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Chapter 3

Ebola Preparedness and Risk in Latin America

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Abstract

Until today, February 22, 2016, no confirmed Ebola cases have been diagnosed in Americas (except USA, four cases with one death). Confusion, lack of knowledge, and fear have led to quickly misclassify cases as suspected, when in fact most of them are false alarms. Nevertheless, European governments summoned to mobilize resources to attend the Ebola outbreak in West Africa. And also Latin American governments should contribute to halt this humanitarian crisis and to be prepared for the potential arrival of this deadly virus in the Caribbean, Central, and South American mainland. In this chapter, we described the experience of preparedness as well as risk assessment done in Latin America regarding the threat of Ebola for the region.

Keywords: Ebola, preparedness, risk assessment, travel medicine, Latin America

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1. Introduction

Ebola virus (EBOV) was the second genus of the Filoviridae family to be discovered. This negative-sense, single-stranded RNA virus was first identified in 1976 following two simultaneous outbreaks in Zaïre (now known as the Democratic Republic of Congo) and Sudan [1–4]. Since then, at least 25 subsequent outbreaks, including the ongoing outbreak in West Africa, have occurred and various EBOV species have been identified with genetic and virulence variability and still unknown pathogenesis. Before 2014, none of those epidemics implied imported cases outside Africa, with its multiple implications [1–9].

Nowadays, the ongoing outbreak (almost finished) in West Africa has been the largest reported in history, and from a global health perspective, it showed again how poverty, cultural practices, and weak and unprepared health systems could interact exacerbating infectious disease spread, limiting its control and mitigation, and the importance of travel in a globalized world, since this was the first outbreak in which EBOV cases and transmission were reported outside of Africa [5, 6, 8].

This outbreak has challenged global capability of response of world policymakers to organize and implement resources in an impoverished and previous overlooked area, it taught the implication of reactive rather than proactive health systems organization, and in a setting of unpreparedness and lack of knowledge, social media played an important role in spreading unfounded fear through false alarms [5, 6, 8].

Until today, February 14, 2016, a total of 28,639 cases and 11,316 deaths (case fatality rate [CFR %] of 39.5%) were reported according to the World Health Organization (WHO) report of February 17, 2016 [10]. The majority of these cases and deaths occurred between August and December 2014, after which case incidence declined apparently associated with scale-up of treatment, isolation, and safe burial.

In the last 21 days, zero cases were reported in the implicated countries (Guinea, Liberia, and Sierra Leone) and on November 7, 2015, December 29, 2015, and January 14, 2016, the WHO declared that human-to-human transmission of Ebola virus has ended in Guinea, Sierra Leone, and Liberia, respectively, if no further cases appear, entering in a period of heightened surveillance, putting these countries in the way on recovery, and giving the chance of getting essential health services backup and to address weaknesses to rebuild a resilient health system [10].

Likewise, there were a total of seven cases reported outside of African continent with one death at USA [10]. Countries involving imported cases outside Africa have been Italy, Spain, United Kingdom, and USA (each one with one case, except USA with four cases) [11] (**Figure 1**), without truly suspected cases in Latin America and the Caribbean (LAC) [6–13].

Nevertheless, European governments summoned to mobilize resources to attend the Ebola outbreak in West Africa during the peak of the epidemics [14–16]. But also LAC governments have been called to contribute to halt this humanitarian crisis and to be prepared for the potential arrival of this deadly virus in the Caribbean, Central, and South American mainland,

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particularly during the peak of the epidemics in Africa. In this chapter, we described the experience of risk assessment as well as preparedness done in Latin America regarding the threat of Ebola for the region.

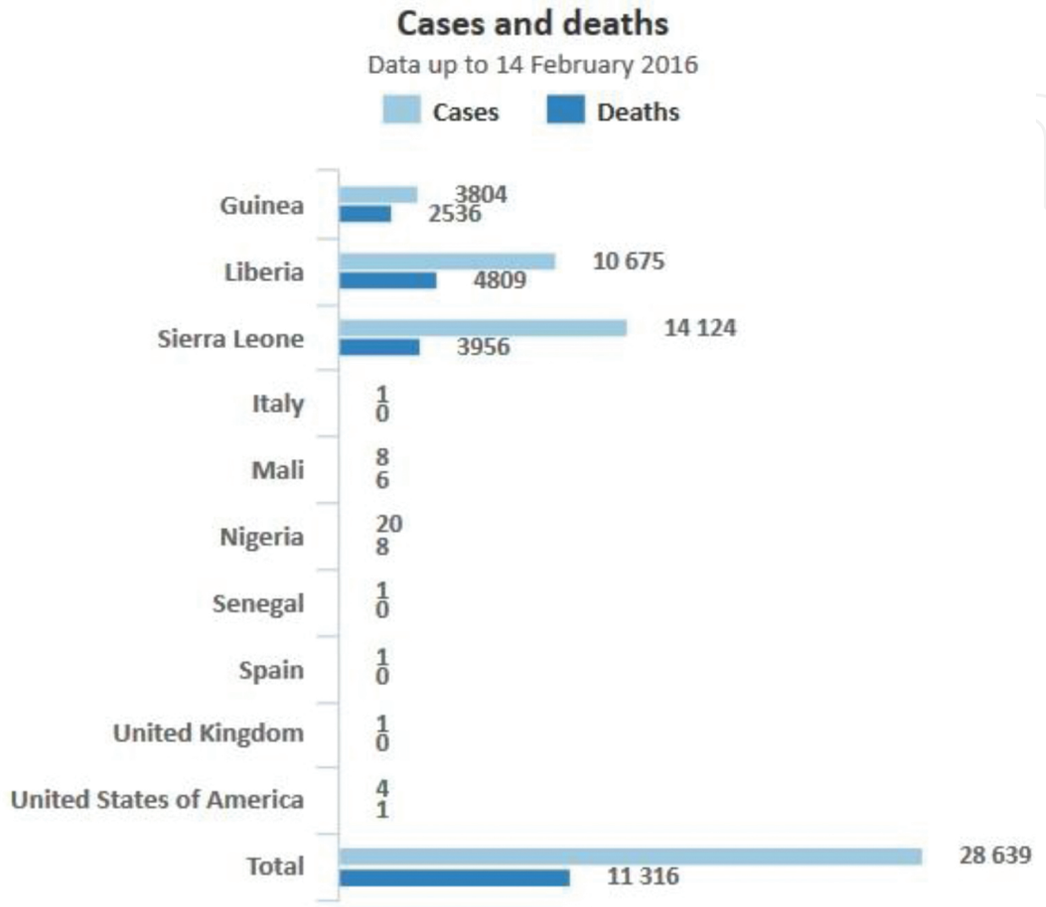


Figure 1. Confirmed, probable, and suspected EVD cases worldwide. From: WHO Ebola Situation Report – February 17, 2016.

2. Risk assessment

Some studies have provided perspectives on the potential for Ebola virus disease (EVD) to spread across international borders via commercial air travel [17–20]. However, they have only focused on top international destinations in Africa, Europe, Asia, and North America. Recently, we have assessed this for Latin American countries.

During the peak of the epidemics, we gathered epidemiological data from the Ebola response roadmap situation report of the World Health Organization (WHO) (for October 29, 2014) [20]. We included Sierra Leone, Guinea, and Liberia as officially affected regions by the EVD epidemics. Because data concerning commercial air travel out of Guinea, Liberia, and Sierra

Leone to LAC countries were unavailable, we used population migration data from the United Nations' international migrant stock by destination and origin database (estimates of the international migrant stock exodus for the midpoint [1 July] of each year: 1990, 2000, 2010, and 2013). We assessed the number of people migrating from Guinea, Liberia, and Sierra Leone to LAC countries in years 2000, 2010, and 2013. We also included within those numbers all potential returns of previously deployed persons from LAC countries to affected West African nations. We took the maximum number of migrating people from West African countries to LAC during those three years, as the potential number of people migrating in 2014, followed by an estimation on the prevalence of EBV in source countries (cases/100,000 pop and %), based on WHO reports and official population estimates, gathered from the World Bank registry data. We assumed a random distribution of prevalence among population as equal for migrating people in order to calculate the number of potential persons migrating with EBV to CSA countries [8].

Up to October 29, 2014, WHO reported 13,676 cases of EBV, with 6535 cases from Liberia, Sierra Leone (5235), and Guinea (1906). During the last 21 days, 1433 active cases were reported in Sierra Leone, 867 in Liberia, and 666 in Guinea, revealing prevalence rates for this period of 23.52 cases/100,000 pop (0.0235%), 20.19 cases/100,000 pop (0.0202%), and 5.67 cases/100,000 pop (0.0057%), respectively [8, 20].

Based on those prevalence rates and assuming migration numbers would be similar for 2014, we estimated the potential number of people with EVD relying on each country's individual prevalence, which resulted in a probability of less than 1 possible EVD case potentially arriving to LAC countries. Assuming the same prevalence of active cases, migration should increase up to 4255 persons/year from Sierra Leone, 4950 from Liberia, and 17,544 from Guinea, to reach at least 1 case in some Latin American countries [8].

Previous reports estimated that one infected international air traveler would leave Guinea every 2.7 months, Liberia every 0.2 months, and Sierra Leone every 0.6 months [17–20]. However, such numbers may represent an underestimate of the real situation if we take into consideration the fact of potential cases originating from the shipping sector and spreading through maritime transport. In addition, connection flights (e.g. Bogota, Colombia to Monrovia, and Liberia with connections at New York, USA, and Casablanca, Morocco) may increase the odds of affected passengers to reach Latin America from these countries by connecting through such alternate bridging destinations [8].

Based on the aforementioned facts, the possibility of EVD spreading to Latin America raises concerns in regard to the capacity of healthcare institutions and laboratories in the region to provide adequate facilities, competently trained healthcare staff, acceptable infection control measures and equipment, supplies, protocols and resources to provide effective disease management, diagnosis, and overall containment strategies [6, 8]. Previously, WHO published the public health actions for early detection and prevention of transmission of Ebola and Marburg viruses. Even in a low-risk setting, there are significant concerns over whether Latin American countries are ready to face EVD within their vulnerable healthcare systems [6, 8]. Fortunately, after the epidemics in Africa, none confirmed cases nor real suspected cases arrived to Latin America, although most countries in the region, particularly Brazil and

Colombia, were prepared for the arrival, developed national guidelines for preparedness, and managed some false alarms properly, in most of the cases.

3. Preparedness

We acknowledged a huge need for field-based laboratories, epidemiological and microbiological surveillance resources, diagnostic equipment, and mobile communications software as well as other technological assets. As revealed by the ongoing chikungunya and Zika epidemics [21–25], LAC is particularly vulnerable to infectious disease spreading given that there is a lack of appropriate healthcare infrastructure to tackle a challenge of such dimensions, particularly from airborne (e.g. Influenza H1N1 in 2009) and vector-borne diseases [22, 26]. However, regarding the collaboration to intervene the crisis, it is important to highlight that the Cuban government sent a team of 165 highly trained healthcare professionals to assist and mitigate the epidemic, being, so far, the largest medical team that any single foreign country sent out to the field, from LAC to Africa [6, 8].

Besides that, the Pan American Health Organization (PAHO) [15], along with the WHO, have recommended nations to implement measures based on surveillance [20], laboratory diagnosis, case management, infection prevention and control, clinical management and awareness and communication. This in order to be prepared and to have an appropriate response to the hypothetical arrival of EVD to LAC, which as has been mentioned, was expected to be low to very low [6, 8]. Although early detection, tracing, and isolation of truly suspected cases and contacts would limit the risk of disease spread, the proper laboratory assessment and sample management will be restricted given the lack of trained health personnel, protective equipment, and adequate transport particularly in some highly densely populated areas, where poverty and deficient basic services constitute a melting point for the development of potential outbreaks. Health personnel must be capable to manage risk group 4 pathogen, as EBOV, and must account with protective equipment like non-sterile gloves, masks, goggles preferably with an anti-fog visor and apron or waterproof apron, disposable if possible [6, 8, 16, 18]. Additionally, staff in charge of handling and transporting the samples must account with a certification by the International Air Transport Association for shipping and handling Category A infectious substance in order to send samples to the only two laboratories in the region that can receive them: the National Center for Emerging Zoonotic Infectious Diseases (NCEZID), Centers for Disease Control and Prevention (CDC) and Zoonotic Diseases and Special Pathogens, National Microbiology Laboratory, Infectious Disease and Emergency Preparedness Branch Public Health Agency of Canada. Furthermore, as opposed to Europe, where BSL-4 (BSL-4) laboratories network already exists, LAC still requires a significant increase in technical partnership as well as other resource capabilities, BSL-4 in LAC are scarce what has limited the work with other important BSL-4 required viral pathogens endemic to the region, such as hantaviruses in the past and in the middle of current of cases of this zoonotic viruses in Chile and other countries in the region [6, 8, 16, 18].

On the other hand, if EBOV arrives to LAC, it would pose an immense diagnostic challenge in a region where endemic viral hemorrhagic fevers exhibit remarkable similar clinical

findings. Distinguishing cases of Guanarito (Venezuela), Machupo (Bolivia), Junín (Argentina), and Sabiá (Brazil) viruses from Ebola, as well as from other highly prevalent infections such as yellow fever, dengue with hemorrhagic manifestations, leptospirosis, and typhoid fever, among others, will constitute an ever-increasing challenge. Point-of-care testing using a biothreat panel like the BioFire diagnostics BioSurveillance system would be useful for screening highly suspicious cases, while at the same time, providing an automated sample-to-answer diagnostic platform in areas with lack of healthcare trained personnel, even though rapid diagnostic test use is discouraged given its low specificity. We still do not know how such tests would perform in a non-prevalent Ebola region, and at the same time, it could be cost prohibitive for many governments in the hemisphere [6, 8, 16, 18].

Otherwise, the clinical management of those suspected and confirmed cases should be at designated hospitals that must comply with contact isolation conditions, ideally individually and not by cohorts of suspected or confirmed cases, appropriate provisions of personal protective equipment, and health services with personnel trained in infection prevention and control [6, 8, 16, 18]. These characteristics probably are lacking even in some intermediate cities of LAC forcing to translate patients to places where these are attained and making to consider that transport of those patients needs special protective measures too. Even more, healthcare institutions should start joining efforts to design preparedness and response programs in order to revamp or build up de novo infrastructure to properly address suspicious cases and prepare healthcare professionals for caring of confirmed Ebola-infected patients. It is also important to coordinate this LAC response to Ebola with the guidance of the regional multilateral health organisms: The PAHO should lead this process; and the recently created South American Institute of Government in Health (www.isags-unasur.org) and the South American National Institutes of Health Network could demonstrate their ability to recruit and materialize resources for global health [6, 8, 16, 18].

The call for attention that was the EBOV outbreak highlighted the importance of proactive organization of health systems particularly in those settings in which poverty, social inequality, and lack of basic healthcare services and facilities could limit action when an infectious disease has established [6, 8, 16, 18]. Many countries in LAC have proved its restraints in infectious disease control, as recently reported for malaria, dengue, chikungunya, and Zika in Venezuela, and its social and economic context can act as boosters for infection spread [22, 26]. As taught, the entire world needs to turn out its look and watch for those impoverished areas before crisis, searching to close gaps in order to reach fairer societies.

Latin America is endemic for many febrile infectious diseases conditions; then, signs and symptoms of EVD may overlap with other acute viral hemorrhagic fevers like dengue, chikungunya, and now Zika posing a challenge at the time of diagnosis [9]. Despite the low-risk for a local outbreak in LAC, the possibility of an imported case always remains latent [6, 8]. Thus, in light of such hypothetical epidemiological scenario, we also considered that assessing knowledge and perceptions among healthcare students and workers about the epidemiology, transmission, and clinical manifestations of Ebola in a country like Colombia is of utmost importance; particularly, taking into account that before the 2014–2015 epidemic, no information concerning EVD was available in Colombia's public health surveillance

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program [9]. Then, an observational, descriptive, cross-sectional study was conducted among 107 healthcare workers attending the symposium "What we should know about Ebola?" (organized by the Coffee Triangle regional chapter of the Colombian Association of Infectious Diseases and the Universidad Tecnológica de Pereira) held in October (2014) in one city of Colombia: Pereira, Risaralda [9]. Attendees who agreed to be part of the research (convenience sample) filled out a basic knowledge questionnaire, which included aspects on the epidemiology, symptoms, and prevention of the disease (five questions). Questionnaires were completed before and after the event. Statistical analysis was performed using the SPSS statistical package, version 19.0. A chi-square test ($p < 0.05$) was run to assess the significance and compare observed frequencies of correct answers before and after the symposium. The results obtained for each individual question revealed an increasing statistical significance when comparing presurvey to postsurvey answers ($p < 0.05$), highlighting the pivotal role of disease prevention, surveillance, preparedness, and response informational resources [9].

As healthcare workers, it is essential to rely on complete and updated information about emergent diseases such as EVD, a disease which has recently been cataloged by WHO as an international public health emergency. Unfortunately, to date, many aspects on the basic ecology, transmission, and pathogenesis of the disease remain unclear. The possibility that different species of bats and primates endemic to the New World could serve as hosts for the virus remains a lurking possibility, as well as a threat to the possible arrival of this disease to the Americas [9].

A lack of experience on how to recognize its signs and symptoms as well as how to approach and manage outbreaks still remains a challenge in most affected countries and a most inherent peril to unaffected regions. All in all, it is imperative to call for awareness and prepare to handle and recognize this disease, for which world class organizations like the CDC and WHO have already issued the necessary guidelines on how to prevent possible epidemics through early recognition of cases, as well as how to achieve prompt institution of containment measures [9].

Due to a lack of efficient healthcare policies and systems, Latin American countries are particularly vulnerable to infectious diseases, as it has been shown with other endemic infectious maladies such as chikungunya, Zika, and malaria [22–26]. In view of this, besides preparing for preventive and interventional actions, educational resources should also aim to battle the negative impact of misinformation and fear, which may lead to jitters as a consequence of false alarm cases which occurred in fact in LAC in the middle of the epidemics of EVD in Africa [6–9].

Informational and educational tools play on improving knowledge about clinical manifestations and disease management among caregivers residing in non-affected areas, as well as how to respond if challenged to face such an unlikely event, in this case, in LAC [9].

4. False alarms

During the epidemics of Ebola in Africa and the arrival of imported cases to Europe and North America, fear and alert were combined in LAC regarding the potential arrival of suspected

cases of EVD in this region [6–9]. As consequence of that, confusion, lack of knowledge, and fear led to quickly misclassify cases as suspected, when in fact most of them are false alarms. Latin America was challenged with false alarms of "suspected" cases of EVD that not met the criteria to be classified as real suspected cases.

Our group assessed false alarms and suspected cases in the Americas of EVD, based on online available information on such cases. Analyzing online news information sources, data on suspected cases were collected and the WHO Ebola fever suspected case definition reviewed in order to classify them as suspected or false alarms.

Until April 1, 2015, 67 reports, containing 232 suspected or false alarm cases, were retrieved from the Web in 25 American countries. From them, 79.1% corresponded to false alarms and 20.9% suspected cases (WHO complied definition). From false alarms, only 18.9% came from Sierra Leone (13%), Liberia (4%), or Guinea (2%), but none of them presented symptoms during last 21 days (**Figure 2**). Although those cases not met the definitions, were considered suspected cases and then reported as that. From real suspected cases (14), all came from Ebola endemic places (28.6% Nigeria, 21.4% Guinea, 7.1% Liberia, 7.1% Sierra Leona), all of them with symptoms (mostly fever) during the last 21 days (**Figure 3**).

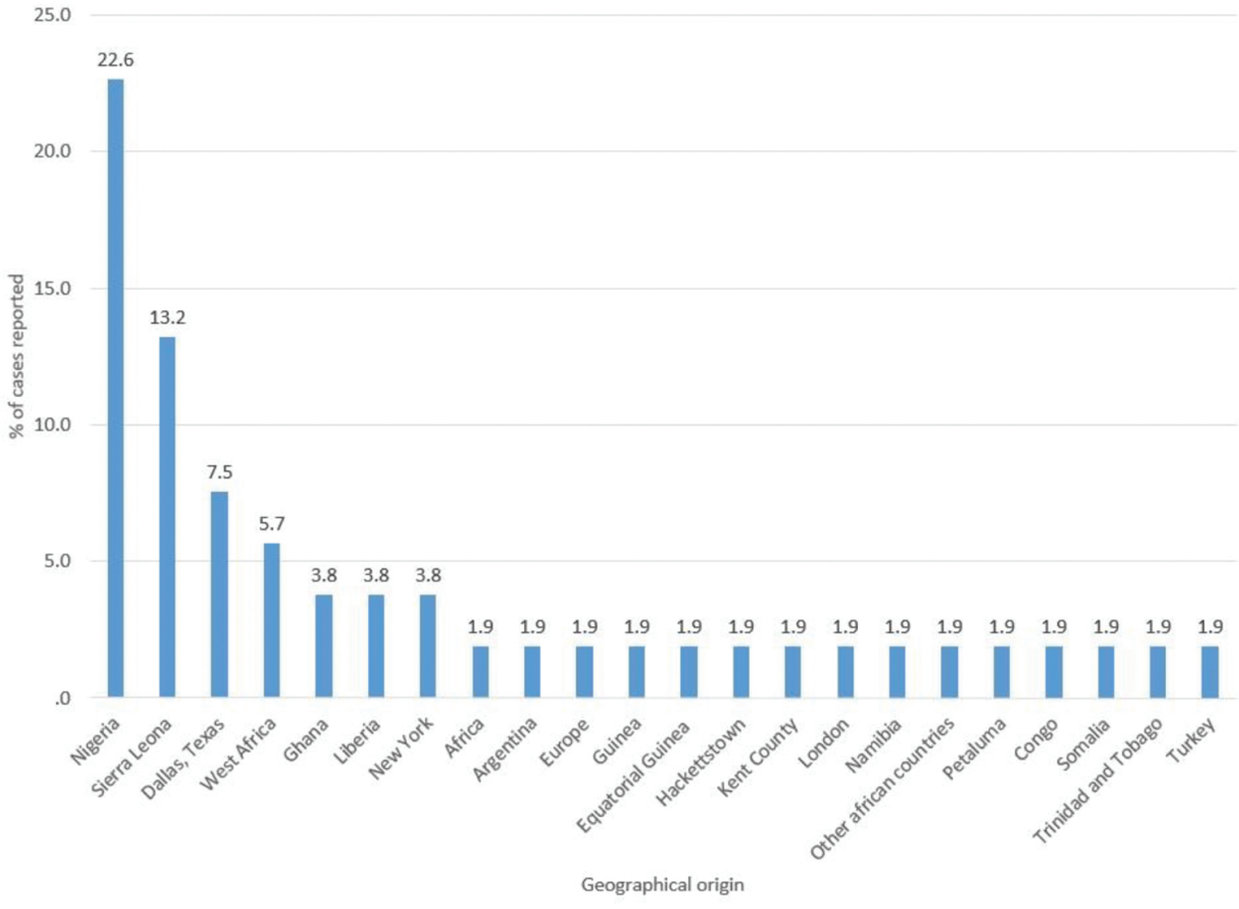


Figure 2. Geographical origin of the false alarm cases.

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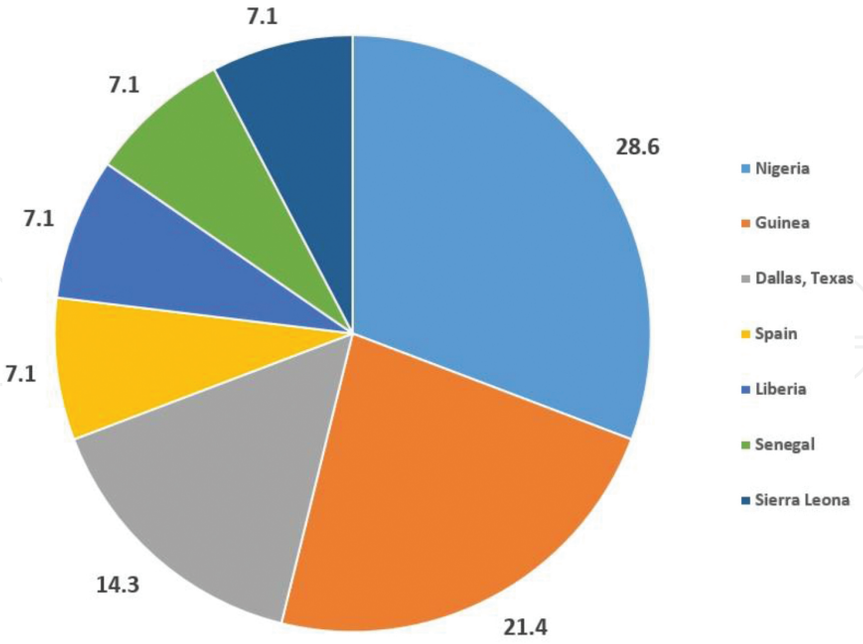


Figure 3. Geographical origin of the suspected cases (met WHO definition of suspected case).

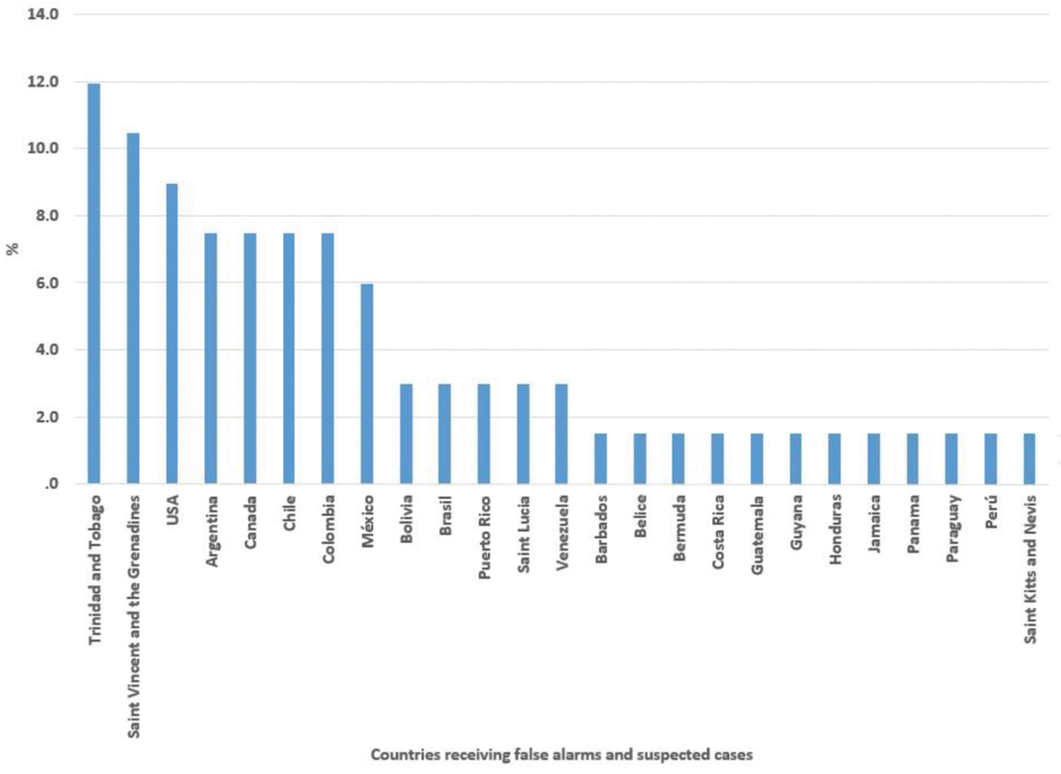


Figure 4. Countries receiving false alarms and suspected cases.

With regard to the countries receiving these cases (suspected and false alarms), most corresponded to Trinidad and Tobago (11.9%), followed by Saint Vincent and the Grenadines

(10.4%), USA (9.0%), Argentina (7.5%), Canada (7.5%), Chile (7.5%), Colombia (7.5%), and Mexico (6.0%) (**Figure 4**). These findings were consistent with the risk assessment previously performed based on the migration and travel patterns from EVD risk countries from Africa to potential countries in LAC region, as described.

Although the possibility of Ebola spreading to Latin America always has been low, as previous models have shown, concerns in regard to the capacity of healthcare institutions and laboratories in the region are real. Even more, healthcare workers in the region are not prepared at all. Then, actions include reinforcement of infection control actions in healthcare settings and access to high-quality diagnosis testing, among others, should be enhanced.

The world experienced the largest epidemic of EVD known in extension and duration to date, since the virus was first identified back in 1976, with cases being reported beyond African borders [1–10, 20]. There was, as a consequence, a sharp increase in the number of research and publications related to vaccine candidates and the immunological aspects of EVD, among other aspects [1, 6, 8]. Although not particularly affected by a large number of cases in this current outbreak, the United States has played historically and continues to play on Ebola research, although other countries have also contributed. Also, cooperation played a key role among different nations, particularly between African, European, and North American countries, but this should be enhanced for future epidemics as already occurred in 2014, considering also the possibility in the future of suspected cases in Latin America and the Caribbean [1, 16].

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