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Human T-lymphotropic virus type 1 infection is frequent in rural communities of the southern Andes of Peru

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SUMMARY

Objectives: To evaluate the presence of human T-lymphotropic virus type 1 (HTLV-1) infection in isolated rural communities in the southern Andes of Peru.
Methods: We conducted a cross-sectional study in five communities located in three provinces in Ayacucho, Peru. The five communities are located at >3000 meters above sea level and are mainly rural, and more than 85% of the population speaks Quechua. Volunteers aged 12 years and older were included. Clinical and epidemiological data were collected, along with a blood sample for serological testing.
Results: We included 397 participants; their median age was 41 years (interquartile range 31–57 years) and 69% were women. According to our definitions, 98% were of Quechua origin. HTLV-1 was diagnosed in 11 people: 0/164 in Cangallo, 3/154 (2%) in Vilcashuaman, and 8/79 (10%) in Parinacochas. There were no cases of HTLV-2. All the HTLV-1-positive participants were born in Ayacucho and were of Quechua origin; they ranged in age from 29 to 87 years (median 56 years) and 10/11 were women. Ten were apparently healthy, and one woman was diagnosed with HTLV-1-associated myelopathy/tropical spastic paraparesis (HAM/TSP). Three out of 11 had a family member with a lower limb impairment compatible with HAM/TSP.
Conclusion: The fact that HTLV-1 infection was present in two out of three provinces suggests that HTLV-1 could be highly endemic in the southern Andes in the Quechua population.

1. Introduction

Human T-cell lymphotropic virus type 1 (HTLV-1) is the causative agent of adult T-cell lymphoma/leukemia (ATLL), HTLV-1-associated myelopathy/tropical spastic paraparesis (HAM/TSP), and HTLV-1-associated uveitis, and it increases the risk of several other inflammatory and infectious diseases.[1] The virus can be transmitted through blood transfusions or shared needles, through sexual contact, and from mother to child mainly through breastfeeding.[2] There is no treatment to cure the infection or a satisfactory treatment for ATLL and HAM/TSP, the two more severe consequences of HTLV-1 infection. However, there are prevention strategies that have proven to decrease the prevalence in a population, such as blood bank screening and avoiding breastfeeding from infected mothers.[3]

HTLV-1 is clustered among different population groups around the world: in Japan, the Caribbean basin, Central Africa, parts of Melanesia, and in Amerindians of Central and South America. The Quechuas are the major Amerindian ethnic group in Hispanic South America.[2,4–6] They are spread across the continent through the Andes highlands and the majority live in Peru and Bolivia. In Peru, they represent 13% of the total population;[7] in Bolivia, 30%.[8] There are many HTLV-1 prevalence studies in different indigenous groups in South America, but only a few reports in Quechuas from Peru[9–11] and Bolivia.[4,12]

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In Peru, no national survey has been conducted to determine the prevalence of HTLV-1 infection. However there is strong evidence suggesting that HTLV-1 is frequent and could affect 1–2% of the total population. A study conducted among 528 healthy women of three cities in Peru, reported an overall HTLV-1 prevalence of 2.5%.[10] In the largest study done in Peru among pregnant women, the authors found a prevalence of 1.7% at the largest maternity hospital in Lima.[13] Recently, a study in blood banks in Arequipa, a city in the southern Andes of Peru, showed a prevalence of HTLV-1 infection of 0.9%.[14]

Since 1991, a cohort of people living with HTLV-1 has been followed by the Institute of Tropical Medicine "Alexander von Humboldt" in Lima, Peru. By March 2007, this cohort included 1452 Peruvians with HTLV-1 infection, of whom 749 (51.5%) were born outside Lima.[15] Among the latter, the South Andean regions, which are mainly inhabited by Quechua and Aymara people, stand out because of the high number of persons infected. Also, Lima and the central and southern Andes account for most of the cases with HAM/TSP in the cohort. This observation was also described in a case series of 61 patients with HAM/TSP done in Lima, where more than 50% of the patients were born in an Andean region.[16,17] Of note, data from the 1993 National Census[18] indicated that the highest rate of lower-limb disability, which can be observed in HAM/TSP cases, occurred in the southern Andean regions of Peru, and, as also described for HAM/TSP, was more frequent in women than in men.

Because of the scarce information on HTLV-1 prevalence in Quechua populations and the indirect evidence suggesting a significant presence of HTLV-1 in the southern Andes of Peru, we explored the infection frequency and risk factors among people of this ethnic group living in the area and hypothesized that the HTLV-1 frequency is above the values reported for other Peruvian populations.

2. Materials and methods

2.1. Location

The study was focused on Ayacucho because this region is one of the predominant birth places among the participants of the HTLV-1 cohort at the Institute of Tropical Medicine "Alexander von Humboldt".

Based on data from the National Census of 1993 – the last survey in which disability of the lower limbs was recorded – we selected the three provinces with the highest rates of lower-limb disability that was not related to polio (data also provided by the census): Cangallo, Vilcashuaman, and Parinacochas. We used the same criteria to choose the five study towns from these provinces (Figure 1, Table 1). We contacted the local health centers and provided them with information about our study prior to commencing work in those towns that were willing to collaborate with the researchers.

Ayacucho is a mainly mountainous region in the south of Peru. The five towns we visited are located between 3200 and 3500 meters above sea level. The weather is cold and dry, with temperatures ranging between 15 and 20 °C during the day and close to 0 °C during the night. The rainy season is from December to March. According to the National Institute of Statistics, 80% of the population is considered poor and 30% live in conditions of extreme poverty.[7] Forty-two percent of the population live in rural areas, and there is an illiteracy rate of 17.9% among inhabitants aged 15 years and older, much higher than the national average of 7.1%. Sixty-three percent of the population in this region speaks Quechua. Ayacucho can be divided into three parts: the northern part, which is the most developed one, with a good road network that connects it with larger cities, including Lima; the central part, more isolated but still connected to the northern part and the capital of the region; and the southern part, which is the least densely populated area, with a separated road system and poor communication with the other parts of Ayacucho (Table 1, Figure 1).

2.2. Study population

We recruited volunteers aged 12 years and older. Since no previous data were available regarding the number of people affected, and because the remoteness of the communities precluded random sampling, we chose arbitrarily to study 5–10% of the population, approximately 400 participants in total. Volunteers were included until this number was reached.

2.3. Laboratory testing

We collected 6 ml of blood from each participant, separated the plasma by centrifugation, and stored it in cryovials. These samples were frozen and transported to Lima. For each sample, other than in one case, we performed two ELISAs.[19] In that one sample, insufficient for additional tests, we performed an ELISA just once. We used two commercial ELISA kits: Murex® HTLVI+II (Murex Biotech Ltd, Dartford, UK) and Ortho® HTLV-I/HTLV/-II Ab-capture ELISA test system (Ortho Clinical Diagnostic, Amersham, UK). The two different brands of ELISA were used for each sample until restrictions with the local availability of Ortho determined that we performed the Murex test twice.

If at least one of the ELISA tests had a positive result, we performed a confirmatory test either with INNO-LIA® HTLV-I/II Score (Innogenetics, Ghent, Belgium) or Western blot HTLV Blot 2.4® (MP Diagnostics, Singapore). Whenever performed, the result of the confirmatory testing, carried out in accordance with the manufacturer's specifications, defined the final HTLV-1 status category of the participant; there were four possible categories: HTLV-1-positive, HTLV-2-positive, HTLV-indeterminate, and HTLV-negative. All cases that had consistent negative results on the ELISA tests, and thus did not require confirmatory testing, were also classified as HTLV-negative.

2.4. Data collection

The questionnaire was filled out by a health worker during a face-to-face interview. We asked questions about the participant's demographics, risk factors for HTLV-1, diagnosed HTLV-1 complications, and symptoms potentially indicative of a complication. Ethnicity was defined according to the parents' place of birth and parents' mother tongue. People were classified as Quechua if both parents were born in an Andean region and both of them spoke Quechua. If at least one parent did not fulfill both of these criteria, the participant was considered mestizo. We explored risky sexual behaviors and looked for risk factors for acquiring infection through blood and syringes, such as transfusion and surgery history. We gathered information regarding breastfeeding practices: how long people were breastfed and how long women breastfed their infants. We included questions about surrogate breastfeeding practices. We asked for symptoms and diseases that could be related to HTLV-1 infection, such as ATLL, HAM/TSP, infective dermatitis, strongyloidiasis, crusted scabies, and tuberculosis. We actively searched for HAM/TSP symptoms and screened patients for trouble walking, trouble getting up from a chair, and urinary incontinence. If HAM/TSP symptoms were found, a detailed physical examination was done. The diagnosis of HAM/TSP was made using the diagnostic criteria proposed by De Castro-Costa et al.[20] We also enquired about HAM/TSP-like symptoms in direct relatives.