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Navigators' KAP About Zika infection

Abstract

This manuscript analyze the KAP about the infection by the Zika virus between navigators from Portuguese Navy ships. We developed a statistical analysis, a cross-sectional study that, splitting distinct groups under study those who will navigate in endemic areas of Zika virus, those that have traveled to endemic areas of ZIKV and navigators in non-endemic areas of ZIKV. The present study allows to describe knowledge, attitudes and practices related to ZIKV infection, also let us to stratify the different groups under study: those who will navigate in endemic areas of Zika virus, those that have traveled to endemic areas of ZIKV and navigators in non-endemic areas of ZIKV. The knowledge level about ZIKV reveals significant differences between the distinct groups. The preliminary results are similar other performed studies revealing an urgency to implement an educational health program about Zika infection, previous to a future outbreak by Zika virus.

Keywords: literacy, questionnaire, statistical approach, factorial analysis, zika virus

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Abbreviations: ZIKV, zika virus; KAP, knowledge, attitudes and preventive practices; GBS, guillain-barré syndrome; WHO, the world health organization; EFA, exploratory factorial analysis; NRP, navio da república portuguesa (ship from portuguese republic); PAHO, pan american health organization; ESPII – emergência de saúde pública de importância internacional (emergence of public health of international importance).

Introduction

During the fourth decade of last century, the study of yellow fever in the Zika Forest of Uganda, the Zika virus was identified in a rhesus monkey. The Zika virus is from Flaviviridae family, *Flavivirus* genus.[1] In 1952 a human case of Zika infection was registered in Uganda[2] following more three cases of human infection during a case of an epidemic of Jaundice in Nigeria.[3] Between 1960s and 1980s, some cases of ZIKV infection were detected. With the huge number of intercontinental flows that have taken place in last decades, the Zika dissemination largely grow. The authors of [3,4] establish that an increment of Zika dissemination contributes to a major probability of genetic mutations, promoting the existence of more resistant and greater epidemic potential. The expansion of the infection promotes the possibility of genetic mutations in certain pathogenic microorganisms. The authors of[5,6] evidence that the existence of the ZIKV in locals far from each other, combining with a high emigration rate can promote a longer viremia time and a more persistent virus in some body fluids.

In mission, military navigators can be infected when visiting endemic sites. Under this possible problem, it is important a policy of prevention, when military staff needs to visit ZIKV endemic sites where the exposure to the virus can occur, prevention of disease and health education are mandatory. The KAP regarding this issue needs to be evaluated in a way to develop intervention strategies, through health educational actions, correct attitudes and preventive practices. A statistical analysis was performed, firstly applying some descriptive techniques, secondly applying some traditional comparison tests, by last using generalized linear models to get predictive models), a cross-sectional study that, in addition to allowing us to describe knowledge, attitudes and practices regarding ZIKV, will allow us to compare the different groups under study: those who will navigate in endemic areas of Zika, those who navigated to Zika endemic zones and navigators in non-endemic areas of Zika. A questionnaire was applied to these three groups. The preliminaries results are in accordance with similar studies already performed.

Preliminaries

Until 1977, the cases of human ZIKV were limited to equatorial Africa. In India, Indonesia, Malaysia and Pakistan took place the expansion of ZIKV but without gravity. Due the low severity, ZIKV has been rarely reported in Asia.[7,8] Outside Africa and Asia, at Micronesia, the first report outbreak in humans happened at 2007, but without hospitalization. Until 2008 it was an accepted idea that infection transmission resulted from Aedes aegypti mosquitoes' action[7] but the first sexual transmission was reported in 2008, in Micronesia. This took place, associated with a condition of rash, conjunctivitis and arthralgias, however without the need for hospitalization. As the authors of[7] point out, until this event, no outbreaks in humans have been documented, with only 14 isolated cases. Later, during 2013, a strong infection incidence rate of about 70% of population from French Polynesia took place, with neurological manifestation in newborns (microcephaly) and adults (Guillain-Barré Syndrome [GBS]).

Later, at 2015, successive outbreaks of Zika were reported in Brazil, firstly, with no associated complications, by last with associating cases of GBS and a larger number of birth children with microcephaly. At the same year, a Zika outbreak with no registered neurological complications occurred in Cape Verde.[6–11]

Due the number of confirmed cases of Zika with association of microcephaly and neurological disorders, the WHO declared Zika infection as a Public Health Emergency of International Concern.[11,12] but later, in the same year, this alert was removed. Almost simultaneously, the Emergency Committee proposed the following lines of action: surveillance of Zika virus transmission, long-term measures, measures associated with travel and information sharing.[13]

Several studies about knowledge, attitudes and practices about Zika infection were performed. The results suggest that comprehensive national preventive healthcare educational programs are needed.[14]

A high level of awareness of the risk of Zika infection was apparent and the majority of students declared taking steps to avoid

exposure to the Zika virus.[15] The results of the questionnaire are in accordance with the fact that, in 2016, the southern states of USA reported outbreaks of the Zika virus.[1,16] We can achieve easily more similar studies from distinct places.[17–21]

Material and methods

The Naval Base of Lisbon was the geographical site chosen for the application of the questionnaire. Actually, the Portuguese Navy has 17 vessels and 2 submarines, all with international operational capacity. When traveling out of the national territory, to the effective fulfillment of the assigned missions, embarked staff are in contact with the multiple infectious agents, armful to their well-being, as well as we can observe in Table 1, where are displayed several destinations of NRP ships. In Figure 1 we can see a map with some mooring points which are identified with the possibility of Zika Transmission.[22] Relatively to this study, during their missions, NRP ships have some of their mooring points identified in a large number of the countries from the list of countries with a record of indigenous Zika cases, namely Angola, Cameroon, Cape Verde, Gabon, Guinea-Bissau, Ivory Coast, Nigeria, Senegal, Indonesia, Thailand.

Table 1 Example of some NRP ships destinations

Ship	Mission date	Local
NRP D. Carlos	Oct-17	Africa (several countries)
NRP Bartolomeu Dias	2015	Africa (several countries)
NRP Vasco da Gama	2016	Africa (several countries)
NRP Almirante Gago Coutinho	September to November 2016	Africa (several countries)
NRP Álvares Cabral	March to May 2017	Africa (several countries)
NRP Bérrio	March to May 2017	Africa (several countries)
NRP Sagres	May to September 2017	Cape Verde, Brazil
NTM (Training in Sea Ship) Creoula	May to October 2017	Coast of Portugal and South of Spain

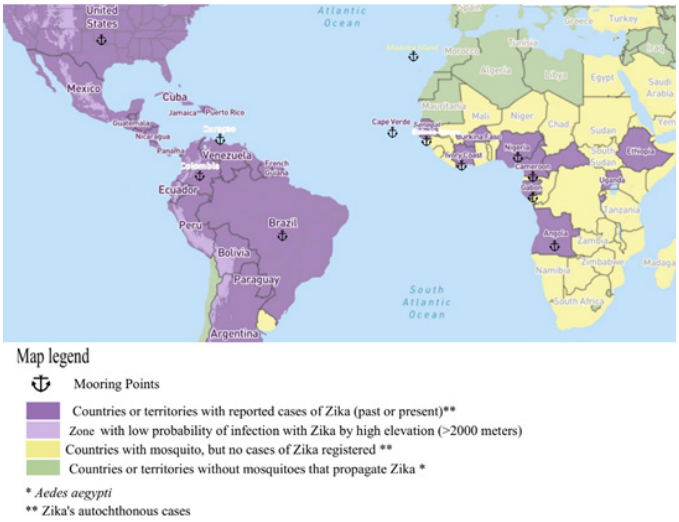

Figure 1 Mooring ports of NRP ships considered in the study (map adapted from[22]).

Initially a pre-test was constructed and subsequently applied, which allowed us to determine if questionnaires 1 and 2 were properly understood by the potential participants, as well as to evaluate the pertinence, disposition, and chaining of the questions. A large number of the countries, identified in the study as mooring points of NRP ships (Ship from Portuguese Republic, in Portuguese, Navio da República Portuguesa (NRP)) during their missions, are in the list of countries with a record of indigenous Zika cases, namely Angola, Cameroon, Cape Verde, Gabon, Guinea-Bissau, Ivory Coast, Nigeria, Senegal, Indonesia, Thailand.

Initially a pre-test was constructed and subsequently applied, which allowed us to determine if questionnaires 1 and 2 were properly understood by the potential participants, as well as to evaluate the pertinence, disposition, and chaining of the questions. These were applied to the garrison of the NRP Corte-Real, a frigate of the Portuguese Navy, with characteristics like the target sample of the study. At the time of application of the pre-test, this ship was moored at the Lisbon Naval Base however, with future possibility of projection to any area of the globe. After applying these questionnaires, 20 per version, the necessary changes were made, to obtain the final version. The target population selected to respond to the questionnaires is the staff of the selected ships described in Table 2.

Table 2 NRP ships designed for 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 has navigated in endemic zones
NRP Vasco da Gama
NRP Almirante Gago Coutinho
NRP Sagres

It was given the approval to apply an adapted questionnaire available in WHO[22,23] and validated by the authors of.[21] Some of these ships had returned from mission overseas, others were moored in preparation for departure on mission.

A questionnaire was applied to each navigator from ship staff. Data collection is still being organized and analyzed but some important results and a detailed discussion can be already found in Faria.[25,26]

Factorial analysis

Factor analysis is one of the most techniques used to reduce the number of registered variables, sometimes obtaining a possible and easier interpretation of data.[27] The FA computes indexes with variables that contribute to explain similar things. We can classify the FA as: exploratory factorial analysis (EFA) and confirmatory factorial analysis (CFA). It is called EFA when there is no idea about the structure or the dimension of the set of variables. When we test some specific structure or dimension number of certain data set we name this technique the CFA.

There are various extraction algorithms such as principal axis factors, principal components analysis or maximum likelihood.[27] There are numerous criteria to decide about the number of factors and their significance.[28] For example, the Kaiser criterion proposes to select factors with eigenvalues greater or equal to one. In the classical model, the original set contains p variables $(X_1, X_2, ..., X_p)$ and m factors $(F_1, F_2, ..., F_m)$ are obtained. Each observable variable $X_j, j = 1,...,\mathrm{p}$ is a linear combination of these factors:

$$Xj = \alpha_{j1}F_1 + \alpha_{j2}F_2 + ... + \alpha_{jm}F_m,\ j = 1,...,\mathrm{p}$$

where e_j is the residual. The factor loading α_{jk} provides an idea of the contribution of the variable $X_j, j = 1,...,\mathrm{p}$ contributes to the factor F_k, $k = 1,...,m$. The factor loadings represents the measure of association between the variable and the factor.[28,29] FA uses variances

to get the communalities between variables. Mainly, the extraction issue is to remove the largest possible amount of variance in the first factor. The variance in observed variables X_i which contribute to a common factor is defined by communality h_{ij} given by

$$h_j^2 = \alpha_{j1}{}^2 + \alpha_{j2}{}^2 + ... + \alpha_{jm}{}^2,\ j = 1,...,p$$

According with the Harman[27] the observable variables with low communalities are often dropped off once the basic idea of FA is to explain the variance by the common factors.[30] The theoretical common factor model assumes that observables depend on the common factors and the unique factors being mandatory to determine the correlation patterns. With such objective the factors/components are successively extracted until a large quantity of variance is explained. After the extraction technique be applied, it is needed to proceed with the rotation of factors/components maximizing the number of high loadings on each observable variable and minimizing the number of factors. In this way, there is a bigger probability of an easier interpretation of factors 'meaning'.

Results

Sample details

In present section we display some details about pre-mission sample and pos-mission sample. Also we performed some basic comparison tests.[31]

In Table 3 the specialists per sample are discriminated. Clearly, we evidence that their distribution is distinct in number and in kind. The number and kind of specialists depend on the mission that garrison is performing. In pré-mission sample, the majority of specialists are Navy/maneuver (marinha/manobras). By opposite, the pos mission garisson include a majority of marines (fuzileiros). When we compare statistically the sample distribution, we obtain a p-value<0.05 evidencing that the distributions of specialists are distintct per each sample. In Figures 2 & 3, is displayed the garrison age distribution per case (pre-mission and pos-mission respectively). Clearly, the garrison pre-mission is, in general, younger than the garrison pos-mission.

Table 3 Specialists per sample pre-mission (top) and pos-mission (bottom)

Pre-mission		
Speciality	**Abs Freq**	**Rel Freq (%)**
FZ (Fuzileiro)	33	23,9
M (Marinha/Manobra)	13	9,4
TA (Técnico de Armame (Dick, 1952)nto)	13	9,4
C (Comunicações)	10	7,2
CM (Condutor de Máquinas)	10	7,2
TOTAL	26 specialities	
Pos-mission		
Speciality	**Abs Freq**	**Rel Freq (%)**
M (Marinha/Manobra)	38	32,2
EM (Electromecânico)	11	9,3
C (Comunicações)	9	7,6
CM (Condutor de Máquinas)	7	5,9
L (Logística)	7	5,9
TOTAL	22 specialities	

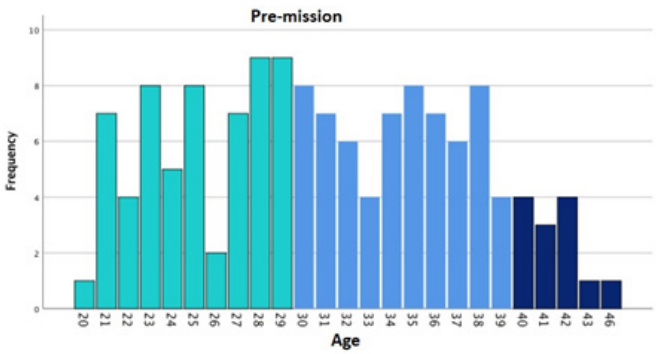

Figure 2 Garrison age distribution (pre-mission).

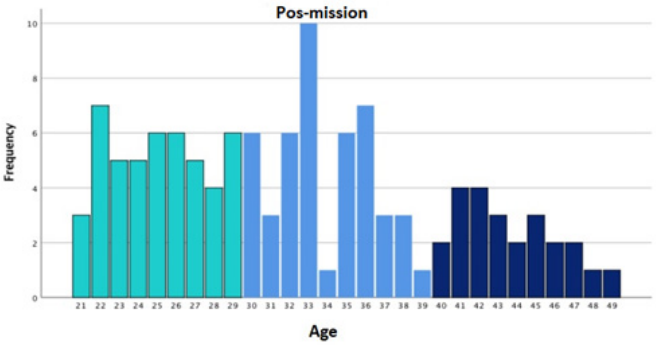

Figure 3 Garrison age distribution (pos-mission).

The educational level of both garrisons is similar as we can observe in Figure 4. The same conclusion is obtained considering the proportions comparison tests (p-value>0.10).

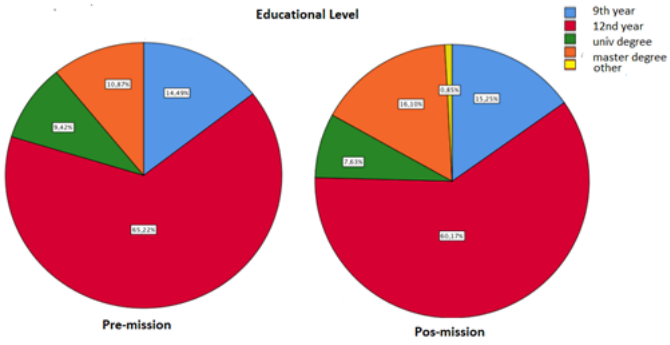

Figure 4 Educational level per sample. Pre-Mission on left. Pos-Mission on right.

Another issue that was studied concerned the gender distribution. The sample distribution was in accordance with the general distribution in Navy. The proportion number of females/number of males are usually between 1:4 and 1:5 depending on the kind of specialization. For example, the NRP Sagres is a Scholar ship with sails, consequently it needs a major quantity of specialists in Navy\ maneuver, that are exclusively men.

Another line of analysis was to analyze the number of wrong questions versus the number of correct questions in each sample. A preliminary analysis can be found.[24,25]

Discussion

Here we present some details that can contribute to show the necessity to take some measures of health education and prevention about Zika.

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 their missions. Half of the responses were wrong for first two options. A reduced number of participants attributes a possible cause of fever to "Zika/Dengue/Chikungunya". Also, was asked if "Zika" was a familiar term for the participants, and if not, they should terminate their participation. 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%. Regarding the knowledge about signs and symptoms of the disease by these military personnel, there is incomplete knowledge on this subject, with a very low number of participants answering all questions correctly, with 7.7% in the "Pre-mission" group and 4.5% in the "Post-mission" group.

Most of the participants are aware of the occurrence of fever as a symptom of the disease, however there is a large percentage of elements that are unaware of conjunctivitis and maculopapular rash as characteristic signs of this disease.

As a complement of work presented in, [24] we consider the pos-mission data.

Another possible approach under the idea of simplicity is to measure the level of association between the involved variables in questionnaire: participants socio-demographic characteristics and responses about Zika.

We evaluate association of the questionnaire answers computing the Spearman coefficient and evaluated of Kruskal-Wallis test. As consequence and similarly to the work described in[24] an EFA was applied to questionary data obtained with pos-mission sample.

Taking the knowledge questions from pos-mission data, we considered all usual statistical tests and measures: R-matrix, test the multi-collinearity or singularity, Bartlett's sphericity test, supporting the existence of patterned relationships, obtaining KMO=0.67, confirming the adequacy of data.

Under the aim of reducing the dimension of data and find some possible index that can be considered as an explanatory variable in a GLM models so we can simulate/explain the problem contributing with a tool so necessary to enable the implementation of some health policy.

We expected that the results were identical to the ones listed in[24], where we could identify 5 factors explaining about 50% of variability. Three factors were identified considering pos-mission data, explained about 45% of variability were: F1 - knowledge how to be infected by Zika virus; F2 - Complications and consequences of Zika infection; F3 - How can it be transmitted. These factors will be considered in a GLM model contributing to consolidate and evidence the urgent necessity to implement a health educational program.

Conclusion

Knowing that staff of Navy spend long periods of time embarked, often during missions that involve contact with Zika virus, it is important to measure the level of knowledge of boarded staff about this issue. Being important to know how to avoid Zika infection, we need to identify how to fight this infection. Completing the previous work, we have considered the data from pos-mission group. We could establish that almost 25% of staff did not know the existence of ZIKA 2 virus. A higher number of the remaining navigators did not know how could prevent to be infected or how could be infected. A reduction of pos-mission data dimension by EFA, identifiing some factors related with Zika knowledge, allows to build GLM models (logit models) or mixed models (where the selected factors are considered explanatory variables).

We expect to get definitive results so we can contribute clearly for the disclosure of Zika Infection. Besides the present study still is going on, we can stablish that the results suggest that a comprehensive navigator preventive healthcare educational program is mandatory before some emergent outbreak occurs again.

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None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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