INFECTIONIOUS DISEASES IN IMMIGRANTS FROM THE PERSPECTIVE OF A TROPICAL MEDICINE REFERRAL UNIT

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Abstract. Immigrants from less developed countries to Europe are growing in number and could contribute to the emergence of some infectious diseases. To address this issue, we conducted a descriptive study of 988 immigrants, of whom 79.9% were sub-Saharan Africans and 72% were of undocumented origin. Fever, pruritus, eosinophilia, visceral megalaly, and anemia were more frequent in Africans, while a cough was more common Latin Americans (P < 0.005). The most frequent diagnoses were previous hepatitis B (46.5%), latent tuberculosis (44.2%), filariasis (24.8%), infection with intestinal helminths (15.4%), malaria (15.1%), infection with intestinal protozoa (10%), hepatitis C (8.8%), other non-parasitic infections (7.8%), active hepatitis B (7.6%), sexually transmitted diseases (7.5%), active tuberculosis (5.8%), and infection with human immunodeficiency virus (HIV) (5.2%). Past and active hepatitis B and C, active tuberculosis, infection with HIV, malaria, and filariasis were more frequent in Africans (P < 0.005). Thirty-two other tropical diseases were also diagnosed.

INTRODUCTION

Infectious diseases cause more than 13 million deaths a year and represent the leading cause of mortality in less developed countries, many of them located in tropical and subtropical areas.1 There are multiple factors that determine the impact of infectious diseases on the inhabitants of these areas, but the most significant are probably health and housing conditions and accessibility to medical care. Many immigrants come from countries with high rates of infectious diseases. In addition, the poor socioeconomic conditions (illegality, inadequate housing, social isolation, difficulty in access to medical services) endured by many during their initial settlement phase in the host country make this collective very vulnerable to certain infectious diseases, some of which are potentially transmissible to the host community. In Western countries, an increase in typically tropical diseases, such as malaria or filariasis, and a return of other formerly common ones, such as tuberculosis or viral hepatitis, are being observed as a consequence of growing migration from less developed countries.2 This phenomenon has reached such serious proportions that the Centers for Disease Control and Prevention (Atlanta, GA) has singled out diseases among travelers, immigrants, and refugees as a problem that causes human suffering and places a burden on society. They advise fighting against these diseases to prevent emerging infectious diseases in the 21st century.3

There are more than 13 million immigrants from less developed countries currently living in the European Union. The geographic location of Spain between Africa and northern Europe and its historical and cultural links with Latin America make this country a frequent (transitory or permanent) destination for immigrants. According to official data, the number of foreign residents in Spain has increased from 334,935 in 1987 to 719,647 in 1998 (50% from less developed countries). Approximately 750,000 immigrants (550,000 legal and 200,000 illegal) from countries outside the European Union were living in Spain by 2001. Most of them are concentrated in big cities such as Madrid, which was host to 240,286 immigrants (88% of them from less developed countries) in 2001 according to the Department of Statistics of the City Council of Madrid.4,5

The shortage of data concerning infectious diseases in immigrants living in Europe and especially in Spain has been the impetus for this study. Its purpose is to ascertain the prevalence of infectious diseases in immigrants from the perspective of a Tropical Medicine Referral Unit.

METHODS

This was a descriptive retrospective study. Immigrants from tropical or subtropical areas as well as from Eastern Europe who were treated at the Tropical Medicine Unit (TMU) of the Ramón y Cajal Hospital in Madrid, Spain between January 1989 and December 1999 were included. To avoid misinterpretation of data, immigrants that had visited their country of origin or traveled to other tropical countries after their arrival in Spain were not included in this study.

Data collection. The following variables were collected using a computerized protocol: personal data, year of birth, sex, legal status, country of origin, arrival date in Spain, date of the first consultation at the TMU, clinical symptoms, diagnostic procedures performed, and diagnoses made. Access about patients is restricted and laboratory results are kept confidential at the TMU; data have never been used for legal actions against illegal immigrants.

The study was reviewed and approved by the Infectious Diseases Ethical Committee of the Hospital Ramón y Cajal and was conducted in accordance with Good Clinical Practice Guidelines. Written informed consent was obtained from all patients enrolled in the study before serologic testing for syphilis and infection with human immunodeficiency virus (HIV).

We have used the term pre-consultation period to designate the time spent in Spain between date of arrival and first consultation at the TMU. According to the length of this period, immigrants were classified into one of three groups: short term (<3 months), medium-term (4–18 months), and long term (>18 months). Health coverage refers to the immigrant’s legal status that determines his or her right to access to the National Health System. Those immigrants who did not have access to the National Health System because they did not legally reside in Spain have been called undocumented immigrants. Except for cases of infancy, pregnancy, or medical emergencies, undocumented immigrants have no rights to...
be assisted by the National Health System in Spain. Assistance and treatment to undocumented immigrants in this study was given because of an established agreement between the Ramón y Cajal Hospital, a teaching hospital belonging to the National Health System, and Karibu (word that means welcome in Swahili), a non-governmental organization (NGO). This is a humanitarian agreement, renewed annually, that began in January 1989 and has proven to be very effective. Karibu is a well known organization dedicated to aiding undocumented immigrants in Madrid that offers basic medical assistance along with other services. Referral to the TMU is done when an immigrant goes for the first time for a medical consultation or when the immigrant outlines diagnostic or therapeutic problems that cannot be resolved at the NGO. Therefore, patients visit the Tropical Medicine clinic for illness or for routine screening, and were either referred or came by their own initiative.

**Testing protocol.** After a medical history was compiled and a complete physical examination was carried out, all immigrants (symptomatic and asymptomatic) were invited to participate in a complementary testing protocol. This protocol included complete and differential blood cell counts, serum biochemistry (glucose, creatinine, liver function tests, albumin, cholesterol, and ferritin), and basic urine tests. Serologic testing for hepatitis B virus (HBV) included detection of hepatitis B surface antigen (HBsAg), antibody to HBsAg, and antibody to hepatitis B core antigen. Testing for hepatitis C virus (HCV) included detection of antibodies to HCV and HCV RNA (by amplification with a polymerase chain reaction [PCR]). Serologic tests for sexually transmitted diseases (STDs) (e.g., syphilis) and infection with HIV were performed. A tuberculin skin test with purified protein derivative (PPD) was conducted and results were considered positive if the induration was ≥10 mm. A chest radiograph was done for all PPD-positive individuals. Three fecal samples were obtained for detection of ova and parasites. Blood and skin samples were tested for microfilariae. Thick and thin blood films for detection of malaria were prepared for all immigrants (both symptomatic and asymptomatic) from sub-Saharan Africa. Other diagnostic tests (as for cysticercosis or hydatid disease) were conducted only in those patients sustained for detection of ova and parasites. Blood and skin specimens from the rectum or urinary bladder and staining with Giemsa and hematoxylin and eosin. *Schistosoma sp.* were detected by an indirect hemagglutination test and imaging techniques (ultrasound and CAT scan). Other diagnostic tests were conducted depending on the clinical symptoms reported by the patient.

**Definitions.** Active hepatitis B was defined as the presence of HBsAg in serum, usually accompanied by an increase in transaminase levels (a persistent carrier state was defined as the persistence of HBsAg in serum for more than six months). Past hepatitis was defined if antibodies to hepatitis B surface antigen or hepatitis B core antigen were detected.

Active tuberculosis was defined as 1) a patient with a positive smear for acid-fast bacilli or culture for *Mycobacterium sp.* or 2) a patient showing radiographic abnormalities consistent with pulmonary tuberculosis, despite being smear and culture negative, who recovered after treatment with a full course of chemotherapy for tuberculosis. The classification of clinical symptoms was as follows. Asymptomatic patients were those who did not report any well-defined symptoms either spontaneously or when questioned. Anemia was defined as a hemoglobin level <11.5 mg/dL. Eosinophilia was defined as a blood eosinophil count >500 cells/ml. Visceromegalgy was defined as liver or spleen enlargement detected by physical examination or by imaging techniques (ultrasound, CAT scan). Fever was defined as an axillary temperature >38°C. Pruritus was defined as generalized skin itching. Acute diarrhea was defined as three or more non-formed stools per day for less than two weeks. Chronic diarrhea was defined as three or more non-formed stools per day for more than two weeks. Ophthalmologic symptoms were defined as those affecting the eyes, such as tearing, conjunctive redness, ocular pains, or a decrease in visual acuity. Bone/joint/muscular symptoms were defined as those affecting the bones, muscles, or joints. Skin lesions were defined as abnormal findings on the skin during a physical examination.

**Statistical analysis.** The chi-square test was used for comparisons among qualitative variables. Relationships were considered statistically significant if *P* < 0.05.

**RESULTS**

Nine hundred eighty-eight immigrants were included in the study: 15.5% were children (0–13 years old), 50.3% were female, and 72% (604 of 839) were undocumented immigrants. The median age of the study population was 28 years (range = 0–82 years). The median pre-consultation period was 25.9 months (range = 0–380 months): 344 (34.8%) were short-term immigrants, 318 (32.2%) were medium-term immigrants, and 326 (33%) were long-term immigrants. Most (79.9%) of the immigrants (79.9%) came from sub-Saharan Africa, and 55% (416 cases) were from Equatorial Guinea. The areas of origin of the immigrants are shown in Table 1.

The most frequent clinical symptoms, physical findings, and results of laboratory tests related to area of origin are shown in Table 2. A comparison of the two largest groups, Africans...
and Latin Americans, shows that fever, pruritus, eosinophilia, visceromegaly, and anemia were more frequent among the former group, while cough was more common among the latter group (P < 0.005).

A clinical diagnosis was made in 834 (84.4%) of 988 cases, but a definitive diagnosis was not reached in 103 (10.4%) cases either because of a lack of follow-up or because the study was not concluded at the time of data analysis. Fifty-one (5.2%) individuals were in good health when the study was concluded (3.8% of the Africans and 11.7% of the Latin Americans). Three or more concomitant diagnoses were made in 30.4% (300) of the cases. This percentage was 35% (276 cases) among African immigrants and 14.1% (23 cases) among Latin American immigrants.

The most frequent infectious diseases detected are shown in Table 1. Past and active infection with HBV, infection with HCV, active tuberculosis, infection with HIV, malaria, and filariasis were more frequent in Africans than in Latin Americans (P < 0.005). Thirty-two other tropical infectious diseases were diagnosed: schistosomiasis (9 cases), cysticercosis (5 cases), leprosy (4 cases), toxocariasis (4 cases), acute dengue (3 cases), amebic liver abscess (3 cases), cutaneous leishmaniasis (2 cases), sleeping sickness (1 case), and Chagas disease (1 case). A total of 309 other diagnoses corresponding to non-infectious diseases were also made.

Fever (35% in short-term immigrants, 24.2% in medium-term immigrants, and 27% in long-term immigrants), visceromegaly (19.2%, 13.5%, and 14.1%, respectively), anemia (19%, 12.9%, and 11.7%, respectively), malaria (26.7%, 12.6%, and 7.1%, respectively), and intestinal helminths (25%, 14.8%, and 4.6%, respectively) were significantly more frequent (P < 0.005) in short-term immigrants than in medium- or long-term immigrants. The difference was not significant (36.6%, 28.3%, and 30.4%, respectively) in other parasitic diseases such as filariasis.

Eosinophilia was observed in 230 patients: 211 from Africa, 18 from Latin America, and 1 from Asia. Two hundred ninety-one parasites isolated from 156 patients were responsible for the eosinophilia: 98 (42.6%) with filariasis; 38 (16.5%) with filariasis and intestinal helminthiasis; 7 (3.0%) with intestinal helminthiasis; 4 (1.7%) with schistosomiasis with or without filariasis; 3 (1.3%) with strongyloidiasis with or without filariasis; 3 (1.3%) with toxocariasis with or without filariasis; 2 (0.9%) with cysticercosis with or without filariasis; and 1 (0.4%) with a hydatid cyst with without filariasis.

Non-parasitic infections. A total of 385 viral hepatitis infections were diagnosed: 289 past infections with HBV, 49 infections with HCV, and 47 active infections with HBV. Two (0.5%) came from eastern Europe, 6 (1.6%) from Asia, 11 (2.9%) from Latin America, and 366 (95.1%) from Africa. The median pre-consultation period of this group was 27.9 months, and 69.8% were undocumented immigrants, 7% were children, and 93% were adults. When children were compared with adults, a non-significant difference was found in the rate of active infection with HBV (4.9% versus 7.9%), while a significant difference was found for infection with HCV (1.4% versus 9.9%, P < 0.005). Among the 496 immigrants from the sub-Saharan Africa, 266 (53.6%) had a past infection with HBV, 45 (9.1%) had an active infection with HBV, and 46 (10.7%) had an infection with HCV. The percentages were 43.8%, 6.3%, and 6.3%, respectively, for the 16 immigrants from northern Africa.

There were 74 cases of STDs: 33 cases of latent syphilis (positive result in a Venereal Disease Research Laboratory Test and a positive result for fluorescent treponemal antibody absorption), 21 chlamydial infections, 12 cases of bacterial vaginosis, 5 cases of trichomoniasis, and 3 cases of gonococcal urethritis. The median age of these individuals was 35 years and the median pre-consultation period was 34.9 months.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Total 988 cases % (No.)</th>
<th>Africa 79% cases % (No.)</th>
<th>North and South America 163 cases % (No.)</th>
<th>Asia 29 cases % (No.)</th>
<th>Europe 7 cases % (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>28.9 (286)</td>
<td>31.7 (250)</td>
<td>15.3 (25)</td>
<td>34.5 (10)</td>
<td>14.3 (1)</td>
</tr>
<tr>
<td>Pruritus</td>
<td>28.8 (285)</td>
<td>34.6 (273)</td>
<td>3.7 (6)</td>
<td>10.3 (3)</td>
<td>–</td>
</tr>
<tr>
<td>Eosinophilia</td>
<td>23.3 (230)</td>
<td>26.7 (211)</td>
<td>11 (18)</td>
<td>3.4 (1)</td>
<td>–</td>
</tr>
<tr>
<td>Visceromegaly</td>
<td>15.7 (155)</td>
<td>18.9 (149)</td>
<td>1.2 (2)</td>
<td>13.8 (4)</td>
<td>–</td>
</tr>
<tr>
<td>Anemia</td>
<td>14.6 (144)</td>
<td>16.1 (127)</td>
<td>8.0 (13)</td>
<td>13.8 (4)</td>
<td>–</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>14.3 (141)</td>
<td>13.2 (104)</td>
<td>16.6 (27)</td>
<td>24.1 (7)</td>
<td>42.9 (3)</td>
</tr>
<tr>
<td>Cough</td>
<td>13.3 (131)</td>
<td>12.3 (97)</td>
<td>18.4 (30)</td>
<td>10.3 (3)</td>
<td>14.3 (1)</td>
</tr>
<tr>
<td>Bone–joint</td>
<td>11.6 (115)</td>
<td>11.7 (92)</td>
<td>13.5 (22)</td>
<td>3.4 (1)</td>
<td>–</td>
</tr>
<tr>
<td>Skin lesions</td>
<td>11.2 (111)</td>
<td>11.9 (94)</td>
<td>8.0 (13)</td>
<td>14.0 (4)</td>
<td>–</td>
</tr>
<tr>
<td>Headache</td>
<td>10.1 (100)</td>
<td>9.8 (77)</td>
<td>12.3 (20)</td>
<td>10.3 (3)</td>
<td>–</td>
</tr>
</tbody>
</table>
Forty-nine (66.2%) were women, 67 (90.5%) were Africans, 7 (9.5%) were Latin Americans, and 78.9% were undocumented immigrants.

Active tuberculosis was diagnosed in 57 immigrants (2 children and 55 adults). The median age of this group was 24 years and median pre-consultation period was 24 months. Thirty-four (59.6%) came from Africa, 17 (29.8%) from Latin America, 4 (7%) from Asia, 2 (3.5%) from Europe, and 64.6% were undocumented immigrants. Four (8.7%) of the cases, all them Africans, were HIV+. Forty-three (75.4%) were classified as having pulmonary tuberculosis and 14 (24.6%) as having extrapulmonary tuberculosis. Forty-three patients (75.4%) had culture evidence of tuberculosis. Primary drug resistance was detected in eight of 24 tests performed (5 to isoniazid, 2 to isoniazid plus streptomycin, and 1 to pyrazinamide), giving an overall primary resistance rate of 33.3% (40% in Africans and 33.3% in Latin Americans).

Infection with HIV was detected in 27 cases. The median age of this group was 32 years (range = 24−56 years) and median pre-consultation period was 15.9 months. Fourteen (51.9%) were male. Twenty-six (96.3%) came from Africa (13 from west Africa, 11 from central Africa, and 2 from East Africa) and 1 (3.7%) came from Asia. Eighty percent were undocumented immigrants. The following concomitant infections were detected: 5 with an STD, 5 with latent tuberculosis, 3 with active tuberculosis, 2 with Mycobacterium avium complex, 2 with active HBV, 2 with HCV, 1 with invasive aspergillosis, and 1 with cryptococcosis.

Parasitic infections. Filariasis was detected in 245 patients. The median age of this group was 30 years (range = 1−80 years) and 93.5% were adults. The median pre-consultation period was 13.1 months. A total of 315 filariae were isolated: 209 Onchocerca volvulus, 85 Mansonella perstans, 13 Loa loa, 7 Mansonella streptocerca, and 1 Wuchereria bancrofti. The most frequent co-infections were 47 with O. volvulus plus M. perstans, 4 with M. perstans plus L. loa, and 4 with O. volvulus, M. perstans, and M. streptocerca.

One hundred fifty-four (22.9%) of 671 patients harbored a parasite in their intestines. Fifty-one (33.1%) were children and 103 (66.9%) were adults. Forty-eight (31.2%) of 154 patients were co-infected with several intestinal parasites: 36 by two parasites, 11 by three parasites, and 1 by four parasites. Two hundred fifteen intestinal parasites were isolated (148 helminths and 67 protozoa): 67 Ascaris lumbricoides, 59 Trichuris trichura, 36 Giardia lamblia, 29 Entamoeba histolytica/dispar, 6 Strongyloides stercoralis, 5 Hymenolepis nana, 4 hookworms, 3 Enterobius vermicularis, 2 Taenia saginata, 1 Hymenolepis diminuta, 1 Taenia solium, 1 Enterozytozoon bieneusi, and 1 Cryptosporidium parvum. In addition, the following non-pathogenic protozoa were identified: 53 Entamoeba coli, 20 Endolimax nana, 8 Iodamoeba bütschlii, 3 Blastozytozoon hominis, 1 Entamoeba hartmanni. Only 27.3% of the patients infected with intestinal parasites reported gastrointestinal symptoms: 8 with acute diarrhea, 5 with chronic diarrhea, and 29 with abdominal pain. Fifty-five (52.9%) of 104 patients infected with intestinal helminths had eosinophilia.

Malaria was diagnosed in 149 patients. The median age of this group was 23.5 years. Malaria was more frequent in children than in adults (32.7% versus 11.9%; P < 0.005). One hundred forty-three (96%) of these patients came from Africa, 4 (2.7%) from Asia, and 2 (1.3%) from Latin America. The Plasmodium species detected were as follows: 83 (55.7%) P. falciparum, 8 (5.7%) P. vivax, 8 (5.7%) P. malariae, 7 (4.7%) P. ovale, 5 (3.4%) mixed infections, and 38 (25.5%) unidentified Plasmodium species. Clinical manifestations were fever (71.8%), visceromegaly (40.9%), anemia (29.5%), headache (17.4%), joint-muscle pain (12.8%), and cough (12.1%); 8.1% did not present any symptoms.

The prevalence of parasites was determined in asymptomatic individuals. One hundred twelve (11.3%) immigrants were asymptomatic at the time of consultation and screened for parasites: 90 from Africa, 18 from Latin America, 2 from Asia, and 2 from Europe. Forty-five (40.2%) harbored some parasite, with those from Africa showing a higher prevalence of parasites than those from the other regions (42.7% versus 30.4%). The parasites most frequently identified in immigrants from Africa were malaria parasites (13.5%), blood fi-
lariae (13.5%), intestinal nematodes (11.2%), skin filariae (10.1%) and intestinal amebas (10.1%). Intestinal amebas (17.4%) and intestinal cestodes (17.4%) were the most frequent ones identified in those from the other regions.

**DISCUSSION**

The disease rates found in this study should be interpreted with caution before extrapolating them to the general immigrant population. Although our sample does not differ from the general Spanish immigrant population or that of other Spanish studies in terms of age and sex, it does not represent in terms of area of origin the general immigrant population in Spain, where the majority are from north Africa and Latin America. The large proportion of sub-Saharan Africans included in our study is due to two reasons. First, there is the previously mentioned collaboration agreement between the TMU of Ramón and Cajal Hospital and the NGO Karibu, which works mainly with African immigrants. Second, the high infectious and tropical disease rates in Africa make it more likely that immigrants from this continent will have an infectious disease and therefore be referred to the TMU from other centers. Almost 77% of the patients studied came from sub-Saharan Africa, and 42% of overall immigrants were from Equatorial Guinea. Thus, the frequencies of symptoms and diagnoses may be biased by the imbalance in areas of origin of the patients. This may explain the high rates of filarial carriage and eosinophilia found in this study.

It is important to point out the large number of undocumented immigrants with no access to the resources of the Public Health System in Spain who would have escaped diagnosis and treatment were it not for the collaborative agreement mentioned earlier. This community is very vulnerable since it runs a greater risk of remaining undiagnosed and/or untreated for possible contagious diseases and because a delay in the diagnosis of other infections can result in additional complications. Fortunately, this problem has been recently addressed in Spain, since access to the Public Health System was recently granted to all immigrants, regardless of their legal status.

Respiratory problems, abdominal pain, bone-joint-muscle pain, and non-specific symptoms are generally the most frequent symptoms reported by immigrants at the primary care level. Conversely, fever, pruritus, eosinophilia, visceromegaly, and anemia are more prevalent at specialized referral units that treat sub-Saharan African immigrants, as in this study.

It is not surprising that immigrants, primarily those from sub-Saharan Africa, have several infectious diseases simultaneously. In this study, hepatitis B and C, infection with HIV, malaria, and filariasis were more frequent in sub-Saharan African immigrants, while tuberculosis (both latent and active) and intestinal parasites were more common among Latin Americans. Other tropical diseases were much less common, although some of them, such as schistosomiasis in Africans and neurocysticercosis among Latin Americans, can have very severe consequences. This spectrum of diseases resembles those reported in other studies.

Infectious diseases detected in immigrants can be divided into three groups. These groups are 1) common diseases, such as respiratory, urinary tract, or skin infections, which are not difficult to diagnose and do not constitute a public health risk; 2) communicable diseases, such as tuberculosis, viral hepatitis, STDs, or infection with HIV, which are most the serious diseases in terms of the individual and public health, and therefore must always be tested for, even in asymptomatic immigrants; and 3) tropical diseases, such as malaria, filariasis, and infections with intestinal parasites, which require specialized centers for diagnosis and treatment, but fortunately are not easily transmitted in temperate, developed countries.

Knowing the length of stay in the host country prior to the first medical consultation is very useful when making a differential diagnosis. Fever, visceromegaly, anemia, malaria, and infections with intestinal helminths are more frequent among newly arrived individuals. Infections with intestinal helminths usually decrease as the length of time in the host country increases. Therefore, in terms of cost-benefits, routine examination for intestinal parasites should be based on the time of arrival in a new country. Conversely, tests for filarial parasites should be conducted in immigrants from endemic areas regardless of their arrival date because the half-lives of these parasites can be as long as 10 years.

The prevalence of hepatitis B and C markers in this study population resembles that in other series, with a prevalence of active hepatitis B of approximately 10% in African immigrants, although some studies have reported rates of up to 17–20%. The majority of hepatitis B and C cases were seen in African immigrants; they were rarely observed in immigrants from Latin America. The fact that the prevalence of hepatitis B is similar in African children and adults leads us to postulate that infection with HBV may occur at an early age (by vertical transmission or in childhood), in contrast with what has been observed in Western countries.

Sexually transmitted diseases, specifically syphilis, are a frequent diagnosis in immigrants, especially sub-Saharan Africans. Similarly, infection with HIV is observed more frequently in this group.

Tuberculosis is an increasing problem in immigrants. Latent tuberculosis infection rates of 52–72% and active infection rates of 7.8% have been reported. In addition to the high rate of drug resistance, makes tuberculosis the most relevant infectious disease in immigrants today. Most cases of tuberculosis in immigrants are reactivated during the first five years after arrival, which is a sufficient time period for detection and treatment of latent infections. Thus, immigrants should be actively screened for both latent and active tuberculosis, especially undocumented immigrants whose access to health care is poor.

Approximately 30% of African immigrants tested were infected with some type of filariae, with O. volvulus being the most frequent, followed by M. perstans. As mentioned earlier, the high filarial infection rate observed in this study group was due to large number of immigrants from central and western Africa (especially Equatorial Guinea), areas of the world where filarial infections are endemic.

Published data on frequency of malaria in immigrants differ according to the area of origin of the immigrants, length of stay in the host country, and level of specialization of the center where the diagnosis was attempted. In some studies, a parasite infection rate of 4–10% has been reported, while in others it can reach 58%. The area of origin determines the species of Plasmodium that will be found after arrival.
Plasmodium falciparum is the most frequently found species in Spanish studies, which is expected given the large number of sub-Saharan African immigrants. As more children are infected than adults because children have not acquired protective immunity and are prone to complications. Occasionally, patients with malaria do not present with fever on consultation, but instead report a history of previous fever. As reported by others, 8% of the malaria patients in our study did not have any typical symptoms. This is sufficient reason for recommending testing for malaria among all newly arrived immigrants, especially those from Sub-Saharan Africa. This is particularly crucial for children and pregnant women, since early diagnosis would avoid later complications.

Published infection rates for intestinal parasites in immigrants range from 29% to 81% and are higher than those reported in this study. The low frequency of gastrointestinal symptoms found in this study corroborates the weak association between symptoms and detection of fecal parasites. Parasitic diseases, mainly those caused by intestinal parasites, were common in asymptomatic immigrants. Thus, routine screening for these parasites in stool specimens by the formal-ether sedimentation technique should be conducted. Moreover, skin snips for cutaneous filariae, blood lysis and centrifugation for filariae, and thick and thin blood films for malaria should be considered for every African immigrant, especially children.

Clinical symptoms and specific infectious diseases are strongly associated with areas of origin of immigrants. Although tropical diseases currently present a relatively low risk to the general public, communicable infectious diseases such as hepatitis B and C, STDs, tuberculosis, and infection with HIV pose a serious threat. If one considers the potential impact of infectious diseases in host countries, infections in immigrants can be transmitted by a number of routes. Certain vector-borne tropical diseases, such as filariasis or malaria, can be transmitted locally through imported cases. Although this possibility seems remote (there may be no appropriate vectors for transmission in the new country), control programs should be directed at the possibility of introduction of infected mosquitoes and their establishment in an appropriate ecologic niche in western countries (as has occurred with Aedes albopictus and dengue virus). In the case of water- or food-borne diseases, the possibility of disease transmission is rare because water and sanitation systems are well developed in developed western countries. However, some serious parasitic diseases such as cysticercosis can be transmitted from a carrier when he or she handles food. With regard to air-borne diseases, the incidence of tuberculosis remains very high in immigrants and represents the most important disease that can transmitted in this manner. However, tuberculosis in immigrants appears to be associated with reactivation of disease rather than with tuberculosis due to recent transmission. In addition, other diseases such as meningitis can be also transmitted in this fashion. Diseases introduced into a host country by immigration can also be acquired by sexual transmission (chancroid, syphilis, other STDs, hepatitis B, and infection with HIV); blood transfusions, organ transplantation, sharing of needles, and skin piercing (malaria, visceral leishmaniasis, sleeping sickness, Chagas disease, syphilis, viral hepatitis, and infections with HIV and other retroviruses); and mother-to-child vertical transmission (malaria, Chagas disease, toxoplasmosis, and other tropical diseases).

In conclusion, any programs designed for the prevention and control of infectious diseases in immigrants must include this segment of the local population. The unfortunate situation in many countries is that immigrants, by their very status, have no access to the public health system. These programs should be characterized by the principles of equity and respect for the patient and have objectives of preserving public health and contributing to the immigrant’s integration into the society of the new host country.

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