

# Seroprevalence of Zika Virus in Moroccan Travelers (From Cote D Ivoire; Mali)

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## Abstract

## Original Research Article

**Introduction:** Zika virus (ZIKV) is an arbovirus of the Flaviviridae family that is usually transmitted through the bite of infected mosquitoes. WHO declared Zika virus disease a public health emergency of international concern on 1 February 2016. In Morocco, the risk of introduction of arboviruses is linked to the risk of entry of patients from endemic areas and the risk of introduction or presence of competent vectors. Our study aims to identify the seroprevalence of the Zika virus among Moroccan travelers who have stayed in endemic countries, and to highlight the risk of introduction of viral diseases previously absent in Morocco. **Materials and Methods:** This is a prospective and descriptive study involving 51 travelers who stayed in Zika virus endemic countries (Angola and Guinea-Bissau) for at least 6 months in 2024. The travelers benefited from serological tests for anti-Zika virus antibodies of the IgG and IgM type using the chemiluminescence technique by the VirClia machine. **Results:** The travelers are aged between 22 and 47 years old with a male predominance with 49 men against 2 women and a sex ratio of 1/24.5. Among the 51 travelers, 3 are séropositive with a general seroprevalence of 5.8%. THE 3 séropositive travelers are male and have stayed in cote d ivoire. **Conclusion:** The seroprevalence of Zika virus in Moroccan travelers is important to highlight the current status of this virus in Morocco and prevent its emergence. This should push for investment in vector control strategies, eradication of mosquito breeding sites, targeted spraying of insecticides and awareness of travelers to prevent future epidemics, and encourage vaccination as soon as it is available.

**Keywords:** Zika virus (ZIKV), Seroprevalence, Moroccan travelers, Arbovirus, Vector control.

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## INTRODUCTION

Zika virus (ZIKV) is an arbovirus of the genus Flavivirus and family Flaviviridae. ZIKV infections in humans are sporadic before emerging in the Pacific and the Americas. ZIKV is usually transmitted by the bite of infected mosquitoes [1]. The ability of *Ae. aegypti* and *Ae. albopictus* mosquitoes to transmit ZIKV is a major public health concern,

Sexually transmitted, perinatally transmitted, and blood transfusion-transmitted ZIKV infections have been described. ZIKV infections in pregnant women can lead to spontaneous miscarriage, intrauterine growth retardation, and microcephaly in newborns [1,2].

The development of a vaccine or treatment is of crucial importance for health structures.

In Morocco, the risk of introduction of arboviruses is linked to the risk of entry of patients from endemic areas and the risk of introduction or presence of

competent vectors.

The objective of our study is to assess the seroprevalence of the Zika virus in Morocco in a young and active population of travelers who have stayed in endemic countries and to highlight the risk of introduction of new viral pathologies in our country.

## MATERIALS AND METHODS

This is a prospective and descriptive study which concerns 51 Moroccan travelers who stayed at least 6 months in 2024 in countries endemic to the Zika virus (cote d ivoire, mali).

The 51 travelers benefited from a serological test for the Zika virus (IgM and IgG) from a venous sample in a dry tube with separator gel without anticoagulant.

Once the samples were collected, they were transported and analyzed at the bacteriology and

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virology laboratory of the Avicenne military hospital in Marrakech, Using the chemiluminescence technique, the VirClia machine can detect the presence of anti-Zika IgG and IgM antibodies.

The results and collected data are imported into an Excel spreadsheet for analysis.

## RESULTS

In our series, travelers are aged between 22 and 47 years old with an average age of 30.5 years. The majority of our travelers are male with 49 cases or 96% against 2 female travelers or 4%. 26 travelers stayed at the cote d ivoire against 25 travelers who stayed at mali. For general seroprevalence: (Table 1), 3 travelers are seropositive, i.e.5.8 % And 48 travelers are séronégative either94.2%.

The combined results of the IgG and IgM tests showed: two traveler is seropositive for both types of antibodies, one traveler is seropositive for IgG alone, No traveler seropositive for IgM aloneAnd 48 travelers are seronegative for both types of antibodies.

Regarding seroprevalence according to age:

- From 18 to 24 years old: two traveler is HIV positive and 12 travelers are HIV negative
- From 25 to 34 years old: the 21 travelers are HIV negative
- From 35 to 44 years old: one traveler is HIV positive and 14 travelers are HIV negative
- From 45 to 54 years old: both travelers are HIV negative

The results of seroprevalence according to sex were as follows:

- For the male gender: 3 travelers are séropositive either 5.8% And 46 travelers are séronégative, i.e. 92%
- For the female gender: both travelers are seronegative

Seroprevalence according to the country of stay showed that Among the 25 travelers staying at the cote d ivoire, 3 travelers are HIV positive either 12 % and 26 travelers are séronégative either 88%, The 25 travelers staying at mali are séronégative.

**Table 1: General results of Zika virus seroprevalence**

Demographic characteristics			Seroprevalence results	
Criteria		Number (%)	Positive results	Negative results
Age	18-24	13 (25.4%)	2(15.38%)	11 (84.62%)
	25-34	21 (41.1%)	0 (0%)	21 (100%)
	35-44	15 (29.4%)	1 (13.3%)	13 (86.7%)
	45-54	2 (4%)	0 (0%)	2 (100%)
Sex	Male	49 (96%)	3 (8%)	45 (92%)
	Female	2 (4%)	0 (100%)	2 (100%)
Country of stay	Mali	26 (50%)	0 (0%)	26 (100%)
	Cote d ivoire	25 (50%)	3(12%)	21 (84%)

## DISCUSSION

The virus Zika (ZIKV) is an arthropod-borne virus (arbovirus) belonging to the genus *Flavivirus* and the family *Flaviviridae* [3].

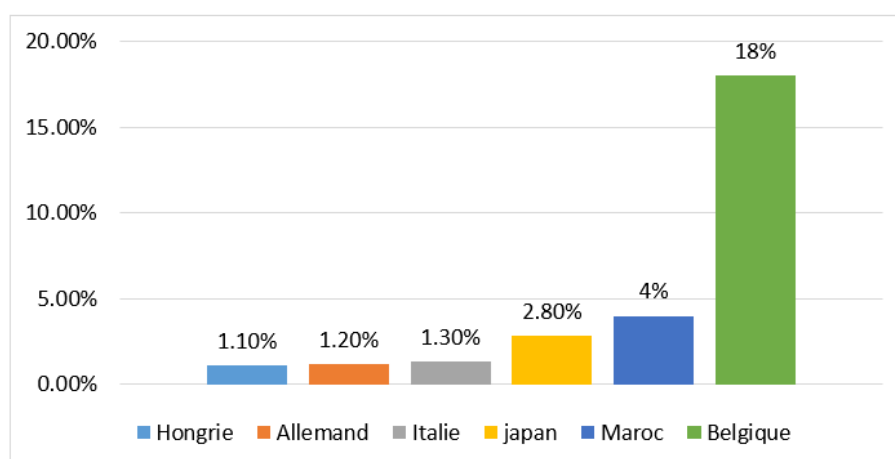
For our study within the bacteriology and virology laboratory of the Hospital Military Avicenna of Marrakech, 3 travelers are séropositive with a prevalence of 5.8%.

Comparing our study with similar international studies (Figure 1), we note a higher rate compared to the

study of Loconsole *et al.*, (1.3%) in Italy [4], the study of Nagy *et al.*, (1.1%) in Hungary [5], the study of Dammermann *et al.*, (1.2%) in Germany [6] and the study of Kitro *et al.*, (2.8%) in Japan [7].

On the other hand, we note a lower rate compared to the study of Huits *et al.*, (18%) in Belgium [8].

This difference in seroprevalence between studies can be explained by the difference in study periods, countries and length of stay of travelers as well as the difference in diagnostic techniques used.



**Figure 1: Zika virus seroprevalence among travelers in our study compared to international studies**

The 3 séropositive travelers in our study are male with a percentage of 100%, the same percentage is observed in the study conducted in Italy (100% of HIV-positive travelers are male).

In the study conducted in Hungary, 85.7% of HIV-positive travelers were male, while 14.3% were female. This result is consistent with that of the study conducted in Belgium, which showed a rate of 77.8% of HIV-positive male travelers compared to 22.2% for females.

The authors explain this difference by a cultural custom, according to which men tend to remove their shirts during periods of heat, which exposes them all night to mosquito bites and the diseases they can transmit.

In our study, the average age of travelers who tested positive was 30.5 years, which is consistent with the average age of the Belgian study, with an average of 29 years, and the average age of the Hungarian study, with an average of 38.2 years.

During the 6 months, 26 travelers spent their stay in the city of abidjon (cote d ivoire), while 25 travelers spent their stay in the city of bamako (Mali). Studies have shown that mosquito-borne viral infections in Cote d ivoire increases over time and space.

*Aedes aegypti* and *Ae. simpsoni* have been confirmed as the main vectors of most mosquito-borne viral infections. Heavy rainfall, human displacement, forest encroachment, and deforestation have been recognized as triggers for the spread of mosquito-borne viruses in cote d ivoire [9].

For Zika virus, a study of 978 blood samples collected between 2013 and 2014 showed that 34 samples (3.5%) were positive for Zika antibodies, detected by the ELISA method [10].

Three complete ZIKV genomes were isolated between 1976 and 1980 in the Republic Central African Republic. The three viruses were isolated from two mosquito species: *Aedes africanus* and *Ae. Opok* [11].

In Morocco, *Aedes aegypti* is already mentioned among the mosquitoes recorded in Morocco, although the last observation of this species dates back to 1949.

*Aedes albopictus* was recently detected in Morocco in Rabat in 2016 [78]. This constitutes the first observation of *S. albopicta* in Morocco and the first documented case of an established population in North Africa [12]. The authorities launched an entomological survey in Rabat and Casablanca in 2017 [13].

This study examined the area where *Aedes albopictus* was reported in 2016 in Rabat, as well as other areas considered at risk, including residential areas with a high population of European expatriates and places where the population perceives daytime nuisances in Rabat and Casablanca [13].

## RECOMMENDATIONS

Recommendations have been established to optimize and/or prevent the transmission of the Zika virus starting with Vector control by eliminating mosquito breeding areas by eliminating accumulations of standing water such as abandoned containers, used tires and clogged water pipes. Spraying insecticides and using larvicides on potential breeding sites and when outdoors, especially during times when mosquitoes are most active (dusk and dawn), wear long-sleeved shirts, pants and socks.

Encourage travelers to get vaccinated against Zika when the vaccine is available, recommended for their destination and Monitor returning travelers for signs of Zika and recommend that they seek medical attention without delay. Surveillance activities should be carried out to detect and report Zika cases quickly using accurate diagnostic tests to confirm Zika virus infections.

Continuing education for healthcare professionals on Zika virus diagnosis, treatment, and control strategies is essential. Furthermore, access to diagnostic tests, essential medicines, and supportive care for Zika patients must be ensured.

And finally environmental management by including Zika prevention measures in climate change adaptation strategies, integrating mosquito control measures into urban planning and development projects to reduce mosquito breeding habitats and establishing effective waste management systems to reduce potential mosquito breeding sites.

## CONCLUSION

Our study in the bacteriology and virology laboratory of the Avicenne Military Hospital in Marrakech showed that the seroprevalence of Zika virus among Moroccan travelers is 5.8%. This result should not be overlooked, especially with the discovery of the presence of virus vectors in Morocco in 2016 and 2017 during the entomological survey conducted by our country.

The results of the study confirm the need to strengthen epidemiological and entomological surveillance. This should lead to investment in vector control strategies, the eradication of mosquito breeding grounds, targeted spraying of insecticides and raising awareness among travelers to prevent future epidemics, especially with the upcoming events organized by Morocco.

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