001*	3.75 (2.56-5.50)	<0.001*
Educational level				
Elementary education	1		1	
Secondary education	0.98 (0.74-1.30)	0.903	1.06 (0.74-1.52)	0.763
Higher education	0.80 (0.60-1.06)	0.120	1.55 (1.04-2.31)	0.033*
Immigration status				
Non regular	1		1	
Regular	0.97 (0.70-1.35)	0.870	1.29 (0.89-1.87)	0.183
Fear of becoming infected with HIV				
No	1		1	
Yes	1.96 (1.56-2.47)	<0.001*	1.28 (0.97-1.70)	0.084**
Knowing someone infected with HIV				
No	1		1	
Yes	2.35 (1.76-3.13)	<0.001*	1.97 (1.43-2.71)	<0.001*
Number of sexual partners	1.15 (1.06-1.25)	0.001*	1.12 (1.03-1.22)	0.008*
Having ever had a consultation on sexual and reproductive health				
No	1		1	
Yes	2.37 (1.77-3.18)	<0.001*	2.52 (1.78-3.58)	<0.001*

*Statistically significant at $p<0.05$

**Statistically significant at $p<0.10$

Table 4. Factors associated with HIV testing

of sexual partners (OR = 1.12, CI 95% = [1.03-1.22]) and having ever had a consultation on sexual and reproductive health (OR = 2.52, CI 95% = [1.78-3.58]). No significant association was found between HIV testing and immigration status.

4. Conclusion

In this study, the prevalence of having ever been tested for HIV was 58.6%, higher than the one (51.2%) estimated in a previous study conducted in 2007 with a sample of immigrants residing in Lisbon (Dias et al., 2010b). The prevalence of HIV testing obtained in the present study was also higher compared to the one estimated in the National Survey of Sexual Behaviour conducted in 2009 - 44% of a representative sample of the general Portuguese population aged 16–64 years old reported having been tested for HIV (National Coordination for HIV/AIDS Infection). The findings of the present study may indicate that the national efforts undertaken during the last years to promote HIV testing among most-at-risk groups as migrants have been positive.

The most commonly reported motivations for having been tested were event-driven (routine medical screening, pregnancy or partners' pregnancy). Also, approximately a fifth of participants were tested based on person-driven reasons (i.e., having the desire to know one's own HIV serostatus, having engaged in risk behaviours). This result may reflect the positive outcomes of prevention strategies population-wide focused on increasing awareness of the importance of doing the test. Nevertheless, reported reasons for having never been tested included low self-risk perception and lack of information on where HIV test can be done. These findings reinforce that continuing efforts are needed to encourage HIV testing among immigrant population.

In this study, demographic, socioeconomic, behavioural and structural factors were identified as predictors of HIV testing.

Differences observed across sex are consistent with previous research reporting higher prevalence of HIV testing among women (Fakoya et al., 2008; Lopez-Quintero et al., 2005). This may be due to the fact that migrant women are commonly of reproductive age and therefore tend to use more health services than men (Bond et al., 2005; Dias et al., 2008). Indeed, in this study, having had a consultation on sexual and reproductive health was more often reported by women. Currently, universal prenatal care in Portugal includes HIV counselling and testing. This may result in more opportunities to get information on HIV prevention and to uptake the test among female migrants.

Accordingly, having had a sexual and reproductive health consultation was also positively associated with HIV testing. Although reasons for having never been consulted were not explored, the results suggest that access to health services is important in linking individuals with HIV testing services. In previous studies, utilization of health services has been found to increase the likelihood of HIV detection as these services are a useful setting in which to provide HIV preventive counselling and promote HIV testing (Bond et al., 2005; Wang et al., 2010). The findings may also suggest that health professionals may be influential in encouraging individuals to receive HIV testing. In fact, previous studies have shown that HIV testing is more likely when health care providers initiate discussion, emphasize its benefits and strongly recommend it (Fernandez et al., 2000).

Age and educational level were also significant socioeconomic factors of HIV testing, similarly to other studies (Fernández et al., 2005; Haile et al., 2007). Higher education has been positively associated with HIV knowledge, awareness of availability of health services and HIV testing (Burns et al., 2005; Dias et al., 2004; Stolte et al., 2003; Wong et al., 2004).

The results show a significant variation across origins, with Brazilian and African participants reporting more often to have been tested for HIV. A similar result was obtained in a previous study (Dias et al., 2010b). In the countries of origin of these participants, Portuguese is the official language. This may reinforce the idea that having a common language may be a facilitator of utilization of health services, and in particular for HIV testing. In several other investigations, linguistic differences have been mentioned as predictive of underutilization of HIV-related health services and having never been tested for HIV among immigrants (Burns et al., 2007; Dias et al., 2004; Prost et al., 2008).

In this study, having been tested for HIV appeared to be independent of immigration status, which may reflect the efforts undertaken to promote voluntary, anonymous and confidential HIV testing, free of charge and regardless of legal status (National Coordination for HIV/AIDS Infection, 2007).

Two thirds of participants feared becoming HIV infected; this variable was associated with higher odds of having been tested for HIV. Perception of individual HIV risk has been associated with knowledge of HIV risk factors, fewer risk-taking practices and HIV testing (Bardem-O'Fallon et al., 2004; Maman et al., 2001; Stein & Nyamathi, 2000). It is possible that individuals who perceive to be at risk for HIV infection are more likely to consider the disease as a personal danger, to recognize its consequences and to acknowledge the importance of adopting HIV-related protective measures (Norman & Gebre, 2005; Worthington & Myers, 2003). Differences by origin revealed that Brazilians and Africans report a higher perception of HIV risk, compared to Eastern Europeans. These findings are consistent with research suggesting that migrants from high prevalence countries tend to show high levels of knowledge and awareness of HIV risk factors (Burns et al., 2007). These migrants may therefore be more likely to perceive themselves at risk of HIV infection. Women also reported higher perception of individual risk compared to men. Although reasons for fearing to become infected with HIV were not explored in this study, in previous investigations the lack of trust in a male partner and a partner's promiscuity are the most common reasons given for perceived high personal risk (Dias et al., 2004, 2010c; Sarker et al., 2005; Ventura-Filipe et al., 2000). Additional research is needed to deepen understanding of the ways in which issues of gender and origin underpin HIV risk perception.

The results show a significant association between knowing someone infected and HIV testing. Studies have pointed out that knowing someone with HIV/AIDS appears to be an important contributor to knowledge of HIV and may result in more positive attitudes toward HIV protective measures (Barden-O'Fallon et al., 2004; Kalichman & Simbayi, 2003). Increased knowledge and more positive attitudes may help individuals to recognize the benefits of the HIV test (Norman & Gebre, 2005). The differences observed by origin support the hypothesis that country of origin's background plays an important role in HIV-related perceptions and experiences, thus influencing willingness to test for HIV.

In this study, risky sexual behaviour as having multiple sexual partners was a predictor of HIV testing. This result confirms the findings of surveys conducted in other countries

showing that increasing number of sexual partners is associated with progressively higher prevalence of testing (Song et al., 2011; Wang et al., 2010). When individuals experience sexual risk behaviours, they may be aware of their increased risk for HIV infection and, in turn, they may be more likely to test for HIV. The findings indicate a variation on sexual behaviour patterns across origin and sex. Further investigation on sexual behaviours must take into account the cultural and gender-related influences.

This study points out interesting challenges for HIV prevention among immigrants and may help in the design of tailored interventions focused on promotion of HIV testing among these populations. The findings highlight that strategies should be targeted to specific subgroups including men, Eastern Europeans, those younger, with lower educational level and in stable relationships.

In view of the missed opportunities for HIV testing in outpatient care, this study reinforces that the sexual and reproductive health services may be a useful setting in which to provide HIV preventive counselling and testing. These services are considered to greatly contribute to HIV prevention given their potential outreach to diverse groups of the population through primary health care (Berer, 2004). Voluntary counselling in primary care is increasingly recognized as an appropriate way to encourage early diagnosis of HIV among immigrants, many of whom often do not suspect to be infected (Askew & Berer, 2003). Interventions might therefore focus on improving the provision of HIV information, counselling and testing in primary care.

Further efforts to improve HIV testing among immigrants should focus on increasing individuals' awareness of HIV self-risk and benefits of doing the test, as well as on promoting utilization of health services and providing access to timely, culturally competent and appropriate HIV testing and counselling.

Studies have consistently pointed toward the need for creating further innovative and effective pathways to HIV testing of immigrant populations (Burns et al., 2001; Delpierre et al., 2007; Erwin et al., 2002). The provision of HIV detection services in non-traditional health settings such as mobile units may be important to facilitate HIV testing and dissemination of HIV information within immigrant communities. Also, the role of community based organizations in HIV prevention among 'hard-to-reach' populations as immigrants has been increasingly recognized (Fakoya et al., 2008; Solorio et al., 2004). Community-based organizations may provide counselling and testing services to migrants and may link those testing positive with health care services, increasing timely access to treatment and care. These organizations may also provide culturally relevant information on HIV risks, protective measures and health services available. Communities' involvement and participation in the planning and development of HIV prevention interventions should be supported.

A deeper understanding of the individual, behavioural and structural factors that underpin HIV testing among immigrant populations is needed. Cultural and gender-related issues should be taken into account as contributors for variation in sexual behaviour patterns, adoption of protective measures and HIV testing across immigrant groups. This knowledge is relevant to support the design of interventions aimed to increase access to diagnosis and reduce the proportion of undiagnosed HIV infection.

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Phone: +86-21-62489820
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