Knowledge of the Boarded Population About Zika Virus

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Abstract. The objective of this study is to describe the knowledge, attitudes and preventive practices regarding the infection by the Zika virus (ZIKV) among the population embarked on Portuguese Navy ships. We have performed a statistical analysis, a cross-sectional study that, besides allowing us 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 and navigators that have already traveled to endemic areas of ZIKV. The knowledge level about ZIKV reveals significant differences between the distinct questions and groups. The preliminary results obtained are in agreement with similar performed studies.

Keywords: Literacy · Questionnaire · Statistical approach · Factorial analysis · Zika virus

1 Introduction

During a study of yellow fever in the Zika Forest of Uganda, the Zika virus was detected in a rhesus monkey at 1947. Between 1960s and 1980s, few cases of human ZIKV infection were identified through serological methods, mostly benign. However, with the expansion of urban centers, transatlantic travel and increasing airflow, as well as the movement of asymptomatic carriers between countries and continents, have contributed with the dissemination of Zika, which have been showing a huge increase [1,2]. All of these have empowered an increase

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in the transmission of Zika, as well as a possibility of genetic mutations in certain pathogenic microorganisms, allowing the existence of more resistant virus and with greater epidemic potential. The rapid expansion of the disease and importation into several countries, on opposite sides of the globe, relates, in addition to the constant intercontinental migratory flows, the prolonged viraemia time and the persistence of the virus in certain body fluids, as well as to the high number of asymptomatic cases [3,5]. Knowing that military staff can visit ZIKV endemic sites where the exposure to the virus can occur, prevention of disease and promotion of the health of the staff is an important issue. It is pertinent to analyze the knowledge, attitudes and practices regarding this issue, in a way to develop intervention strategies, through health education actions. The objective of this study is to describe the knowledge, attitudes and preventive practices regarding infection by Zika virus, among the population embarked on ships of the Portuguese Navy. We are carrying out a statistical analysis (firstly applying some descriptive techniques [4], secondly applying some traditional comparison tests), a cross-sectional study that, in addition to allowing us to describe knowledge, attitudes and practices regarding ZIKV infection, will allow us to compare the different groups under study: those who will navigate in endemic areas of Zika and who have navigated to Zika endemic zones of Zika. A questionnaire was applied to these two groups. The preliminary results are in accordance with similar studies already performed. In the present work we apply an exploratory factorial analysis to identify which questions can do the major contribute to the individual knowledge about Zika infection.

The outline of this article is developed in four sections. In Sect. 2 is presented some background about Zika infection. The methodology is presented in Sect. 3. The questionnaire is detailed and it is made a brief summary about the Factorial Analysis approach. The Sect. 4 corresponds to the empirical application where are given more details about data, the data analysis and the exploratory Factorial Analysis results are partially described. It is presented a summary about exploratory analysis of the data set corresponding to pre-mission group. Finally in Sect. 5 are drawn some conclusions, some suggestions for future work are pointed.

2 Preliminaries

In the decades after the discovery of the Zika virus few were reported cases of human infection, being limited to equatorial Africa. In 1977 a geographical expansion occurred, with some cases being identified in equatorial Asia (India, Indonesia, Malaysia and Pakistan), but without the need for public health intervention. As in Africa, these cases demonstrated a rare periodicity and a mild clinical picture, very similar to that presented in dengue (DENV) and chikungunya (CHIKV) virus infections. This similarity may have been one of the reasons why ZIKV infection has been so rarely reported in Asia [6,7]. In 2007 the first report of an outbreak of Zika occurred in humans outside Africa and Asia. This occurred on the island of Yap (Micronesia), associated with a rash, conjunctivitis and arthralgia, but without hospitalization [8]. As reported by Kindhauser

[6], until this event, no human outbreaks were documented, with only 14 isolated cases. In 2008, the first documented case of sexual transmission of this disease appeared, which until then was known to be transmitted by mosquitoes [6]. Five years later, in 2013, a larger outbreak occurred in French Polynesia, with an estimated incidence of infection in about 70% of the population, with particular scientific interest, because in addition to the mild clinical picture, the first neurological manifestations happens[1] [7]. On May 7, 2015, the first Zika outbreak in Brazil was reported, with no associated complications. In July and October 2015, in this same country, new outbreaks of Zika are reported, however, associating cases of GBS and an increase in the number of births of children with microcephaly, respectively. On October 21, 2015, the first outbreak of Zika in Cape Verde began, with no reported neurological complications [2,6,7,9–11]. Thus, in view of the significant increase in the number of confirmed cases of Zika and the association of microcephaly and neurological disorders with infection, on 1 February 2016 the World Health Organization (WHO) declared Zika as a public health emergency of international importance ESPII) [12,13]. On 18 November of the same year, despite the fact that the virus was associated with these disorders, as well as the challenge posed to Public Health, WHO put an end to this alert. Nevertheless, as a precautionary measure, the Emergency Committee suggests four attitudes [12]:

- surveillance of Zika virus transmission;
- long-term measures;
- measures associated with intercontinental travel;
- sharing of information,

so it can be possible to verify that the rapid expansion of the disease and importation into several countries, on opposite sides of the globe, is related to the constant intercontinental migratory flows, the prolonged viraemia time, the persistence of the virus in certain body fluids, and, to the high number of asymptomatic cases [14].

3 Methodology

3.1 Questionnaire

Thus, in order to obtain answers to the objectives defined for this study, two self-filling questionnaires were developed, with questions of open response and closed response questions, elaborated with a simple and easily understood language for the participants. The questions elaborated were based on the pre-validated and tested questionnaire by Rosalino et al. in [15], contributions of various scientific articles consulted, related to knowledge, Attitude and Practice (KAP) studies and the resource kit of the WHO [16].

The questionnaire is divided into two parts, the first with the independent variables and a second part, with the dependent variables. The initial part concerns the socio-demographic variables of the participants and is composed of five

[1] Guillain-Barré syndrome (GBS) in adults and microcephaly appears in newborns.

questions (open or closed). The second part consists of 28 questions of open or closed response, with the possibility of choosing more than one answer in each question and also some questions in the form of Likert scale. This second part aimed at evaluating participants' knowledge, attitudes and practices regarding Zika virus infection, comprising 12 questions about knowledge issues, other 10 about attitudes and four that consider practices details. In question 2 of the second part, it was questioned if the participant had knowledge or had already read about the topic in question and, in the event of a negative answer, the participant should give his participation as finished and submit the questionnaire to the researcher.

The authors of [17] indicate that with these studies, it is possible to evaluate the extent of an already known situation, to confirm or refute a hypothesis, to provide new perspectives of the reality of a given situation; improve knowledge, attitudes and practices about specific subjects, even when applying the questionnaire itself, which can serve as an educational tool; may allow establishing baseline or benchmarks for use in future assessments and assist in assessing the effectiveness of activities and programs that aim to change health behaviors. These may also suggest intervention strategies based on specific local circumstances or factors, allowing the implementation of activities appropriate to that particular population [17]. The results obtained may reveal misconceptions or shortcomings, which may represent an obstacle to the activities that are intended to be implemented, as well as to highlight potential barriers to behavior change/adoption [17].

3.2 Factorial Analysis

Factor analysis (FA) is a technique often used to reduce data. The purpose is to get a reduced number of variables from an initial big set of variables and get easier interpretations [18]. The FA computes indexes with variables that measures similar things. There are two types of factor analysis: exploratory factorial analysis (EFA) and confirmatory factorial analysis (CFA) [19]. 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 (see [20] for example). There are numerous criteria to decide about the number of factors and theirs significance. For example, the Kaiser criterion proposes to keep the factors that correspond to eigenvalues greater or equal to one. In the classical model, the original set contains p variables $(X_1, X_2, \ldots, X_p)$ and m factors $(F_1, F_2, \ldots, F_m)$ are obtained. Each observable variable X_j, $j = 1, \ldots, p$ is a linear combination of these factors:

$$X_j = \alpha_{j1}F_1 + \alpha_{j2}F_2 + \cdots + \alpha_{jm}F_m + e_j, \qquad j = 1, \ldots, p, \tag{1}$$

where e_j is the residual. The factor loading α_{jk} provides an idea of the contribution of the variable X_j, $j = 1, \ldots, p$, contributes to the factor F_k, $k = 1, \ldots, m$.

The factor loadings represents the measure of association between the variable and the factor [18,19].

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_j which contribute to a common factor is defined by communality h_j^2 and is given by

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

According with the author of [21], 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. 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'.

4 Empirical Application

4.1 Data

The Naval Base of Lisbon, in Almada, is the geographical area chosen for the application of the questionnaire due the localization of some ships of Portuguese Navy. Actually, the Portuguese Navy has 17 vessels and 2 submarines, all with international operational capacity, able to "*...face the multiple challenges posed by a very dynamic and unpredictable international environment...*" [22], however, when traveling out of the national territory, the boarded staff are subject to the exposure of multiple infectious agents, harmful to their well-being, as well as to the effective fulfillment of the assigned missions.

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 Portuguese Republic Ship Corte-Real (in Portuguese, Navio da República Portuguesa (NRP)), a frigate of the Portuguese Navy, with characteristics similar to the target sample of the study. At the time of application of the pre-test, this ship was moored at the Lisbon Naval Base (BNL), however, with future possibility of projection to any area of the globe. After applying these questionnaires, 20 for each version, the necessary changes were made, in order to obtain the final version.

The target population selected to respond to the questionnaires is the staff of some selected ships described in them top of Table 1 to which was given the approval to apply the questionnaire. Some of these ships had returned from mission overseas, others were moored in preparation for departure on mission.

A questionnaire was applied to each element of ship staff. Data collection is still being organized and analyzed but some important results and a detailed discussion can be already found in [4].

We performed a statistical approach by factorial analysis using partial data concerning to pre-mission boarded staff relatively to knowledge questions so we could reduce the dimensionality, but firstly were applied some descriptive techniques, secondly were used some traditional comparison tests to al question from pre-mission data. By last was considered the general linear models to obtain some predictive models, but this step is not completed yet. The preliminary results evidences that distinct groups have a different level of Zika virus knowledge. This issue is in line with similar studies already conducted.

Summarizing the data, several groups of individuals were preliminary considered, 256 individuals answered to a questionnaire about Zika. The first step organizes the data and get some simple measures by descriptive statistic techniques and performs some intermediate level techniques (see [23]), e.g, proportion tests, independence tests, non parametric tests, etc. (Fig. 1).

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

Fig. 1. Ships considered in the study. The questionnaire to the individuals of staff from each ship split into specific situations: the staff is going to an endemic zone of Zika (top) and the staff that already was in an endemic zone of Zika (bottom).

All groups present a minimum and maximum age of 20 and 49 years, with a mean age of 31 ± 6.8 years. The groups do not have identical distribution of ages. There exist $85,5\%$ of individuals with age between 20 and 39 years.

The groups were composed of 84% men and 16% women. The distribution per gender is statistically different ($p\text{-}value = 0.025$). About educational level of participants (see Fig. 2), 63% of the individuals completed the high school and 22% have an university level degree (bachelor or master).

In Fig. 3 are displayed some of the countries visited by the ships considered in this work. A large number of the countries identified in the study as mooring points from our ships during their missions are on the CDC list (countries with a record of indigenous Zika cases), namely:

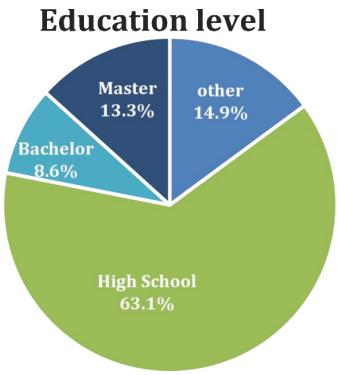

Fig. 2. Educational level of the participants considered in the study.

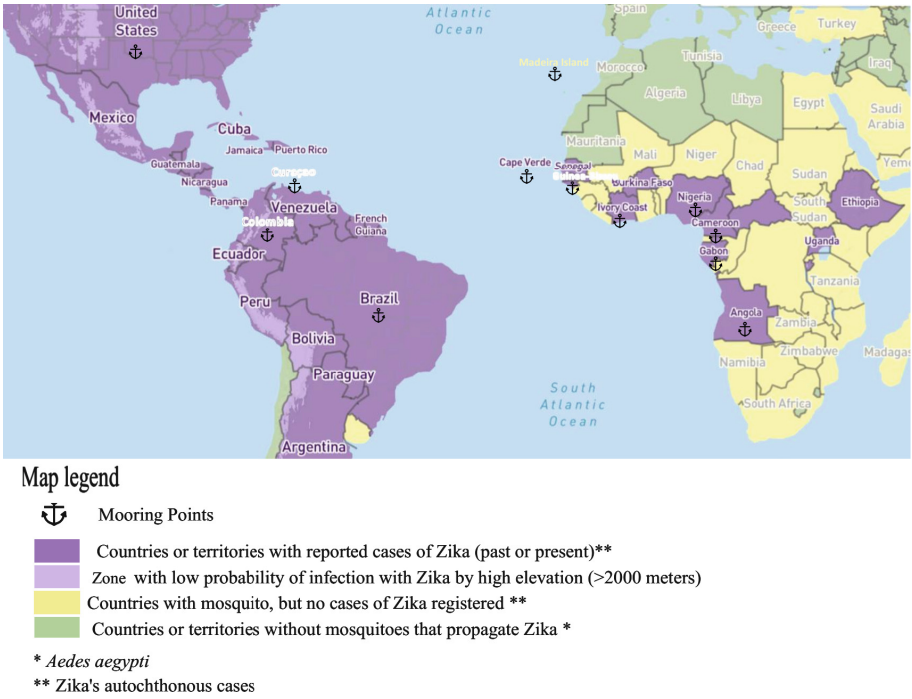

Fig. 3. Mooring ports of the ships considered in the study (adapted from [25]).

- Africa: Angola, Cameroon, Cape Verde, Gabon, Guinea-Bissau, Ivory Coast, Nigeria, Senegal;
- Asia: Indonesia, Thailand;
- The Caribbean: Curacao;
- North America: United States (Continental US);
- South America: Brazil, Colombia.

In 2015 the Pan American Health Organization issued the epidemiological alert entitled "Zika virus infection", which included details on laboratory, case management, disease prevention and control measures and more relevant to our study, recommendations for travelers [24], so the year 2015 was set as the lower limit for the date of the mission.

Also, some participants mentioned some visited ports as Indonesia and Thailand that are not included in Fig. 3, but also belong to the list of countries included in the "*A*rea at Zika risk" [25].

Madeira Island was one of the points that the ships from Table 1 have visited during their mission in Navy. This point of mooring is frequently used in the return from trips from Africa or the American continent. This is identified by the CDC [26] with yellow color because it has an established population of *Ae.* aegypti in this territory, constituting a potential risk of introducing the disease on the island, similar to the Dengue outbreak in 2012. In addition, some of the participants who have indicated other countries bring us to the greatest concern and on which our formative and enlightening actions should focus, in order to safeguard the health and well-being of our military staff, as well as their companions and families.

Detailing some issues, we confirm that nobody answered correctly (or wrongly) all seven questions that composed the pre-questionnaire. Respectively, we have 10.9% of staff that answered correctly to one question. Three correct answers was the most frequent result. The maximum of number of correct answers was 6 with a percentage of 6%. We can infer the boarded still has a low level of literacy about Zika.

Table 1. Worst and best situations in the sense of correct answers (C), Incorrect answers (I), Not Know answers (nK), Wrong answers (W) considering all questions and sub-questions to evaluate knowledge (total = 43). The questionnaire to the individuals of staff from each ship (top) split into specific situations: the staff is going to an endemic zone of Zika (138 individuals) and the staff that already was in an endemic zone of Zika (120 individuals).

	Pre mission	%	pos-mission	%
best	36C+7I	0,70%	35C+8I	0,80%
worst	3W+40 miss	2,90%	3E+40 miss	7,60%
not Know	3 NK+40 Miss	8,70%	3NK+40 miss	8,50%
Max Wrong		2,50%		2,50%

In a preliminary data analysis of pre-mission questionnaires, and taking into account the non-quantitative nature of the involved variables, were calculated measures of association, nonparametric Spearman correlation coefficient, nonparametric test of Friedman for paired samples, etc.

We measure the homogeneity and internal consistence of questionnaire and respective validation. The alpha-Cronbach coefficient was adequate, giving the indication of a good internal consistency. This measure of questionnaire reliability is improved if some questions are not considered. The same issue is confirmed

when were performed several tests to compare the answers of questions associated with knowledge issue. The paired T-test, McNemar's test for frequencies comparison, Crochan's Q test for binary variables comparison. Also were performed the Friedman test ($p\text{-}value < 0.001$) and Kendalls coefficient of concordance test ($p\text{-}value < 0.001$). All tests conduced to the same conclusion: the distributions of considered questions are not the same. Notice that the Spearman correlation coefficient conduces to significant relations between some questions, also Friedman's tests supports such association ($p\text{-}value < 0.001$). Even this detail could be considered so we could let some questions, all questions were considered pertinent and important, so were included in study. Also was performed a runs test to each individual question from pre-mission data, were the null hypothesis confirms the value of the estimated median as the real values versus all other values. The runs tests are displayed in Table 2. The runs test valuates if the estimated median is an adequate descriptor of the analyzed answer. Very few questions had a significant test: We can say that only about the effects of Zika Infection on pregnants and/or fetus, the fetus malformation (me = 1; p-value = 0.05), fetus microcephaly (me = 1; p-value = 0.010), born dead (me = 2; p-value = 0.07) were significant. These means that the majority of participants achieved that the fetus microcephaly was not a possibility or did not know the fact, The same for fetus malformation. When the test is not significant (for a significance level less than 10%), it means that we can consider the estimated value of mean as the representative value. For example, the question about the consequences of Zika infection, we can consider for serious sequelae me = 2, meaning that the majority of participant did not know the answer; for GBS me = 2, the majority of participants did not Know the answer; the same for newborn with microcephaly. All answers from questionnaire can have a similar interpretation. We leave these details for another time.

We also evaluate association of the questionnaire answers with sociodemographic characteristics of participants. The Spearman coefficient and the Kruskal-Wallis test were used for such purpose. Given the extension of all issues, similarly to previous paragraph, the results will be described in the extended version of this manuscript.

The next step of process applies a FA so we can reduce the dimensionality. Under the aim of a preliminary and exploratory approach, we have considered the questions associated to knowledge from the pre-mission group. For such purpose we estimate the communality for the factors, analyzed the significance of R-matrix, test the multi-collinearity or singularity. The Bartlett's sphericity test provided a strongly significant level $p < 0.001$, so we confirmed the existence of patterned relationships. Also, the Kaiser-Meyer-Olkin measure (KMO) of sampling adequacy conduced to $KMO = 0.741$, so the data is appropriate to apply an EFA.

In Table 3 are presented the eigenvalues and total variance accounted by each factor by descendent order. The i^{th}line corresponds to cumulative variance percentage explained by the first i factors. Notice that Table 3 contains the information before extraction, after extraction and after rotation.

Table 2. Results of runs test applied to all questions individually. Partial output.

	1 - Causa de febre - Zika, Dengue, Chikungunya	1 - Causa de febre - Malária	1 - Causa de febre - Gripe	2 - Conhece ou ouvir sobre Zika?	3 - Conhecimento Zika - Família, amigos, vizinhos	3 - Conhecimento Zika - Enfermeiro, Médico, outro prof. saúde	3 - Conhecimento Zika - TV, rádio, jornais, pósters	3 - Conhecimento Zika - Internet, facebook, twitter, instagram, outras redes	4 - Possibilidade infecção com Zika - Mulheres	4 - Possibilidade infecção com Zika - Homens	4 - Possibilidade infecção com Zika - Crianças	5 - Como ser infectado com Zika - Picada mosquito	5 - Como ser infectado com Zika - Sexo com pessoa infectada	5 - Como ser infectado com Zika - Sexo com pessoa infectada, sem sintomas	5 - Como ser infectado com Zika - Beijar pessoa infectada	5 - Como ser infectado com Zika - Pelo ar (tosse, espirros)	5 - Como ser infectado com Zika - Transmissão vertical	5 - Como ser infectado com Zika - Transfusão sanguínea	6 - Como evitar infecção por Zika - Repelente	6 - Como evitar infecção por Zika - Vestuário protector	6 - Como evitar infecção por Zika - Ar condicionado
Test Value[a]	1	1	1	1	0[b]	0[b]	1	1	1	1	1	1[b]	1	1	1	0[b]	1	1	1	1	1
Cases < Test Value	28	25	16	47	0	0	10	42	4	8	4	0	31	38	0	42	17	16	4	10	15
Cases >= Test Value	110	113	122	91	91	91	81	49	87	83	87	91	60	53	91	49	74	75	87	81	76
Total Cases	138	138	138	138	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Number of Runs	39	39	28	36	1[c]	1[c]	16	49	9	17	9	1[c]	43	45	1[c]	45	29	26	9	14	24
Z	-1,760	-,852	-,543	-5,137			-1,537	,587	,468	,947	,468		,263	-,057		-,261	,123	-,504	,468	-2,634	-,794
Asymp. Sig. (2-tailed)	,078	,394	,587	,000			,124	,557	,640	,343	,640		,792	,954		,794	,902	,614	,640	,008	,427

	6 - Como evitar infecção por Zika - Rede mosquiteira	6 - Como evitar infecção por Zika - Repelente	6 - Como evitar infecção por Zika - Vestuário protector	6 - Como evitar infecção por Zika - Ar condicionado	6 - Como evitar infecção por Zika - Rede mosquiteira	6 - Como evitar infecção por Zika - Insecticida	6 - Como evitar infecção por Zika - Relações sexuais	7 - Sinais e sintomas de Zika - Febre	7 - Sinais e sintomas de Zika - Manchas na pele	7 - Sinais e sintomas de Zika - Conjuntivite	7 - Sinais e sintomas de Zika - Dor	8 - Todas as pessoas com Zika apresentam sintomas?	9 - Complicações de Zika - Nenhuma	9 - Complicações de Zika - Sequelas cerebrais graves	9 - Complicações de Zika - Síndrome Guillain-Barré	9 - Complicações de Zika - Microcefalia	9 - Complicações de Zika - Morte	10 - Consequências para a grávida e/ou feto - Nenhuma	10 - Consequências para a grávida e/ou feto - Aborto	10 - Consequências para a grávida e/ou feto - Microcefalia	10 - Consequências para a grávida e/ou feto - Outras malformações
Test Value[a]	1	1	1	1	1	1	1	1	2	2	1	1	0[b]	2	2	2	1	0[b]	2	1	1
Cases < Test Value	8	4	10	15	8	10	24	2	30	31	5	18	0	41	19	45	6	0	30	2	6
Cases >= Test Value	83	87	81	76	83	81	67	89	61	60	86	73	91	50	72	46	84	91	61	89	85
Total Cases	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	90	91	91	91	91
Number of Runs	12	9	14	24	12	17	39	5	36	42	11	32	1[c]	44	26	39	11	1[c]	36	4	10
Z	-2,420	,468	-2,634	-,794	-2,420	-,989	,724	,247	-1,247	,028	,583	,709		-,438	-1,626	-1,580	-1,059		-1,247	-2,564	-1,959
Asymp. Sig. (2-tailed)	,016	,640	,008	,427	,016	,323	,469	,805	,212	,977	,560	,478		,662	,104	,114	,290		,212	,010	,050

	10 - Consequências para a grávida e/ou feto - Feto nascer morto	11 - Possibilidade de infecção nesta missão	12 - Porque pode ficar infectado - Picado por mosquitos	12 - Porque pode ficar infectado - Relações sexuais desprotegidas	12 - Porque pode ficar infectado - Não vou usar repelente	12 - Porque pode ficar infectado - Não vou usar vestuário adequado	12 - Porque pode ficar infectado - Posso estar em lugares sem A?/C	12 - Porque pode ficar infectado - Não vou usar rede mosquiteira	12 - Porque pode ficar infectado - Não vou usar insecticida	12 - Porque pode ficar infectado - Posso estar perto de habitantes locais	12 - Porque pode ficar infectado - Zika local de missão	13 - Medidas para evitar infecção - Repelente	13 - Medidas para evitar infecção - Vestuário	13 - Medidas para evitar infecção - Ar condicionado	13 - Medidas para evitar infecção - Rede mosquiteira	13 - Medidas para evitar infecção - Insecticida	13 - Medidas para evitar infecção - Não ter relações sexuais	13 - Medidas para evitar infecção - Relações sexuais protegidas	14 - Possibilidade de transmissão Zika no regresso	15 - Porque não pode transmitir Zika em PT - Sem sintomas, não tem Zika	15 - Porque não pode transmitir Zika em PT - Uma pessoa não pode transmitir Zika a outra pessoa
Test Value[a]	2	2	1	0[b]	0[b]	0[b]	1	0[b]	0[b]	1	1	3	2	3	1	2	1	1	1	1	1
Cases < Test Value	27	9	1	0	0	0	15	0	0	11	7	14	18	38	22	30	28	2	6	4	4
Cases >= Test Value	64	70	55	55	55	56	41	56	56	45	49	65	61	41	57	49	51	77	73	6	6
Total Cases	91	79	56	55	55	56	56	56	56	56	56	79	79	79	79	79	79	79	79	10	10
Number of Runs	32	14	3	1[c]	1[c]	1[c]	24	1[c]	1[c]	17	12	25	28	47	28	33	34	5	12	8	4
Z	-1,767	-1,687	,192				,358			-,725	-,790	,377	-,258	1,487	-1,342	-1,255	-,781	,266	-,074	1,194	-,913
Asymp. Sig. (2-tailed)	,077	,092	,847				,720			,468	,430	,706	,796	,137	,180	,210	,435	,790	,941	,232	,361

	15 - Porque não pode transmitir Zika em PT - Não há mosquitos em PT	16 - Como Zika pode ser transmitido em PT - Relação sexual	16 - Como Zika pode ser transmitido em PT - Picada mosquito	16 - Como Zika pode ser transmitido em PT - Transmissão vertical	17 - Medidas para evitar transmitir Zika - Preservativo	17 - Medidas para evitar transmitir Zika - Evitar relações sexuais	17 - Medidas para evitar transmitir Zika - Evitar engravidar	17 - Medidas para evitar transmitir Zika - Evitar ser picado	18 - Planeia tomar alguma destas medidas?	19 - Importância do uso do preservativo para prevenir Zika	20 - Dificuldade em identificar sinais e sintomas de Zika	21 - Se suspeitar ter Zika, quando irá procurar ajuda médica	22 - Ao regressar de zona com Zika - Irei ao Serviço de Saúde, sem sintomas	22 - Ao regressar de zona com Zika - Irei ao Serviço de Saúde, apenas se tivesse sintomas	22 - Ao regressar de zona com Zika - Vou tomar medidas para não infectar ninguém	23 - Sendo mulher, pode engravidar durante estadia em zona com Zika e 6 semanas após regresso	24 - Sendo homem, deve evitar que companheira engravide 6 meses após regresso	25 - Existe tratamento para infecção por virus Zika	26 - Existe vacina contra o virus Zika	27 - Tem informação suficiente sobre Zika	28 - Gostaria de obter mais informações sobre Zika
Test Value[a]	1	1	1	1	1	1	1	1	1	3	2	3	0[b]	1	1	3	3	1	2	0[b]	1
Cases < Test Value	1	13	16	5	7	16	10	3	1	35	28	24	0	24	16	7	30	6	32	0	5
Cases >= Test Value	9	69	66	77	75	66	72	71	73	44	51	53	79	55	63	12	42	85	59	91	86
Total Cases	10	82	82	82	82	82	82	74	74	79	79	77	79	79	79	19	72	91	91	91	91
Number of Runs	3	21	26	11	13	27	20	7	3	38	43	35	1[c]	36	28	10	37	11	47	1[c]	9
Z	0,000	-,791	-,269	,618	-,589	,087	,759	,397	,167	-,456	1,449	,258		,425	,523	0,000	,244	-1,072	1,043		-1,540
Asymp. Sig. (2-tailed)	1,000	,429	,788	,536	,556	,931	,448	,691	,868	,648	,147	,797		,671	,601	1,000	,807	,284	,297		,124

a. Median

b. All values are greater than or less than the cutoff. Runs Test cannot be performed.

c. Only one run occurs. Runs Test cannot be performed.

Table 3. Total variance accounted for each factor.

Total variance explained						
Factor	Initial eigenvalues			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	11,217	23,866	23,866	6,218	13,299	13,299
2	3,470	7,383	31,249	5,130	10,914	24,143
3	3,111	6,619	37,869	3,583	7,623	31,766
4	2,398	5,102	42,970	2,870	6,106	37,873
5	2,234	4,752	47,723	1,962	4,175	42,048

If we consider the Kaiser criterion for simplicity, we retain the first 5 factors (eigenvalues great or equal to one). Other criteria may be applied, for example using the scree plot or using the average of extracted communalities to determine the eigenvalue cut-off. The varimax algorithm which produces orthogonal factors was applied after the extraction process. This technique is adequate when we want to identify variables to create indexes or new variables without intercorrelated components. In the present case, we could get the 'meaning' of each factor. To get such meaning we consider Table 4 analyzing the rotated factors scores. Namely each of first five factors factor are related with:

- **F1** - knowledge how to be infected by Zika virus and Which is the infection symptomatology;
- **F2** - Complications and consequences of Zika infection;
- **F3** - Measures to avoid Zika infection transmission and How can it be transmitted;
- **F4** - How to avoid the infection by Zika virus;
- **F5** - How took acknowledge about ZiKa.

The first 5 or 6 factors (about 50% of variance explication) can be used as independent variables in a predictive model. In [27] we can find a first propose for a very simple predictive model. The next step of our work: consider the factors as explanatory variables in a generalized linear models approach or a mixed linear models approach to get predictive models. Some simple mixed linear models including these factors were already obtained so we could identify some risk factors, but their validation is still ongoing.

Table 4. Rotated factors scores.

Rotated Factor Matrix[a]

	Factor				
	1	2	3	4	5
5 - Como ser infectado com Zika - Sexo com pessoa infectada, sem sintomas	,863		,239		
5 - Como ser infectado com Zika - Sexo com pessoa infectada	,856		,260		
5 - Como ser infectado com Zika - Beijar pessoa infectada	,778	,111	,239		-,119
5 - Como ser infectado com Zika - Pelo ar (tosse, espirros)	,757	,196	,152	,237	
5 - Como ser infectado com Zika - Transmissão vertical	,669	,125			
5 - Como ser infectado com Zika - Transfusão sanguínea	,622	,115		,105	
6 - Como evitar infecção por Zika - Ar condicionado	,531	,242		,245	
7 - Sinais e sintomas de Zika - Manchas na pele	,508	,392		,123	,427
6 - Como evitar infecção por Zika - Relações sexuais	,502	,154	,272	,160	
7 - Sinais e sintomas de Zika - Dor	,457	,314		,151	,328
7 - Sinais e sintomas de Zika - Conjuntivite	,453	,425		,126	,396
9 - Complicações de Zika - Síndrome Guillain-Barré	,206	,706		,106	,153
10 - Consequências para a grávida e/ou feto - Feto nascer morto	,278	,677			,173
10 - Consequências para a grávida e/ou feto - Aborto	,349	,657	,139		
9 - Complicações de Zika - Sequelas cerebrais graves		,599		,155	
10 - Consequências para a grávida e/ou feto - Outras malformações	,324	,596	,185		,205
9 - Complicações de Zika - Microcefalia		,594	,207		
10 - Consequências para a grávida e/ou feto - Microcefalia	,129	,588	,245	-,106	
10 - Consequências para a grávida e/ou feto - Nenhuma		,571	,265	,134	
9 - Complicações de Zika - Nenhuma	-,130	,568	,199	,186	
9 - Complicações de Zika - Morte		,408	,157	,171	-,183
8 - Todas as pessoas com Zika apresentam sintomas?	,164	,366			,136
7 - Sinais e sintomas de Zika - Febre	,228	,337		,267	
17 - Medidas para evitar transmitir Zika - Preservativo		,188	,792		
17 - Medidas para evitar transmitir Zika - Evitar relações sexuais	,173	,241	,771	,135	-,108
16 - Como Zika pode ser transmitido em PT - Relação sexual	,278	,139	,695	,148	
16 - Como Zika pode ser transmitido em PT - Transmissão vertical	,210	,254	,618		
17 - Medidas para evitar transmitir Zika - Evitar engravidar	,112	,177	,550	,142	-,134
16 - Como Zika pode ser transmitido em PT - Picada mosquito	,272	,111	,408	,213	
17 - Medidas para evitar transmitir Zika - Evitar ser picado			,193		
6 - Como evitar infecção por Zika - Insecticida	,343	,220		,610	
6 - Como evitar infecção por Zika - Rede mosquiteira	,278	,263		,591	
4 - Possibilidade infecção com Zika - Homens		-,104	,223	,555	,136
6 - Como evitar infecção por Zika - Vestuário protector	,458	,130		,529	
4 - Possibilidade infecção com Zika - Mulheres			,294	,449	,189
4 - Possibilidade infecção com Zika - Crianças	,255		,160	,425	
6 - Como evitar infecção por Zika - Repelente	,371	,130		,394	-,169
1 - Causa de febre - Malária	,100	,186	,183	,331	,252
1 - Causa de febre - Zika, Dengue, Chikungunya		,282	,103	,316	,166
3 - Conhecimento Zika - Enfermeiro, Médico, outro prof. saúde	-,130	-,196			-,657
3 - Conhecimento Zika - TV, rádio, jornais, pósters	,156			-,110	,394
25 - Existe tratamento para infecção por vírus Zika		,169	-,121	,329	,385
5 - Como ser infectado com Zika - Picada mosquito	,234	,189	-,245	,156	-,334
26 - Existe vacina contra o vírus Zika		,204	,161	,263	,321
1 - Causa de febre - Gripe	,244	,121	,188	,146	,248
3 - Conhecimento Zika - Internet, facebook, twitter, instagram, outras redes	,125				-,195
3 - Conhecimento Zika - Família, amigos, vizinhos			-,139	-,101	-,158

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 10 iterations.

5 Results and Conclusions

The objectives of this study are to determine the literacy of boarded staff about ZIKA, as well as to identify the best way of disclosure this infection. In this work was considered the data from pre-mission group and the subset of questions associated with knowledge. Almost 34% of staff did not know the existence of ZIKA virus. Between the individuals who knew the existence of ZIKA virus, the majority did not Known how could be infected. Also, between the individuals who knew the existence of ZIKA virus, the most part did not know how could

make its prevention. An exploratory Factorial Analysis was applied to knowledge pre-mission data and some factors were selected and identified with a meaning. These factors can help to identify which are the themes that shall be focused in a disclosure issue. Some simple mixed linear models including these factors were already obtained so we could identify some factors that "'explain"' the individual literacy about Zika virus, but models analysis and their validation are still going on. A detailed analysis of these results will be described in an extended version of the present work.

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