Zika: A Case Study

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Abstract. This manuscript analyzes Zika virus infection KAP among the fleet of Portuguese Navy ships. We developed a statistical ana those who have travelled in ZIKV endemic areas lysis, a cross-sectional study, that divided the study group into distinct groups traveling in ZIKV those travelling in ZIKV endemic areas endemic areas, and those traveling in non-ZIKV endemic areas. The present study evaluates the correct/incorrect answers off a questionnaire about knowledge, attitudes and practices related to Zika infection applied to those who travel to endemic areas of the Zika virus. The level of knowledge about ZIKV shows significant differences between different groups. Preliminary results are similar to other studies showing the need to implement a health education program on Zika infection in advance of possible future Zika virus outbreaks.

Keywords: Literacy · Questionnaire · Statistical Approach · Zika Virus · Infection

1 Introduction

During th fourth decade of the last century, when studying yellow fever in the Zika forest of Uganda, the Zika virus was identified in a rhesus monkey. The Zika virus belongs to the Flaviviridae family, genus Flavivirus (Sharma, 2020). In 1952, a human case of Zika infection was reported in Uganda (Dick, 1952)after three more cases of human infection during a jaundice epidemic in Nigeria (MacNamara, 1954).Between the 1960s and 1980s, cases of ZIKV infection were identified. With the large number of transcontinental flows that have occurred in recent decades, the spread of Zika grows exponentially. The authors (Zanluca, 2015) (Walddell L, 2016) prove that the increased dissemination of Zika contributes to a greater probability of genetic mutations and promotes the existence of a more resistant and epidemic potential. The spread of infection increases the possibility of genetic mutation in some pathogenic microorganisms. Authors (ECDC, 2016) (Cao-Lormeau, 2016). Evidence that the presence of ZIKV in distant local populations, combined with high migration rates, may result in longer

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viremia and more persistent virus in some body fluids. On mission, military navigators can become infected when visiting native locations. Under this potential problem, prevention policy is important, when military personnel need to visit ZIKV endemic sites where exposure to the virus may occur, disease prevention and health education are necessary. Knowledge, Attitudes and Practices (KAP) need to be evaluated in relation to this issue to develop intervention strategies through health education measures, correct attitude and preventive actions. Statistical analysis was carried out, first using some descriptive techniques, secondly using some traditional comparison tests, finally using generalized linear models to obtain predictive models), a cross-sectional study that, in addition to describing knowledge, attitudes and actions allow us. In the case of ZIKV, it allows comparing different study groups: those moving to Zika endemic areas, those who had travelled to Zika endemic areas. A questionnaire was used for these groups. The preliminary results are in line with similar studies that have been done before.

2 Preliminaries

2.1 Historical Note

Until 1977, cases of human infection with Zika were confined to tropical Africa. In India, Indonesia, Malaysia and Pakistan, spread of ZIKV has occurred, but without severity. Due to low severity, Zika infection is rarely reported in Asia (Kindhauser A, 2016) (Olson J, 1981). Outside of Africa and Asia, in Micronesia, the first reported human outbreak occurred in 2007, but without hospitalization. Until 2008, it was accepted that the infection was transmitted exclusively by the mosquito *Aedes aegypti* (Kindhauser A, 2016), but the first sexual transmission was reported in Micronesia in 2008. This was accompanied by rash, conjunctivitis, and arthralgia, but without hospitalization. As the authors point out (Kindhauser A, 2016) until this event, no human outbreak had been recorded and only 14 cases were isolated. Later, during 2013, a strong rate of infection occurred in about 70% of the population of French Polynesia, with neurological manifestations in infants (microcephaly) and adults (Guillain Barre syndrome [GBS]).

Later, in 2015, successive Zika outbreaks were reported in Brazil, first without associated complications and finally with cases related to GBS and a greater number of babies born with microcephaly. In the same year, an outbreak of Zika occurred in Cape Verde with no recorded neurological complications (Walddell L, 2016), (WHO/Europe, 2016), (Kindhauser A, 2016), (Olson J, 1981), (Sampathkumar P S. J., 2016), (Rabaan A, 2017).

Due to the number of confirmed Zika cases associated with microcephaly and neurological disorders, WHO declared Zika infection as a public health emergency of international concern (Sampathkumar P S. J., 2016), (Rabaan A, 2017), but later that year, warning has been removed. Almost simultaneously, the emergency committee proposed the following lines of action: surveillance of Zika virus transmission, long-term measures, travel-related measures, and information sharing (Who, 2016a).

Several studies have been conducted on knowledge, attitudes and practices regarding Zika infection. In (Pergolizzi, 2020), the results show that comprehensive national preventive health education programs are needed.

In (Darrow, 2018), a high level of awareness about the risk of Zika infection was evident, and most students reported taking steps to prevent exposure to the Zika virus. The results of the questionnaire are consistent with the fact that in 2016, the southern states of the United States reported outbreaks of the Zika virus (Sharma, 2020), (CDC, 2019), (Services, 2016).

We can easily find more similar studies from different places and authors: (Plaster, 2018), (Gregorio Jr., 2019), (Wishner, 2020), (Lim, 2020), (Rosalino, 2016).

2.2 Sample

The Portuguese Navy has 17 ships and two submarines, all capable of conducting international operations. To effectively carry out assigned missions while traveling outside Portugal, officers on board are exposed to many infectious agents and contribute to improving their health. This can be seen in Table 1 which shows several NRP ship destinations. In Fig. 1, you can see a map with some of the ports identified as particularly vulnerable to Zika transmission (PAHO/WHO, 2016). In this study, the NRP ship during the mission identified several ports with a history of Zika transmission in several countries such as Angola, Cameroon, Cape Verde, Gabon, Guinea-Bissau, Ivory Coast, Nigeria, Senegal, Indonesia, Thailand, etc. Some of the countries identified as ports of entry for NRP vessels (NRP - Navio da República Portuguesa (Ship from Portuguese Republic)) in this study were identified as countries with local Zika infection records in their missions: Angola, Cameroon, Cape Verde, Gabon, Guinea-Bissau, Ivory Coast, Nigeria, Senegal, Indonesia, Thailand.

Questionnaires are created, tested, modified, and used later. A pre-questionnaire was implemented to staff of Portuguese Navy frigate NRP Court-Real (the ship was docked at the naval base of Lisbon during preliminary trial) so we could confirm that questionnaires 1 and 2 were clear for prospective participants. Also relevance, placement and order of questions were evaluated. It was evaluated the relevance, position and order of the questions. After using this questionnaire trial, after the necessary corrections, the final version was ready. The target population selected to answer the questionnaires 1/2 is the embarked staff of selected ships described in Table 1.

Table 1. NRP Ships chosen to the study.

1. **Questionnaire to whom is going to navigate in endemic zones**
NRP D. Carlos I
NRP Figueira da Foz
NRP D. Francisco de Almeida
NRP Viana do Castelo
2. **Questionnaire to whom had navigated in endemic zones**
NRP Vasco da Gama
NRP Almirante Gago Coutinho
NRP Sagres

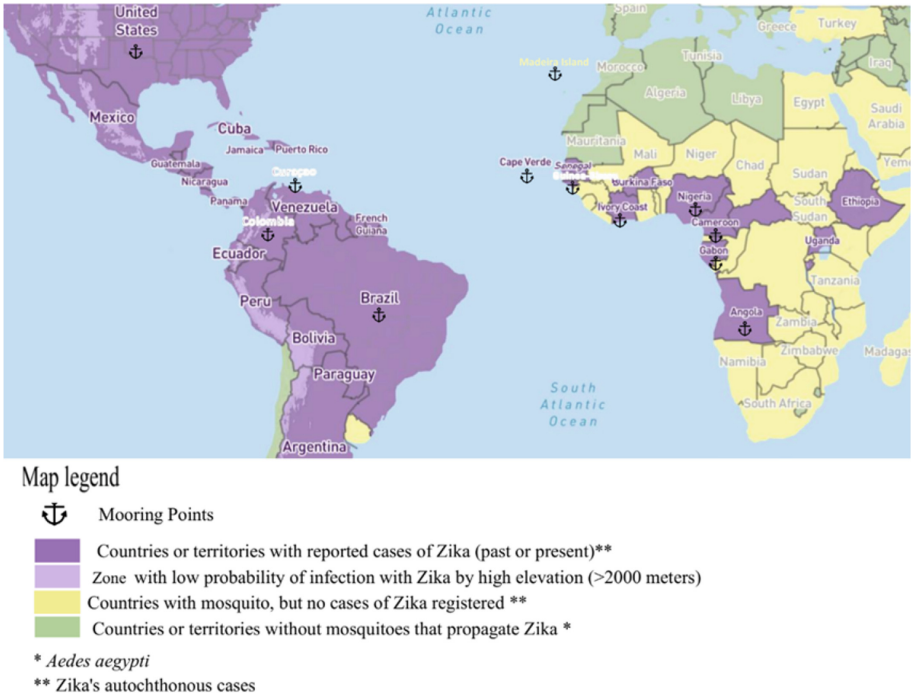

Fig. 1. Mooring ports of NRP ships considered in the study (map adapted from (PAHO/WHO, 2016)).

3 Empirical Application

It was given the approval to apply an adapted questionnaire available (WHO, 2016) and validated by the authors of (Rosalino, 2016). Some of these ships had returned from mission overseas, others were moored in preparation for departure on mission.

After the verification that questionnaires 1 and 2 were correctly understood by potential participants, a questionnaire was applied to each navigator from ship staff. Data collection is still being organized and analyzed. The present work is the continuation of (Faria J., 2019), (Faria J. T., 2019), (Teodoro, 2023) where some important results and a detailed discussion with the application of a factorial analyses to reduce the dimensionality of the problem can be already found. Here we analyze with detail some detail the sociodemographic information contained in questionnaire – part 1. Also, we analyze some questions from part 2 of questionnaire.

3.1 Socio-demographic Characterization (Questionnaire – Part 1)

Age

The population selected to respond to the questionnaires concerns the military belonging to the crews of some of these ships, with a total of 256 elements participating. This is

a relatively young population, with the majority between 20 and 39 years old, around 85.5%. The average age is 31 years old, with a standard deviation of 6.8, with 20 years old as a minimum and 49 years old as a maximum. As Fig. 2. Displays, the ages of the participants were stratified into three different classes.

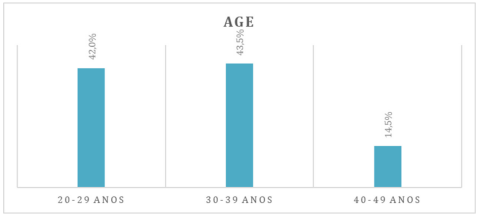

Fig. 2. Distribution of participants by age groups.

Gender

With regard to gender, there is a clear disparity between the participants, the majority being male (83.9%) – see Fig. 3. This disproportion between the two genders is a trend that has gradually been changing, given the will of military leaders in facilitating and promoting the inclusion of women in the Armed Forces. However, the fact that there is a large population of male elements, makes us aware of the need to develop more informative sessions on the disease, which focus on the practice of protected sexual relations after returning from missions in countries endemic for Zika.

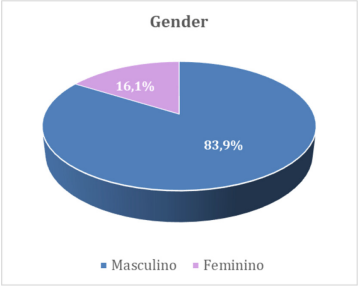

Fig. 3. Distribution of participants by gender.

Relativelly to participants' level of education, the majority (n = 161/63.1%) reported having completed the 12th year of schooling, followed by the 9th year (n = 38), Master's (n = 34) and degree (n = 22) (see Fig. 4).

Military Specialty

"Military specialty" refers to the area of knowledge to which each military member belongs, and consequently a series of specific normative functions are foreseen for each of them. Military personnel from 28 different specialties partic-ipated in the study The

four with the greatest participation were Navy/Maneuver (M), Marine (FZ), Electromechanical (EM) and Communications (C). The specialties participating in the study are displayed in Fig. 5.

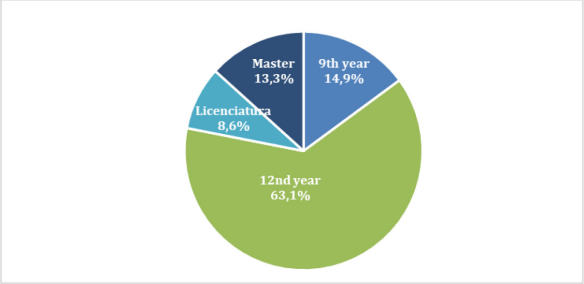

Fig. 4. Distribution of participants by level of education.

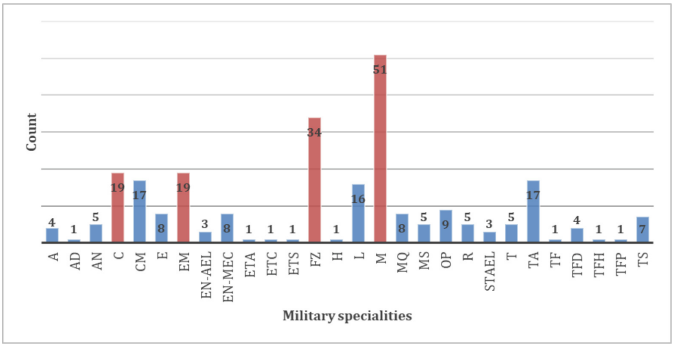

Fig. 5. Distribution of participants by military specialties.

The Navy/Maneuver classes are the ones with the highest number of individuals, possibly because the questionnaires were applied on the NRP Sagres, a sailing ship that only has men in its crew, and also because it is a sailing ship, the amount of elements of the Maneuver class is considerably higher than the rest.

3.2 Questionnaire – Part 2

Fever Causes

At the beginning of the second part of the questionnaire, participants were asked which of the following response options "*Zika/Dengue/Chikungunya*", "*Malaria*", "*Flu*" and "*Other*", could be the cause of an episode of fever during the course of of your missions. Only one participant belonging to the Pre-mission group filled in the "*Other*" field, having answered "*Yellow Fever*". Regarding the other answers to this question, about half of the participants in the Post-mission group answered the first two options

wrongly, not attributing a possible episode of fever to any of the mentioned arboviruses (*Zika/Dengue/Chikungunya* – 49.6%, n = 58 and *Malaria* – 46.2%, n = 54). Still in this group, only a small number of people (15.5%, n = 18) attributed a possible cause of fever to "*Zika/Dengue/Chikungunya*", similarly to the Pre-mission group, despite presenting a higher number, also had a small number of participants (35.5%, n = 49) putting these three diseases as a hypothesis for the cause of fever (see Fig. 6 And Fig. 7).

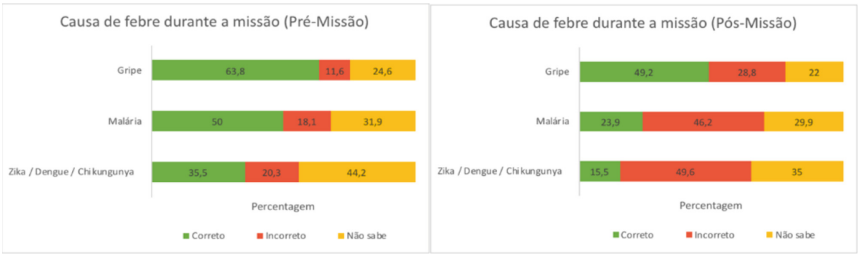

Fig. 6. Perception of the causes of fever during the mission (Pre-mission on left, Post-mission on right). (Color figure online)

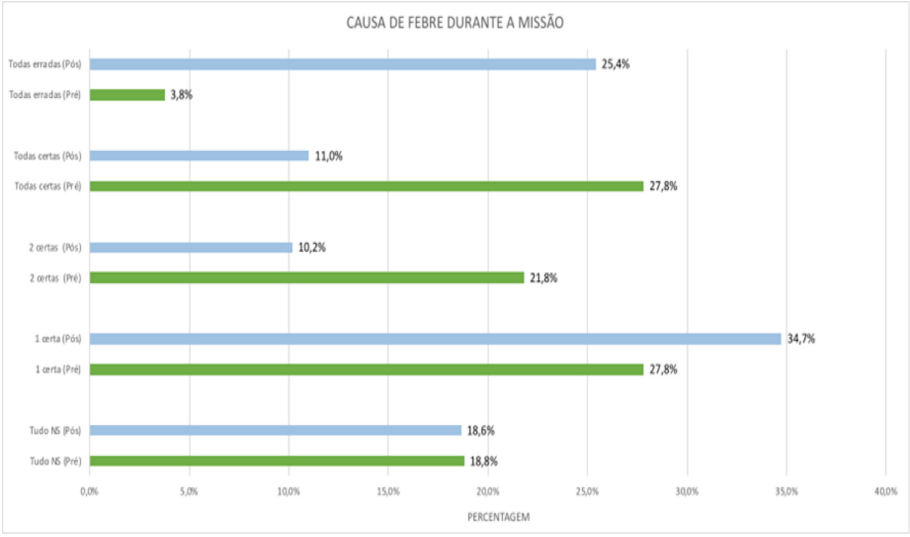

Fig. 7. Percentage of correct and incorrect answers for the fever causes questions (blue-pos-mission, green-pre-mission). (Color figure online)

Zika Knowledge

In question no. 2 of the second part of the questionnaire, the aim was to find out whether "Zika" was a familiar term for the participants, and if not, they should terminate their participation and hand the questionnaire over to the researcher. The next question aimed to find out which are the main sources of knowledge used to obtain information about

Zika, with five options being given with the possibility of answering "Yes" or "No" in each of them.

In the Pre-mission group, of the 138 participants, 65.9% reported having heard about Zika, with the majority (89%) obtaining information on the subject through TV, radio, newspapers and posters, placing the contribution of professionals health in third place, with 30.8%. As described in the articles by (Ricamonte B, 2018), (Binsaad Y, 2017), (Mouchtouri V, 2017), (Michael G, 2017) and (Gupta N, 2016), the participants in their studies also considered TV and radio as the main ways of obtaining information on Zika (79), (Ricamonte B, 2018), (Binsaad Y, 2017), (Mouchtouri V, 2017), (Gupta N, 2016) (Fig. 8).

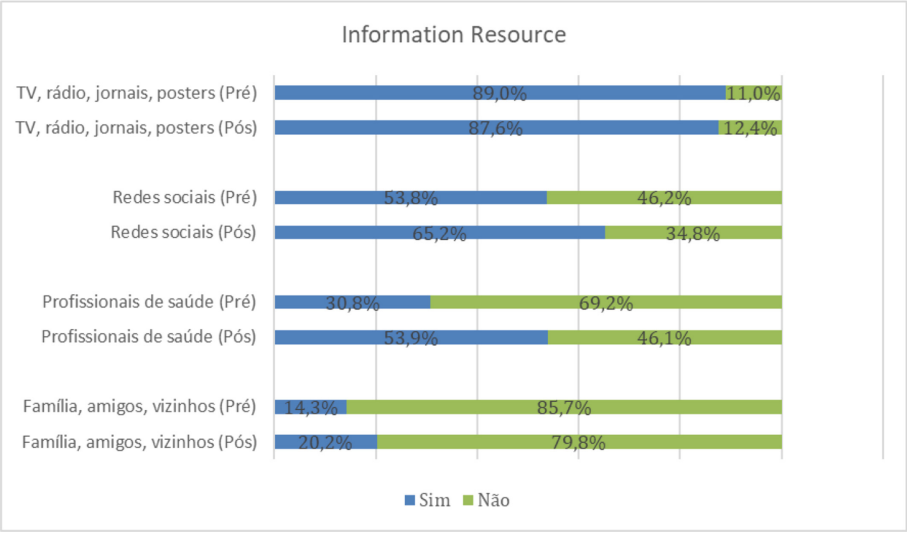

Fig. 8. Knowledge about "Zika" (blue -Yes, green-No). If Yes, how. (Color figure online)

The author of (Ricamonte B, 2018) even refers to the meager contribution of health professionals (8.8%) in terms of improving the knowledge of pregnant women in the Philippines, indicating the media (93.1%) as the main way of obtaining knowledge about the theme, suggesting in its conclusions the need for greater efforts on the part of health organizations in ord er to increase the awareness of the population and fill these gaps in knowledge, in order to promote favorable attitudes towards the infection.

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Regarding the Post-mission group, out of 118 participants, 75.4% reported having heard about "Zika", with the vast majority (87.6%) selecting the answer "TV, radio, newspapers and posters" as the answer. Main source of obtaining information about Zika, having selected health professionals in third place, with 53.9%.

With regard to health professionals, it is considered that the difference between the "pre" and "post" group may be related to the period of readiness that precedes the missions, which generally include lectures given by the nurse or doctor on board, lectures these that address issues such as health prevention, traveler's health and infectious diseases. We believe that this is a low percentage, with the need to improve the communication strategies used by these professionals.

The use of social networks (internet) is indicated by (Huang Y, 2017), (Ibrahim N, 2018), (Harapan H, 2018) and (Arief M, 2017) as being the preferred source of information for the interviewed populations, seen as a good vehicle of information, thus resembling the results obtained in the two groups of our investigation (Harapan H, 2017), (Huang Y, 2017), (Ibrahim N, 2018) and (Arief M, 2017). In the study by (Ibrahim, 2017), aimed at medical students in Saudi Arabia, 56.1% indicated Facebook as the most common source for obtaining information about ZIKV, followed by other internet sources (Ibrahim N, 2018), (Ricamonte B, 2018).

4 Conclusion

People that spend long periods of time navigating, often with mooring ports that involve contact with Zika virus. Considering this fact, it is mandatory to evaluate the level of knowledge about Zika infection. In the present work we analyze some questions of the applied questionnaire, namely, if Zika infection could induce fever, if the participants in the study knew Zika infection, and if yes, how they did that. We have considered the data pre-mission ans post-mission group. We could stablish that almost 25% and 35% (respectively pre mission and pos mission) of staff did not know the existence of ZIKA virus. Between the staff that knew the existence of Zika, the majority took acknowledge of Zika virus by the media, Only about one third took acknowledge by the health profissionals. Our study that the results suggest that a comprehensive navigator preventive healthcare educational program is mandatory before some emergent outbreak occurs again.

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