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Asian Pacific Journal of Tropical Medicine
journal homepage: http://ees.elsevier.com/apjtm

Original research http://dx.doi.org/10.1016/j.apjtm.2017.01.018

Healthcare workers' knowledge towards Zika virus infection in Indonesia: A survey in Aceh

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ARTICLE INFO

Article history:
Received 2 Oct 2016
Received in revised form 10 Dec 2016
Accepted 5 Jan 2017
Available online 24 Jan 2017

Keywords:
Zika virus
Zika fever
Knowledge
Attitude
Health care worker
Indonesia

ABSTRACT

Objective: To assess the knowledge on Zika virus infection among healthcare providers (doctors) in Aceh province, Indonesia.

Methods: A self-administered internet based survey was conducted from 3 May to 3 June 2016 among the members of doctor organizations in Aceh province. A set of validated, pre-tested questionnaire was used to measure knowledge regarding Zika infection and to collect a range of explanatory variables. A two-steps logistic regression analysis was employed to assess the association of participants' demographic, workplace characteristics and other explanatory variables with the knowledge.

Results: A total of 442 participants included in the final analysis and 35.9% of them (159) had a good knowledge on Zika infection. Multivariate model revealed that type of occupation, type of workplace, availability of access to medical journals and experience made Zika disease as differential diagnose were associated with knowledge on Zika infection. In addition, three significant source of information regarding Zika were online media (60%), medical article or medical news (16.2%) and television (13.2%).

Conclusion: The knowledge of the doctors in Aceh regarding Zika infection is relatively low. Doctors who have a good knowledge on Zika infection are more confident to established Zika disease as differential diagnosis in their clinical setting. Therefore, such program to increase healthcare providers' knowledge regarding Zika infection is needed to screen potential carriers of Zika infection.

1. Introduction

In 2007, the first Zika fever outbreak was reported in the Federated States of Micronesia [1]. Subsequent infections of Zika Virus (ZIKV) were not reported until an outbreak occurred in French Polynesia in 2013 followed in New Caledonia, Cook Islands, and Easter Island in 2014 and in Vanuatu, Solomon Islands, Samoa, and Fiji in 2015 [2]. In May 2015, for the first time, ZIKV emerged in America [3]. On February 1, 2016, WHO declared ZIKV infection as a public health emergency of international concern and in the early of May 2016, 58 countries and territories reported continuing mosquito-borne transmission of ZIKV, most of them in the Americas [4]. ZIKV infection has been mainly associated with microcephaly and other central nervous system birth defects [5,6] and it has been linked to more than 4.000 recent microcephaly cases in Brazil as well some cases in Colombia and Venezuela [7]. In

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Peer review under responsibility of Hainan Medical University.

addition, ZIKV infection was also associated with Guillain-Barre Syndrome [8].

In Indonesia, the first Zika case with serologic evidence, was reported in 1981 in Central Java [9]. In 1983, a survey in Lombok indicated that 12.7% (9/71) of the human serum samples had neutralizing antibody to ZIKV using a hemagglutination inhibition test [10]. In 2013, a traveler acquired ZIKV infection during a visit in Jakarta [11] and in 2015, a traveler returning to Australia developed Zika fever after a monkey bite in Bali [12]. For the first time, in 2016, ZIKV was isolated from a febrile patient during a 2015 dengue outbreak in Jambi province [13].

Co-circulation of ZIKV with dengue virus and chikungunya virus has been documented in some regions [14,15] and this is likely also occurs throughout the Asia and other regions where dengue virus and chikungunya virus are endemic [2]. Even, triple coinfections (dengue, chikungunya and Zika viruses) have recently documented in Colombia [16,17]. Moreover, it is now clear that ZIKV is following the path of dengue virus and chikungunya virus, spreading to all countries infested with *Aedes aegypti* and *Aedes albopictus* mosquitoes, but probably with other vectors involved (e.g. *Culex*) [18]. Indonesia is one of the largest countries in the dengue endemic [19] and chikungunya outbreaks have occurred throughout Indonesia [20–22]. Therefore, Indonesia might be a vulnerable country for ZIKV outbreak.

ZIKV infection has become a major public health concern worldwide and it has potential to cause a pandemic. Therefore, it is important for healthcare workers to have sufficient knowledge to screen potential carriers in their clinical settings. WHO expert meetings have identified gaps in knowledge about ZIKV, potentially related complications and effective interventions and WHO has released the resource information pack of knowledge, attitudes and practice survey for ZIKV disease and potential complications [23]. Up to today, data regarding knowledge, attitude and practice towards ZIKV infection among healthcare workers is limited. Therefore, the aim of this study was to assess the knowledge on ZIKV infection among doctors in Aceh province, Indonesia.

2. Materials and methods

2.1. Ethical clearance

The Ethical Clearance Committee of the School of Medicine, Syiah Kuala University, Banda Aceh, Indonesia approved this study protocol (approval 19/KE/FK/2016). A brief explanation of the study was given to all participants and informed concern was obtained from all participants prior to enrollment. Participation was voluntary, anonymous, and no direct financial compensation was offered.

2.2. Survey design and study instrument

To assess the knowledge regarding Zika infection, a self-administered internet based survey was conducted from 3 May to 3 June 2016. A link to online questionnaire was sent to doctor organizations in Aceh province and the survey was forwarded to member via social media. The remainders were sent each week after the initial invitation. It required approximately 8–12 min completing the survey.

The questions within knowledge domain were designed based on information provided by Centers for Disease Control and Prevention [24]. The questionnaire also covered a range of explanatory variables (basic demographic data, education attainment, type of workplace, characteristics of the workplace and the experience related to Zika disease). In addition, the sources of information regarding Zika were also collected. A reliability test of questionnaires within knowledge domain, consisting eleven questions, was conducted among 30 participants prior the study. The Cronbach's alpha score was 0.78, indicating a good internal consistency of the items in the scale.

2.3. Research variables

2.3.1. Response variable

To measure the knowledge regarding the cause, sign and symptom, diagnosis, treatment, prevention, transmission and risk of the Zika infection, a set of 11-questions questionnaire was used. The possible responses to all of the questions were “yes” or “no” and there was no “do not know” option provided. Correct answers were given a score of one, and incorrect ones, zero. The knowledge of a participant was computed as the total sum of correct responses such that higher score indicated a better knowledge regarding Zika infection.

2.3.2. Explanatory variables

Data on age, gender, education attainment and type of occupation were collected from each participant. Information of workplace department, location of workplace (district, regency or capital city of province), characteristics of workplace including the availability of certain testing procedures (PCR and ELISA) and the availability of the access to scientific journals were also recorded. The respondents were also asked about experience attending medical conference or training in the last five months and their medical experience (in year). The experience diagnosing Zika disease was collected including whether they have diagnosed or made Zika as differential diagnosis to their patients. Furthermore, the main sources of information regarding Zika were collected by asking the participants to chose from a list provided (printed media, online media, television, radio, medical colleagues, scientific articles and medical conference).

2.4. Statistical analysis

For each participant, the score for knowledge regarding Zika infection was computed as the sum of the correct response scores and the additive scale score ranged from 0 to 11. For the statistical analysis propose, the level of knowledge was dichotomized into “good” and “poor” based on an 80% cut-off point. To assess the association of participants' demographic, workplace characteristics and other explanatory variables with the knowledge, a two-steps logistic regression analysis was employed. In the univariate logistic regression, all explanatory factors were included and explanatory variables that were associated with knowledge with a *P*-value ≤ 0.25 in the univariate analysis were then included into the multivariate analysis. The estimated odds ratio (OR) was interpreted in relation to one of the categories, which was designated as the reference category [25,26]. Confounding factors were explored by comparing the difference between the adjusted odds ratio (aOR) in multivariate analyses and the crude odds ratio (OR) in univariate analyses. All significance tests were two tailed and *P*-value of less than 0.05 was considered to be statistically significant. All analysis was performed using the Statistical Package of Social Sciences 17.0 software (SPSS Inc., Chicago, IL).

3. Results

3.1. Participant characteristics

We received 631 participant responses during the study period and 189 data were excluded from final analysis due to missing information. A total of 442 (70.04%) participants, well distributed from regions of district, regency and the capital city of province, were analyzed. The characteristics of the participants are presented in Table 1. The proportion of the gender was slightly different, 42% *vs.* 57% for male and female, respectively and a majority of the participants (80.1%) was general practitioner. More than 90% of the participants had medical experience less than 5 years and approximately 10% have attended at least one international conference in the last five months. In general, less than 30% of the participants stated that their workplace had either PCR or ELISA facility. Although 6.6% of participants have contacted with patients were presented signs and symptoms of Zika infection, only less than half of them stated had experience making Zika infection as differential diagnosis.

3.2. Knowledge on Zika and associated factors

We found that 159 (35.9%) participants had a good knowledge on Zika infection. Univariate logistic regression analysis revealed that gender, education attainment, type of occupation, department, type and location of workplace, participation in national conference within last five months, availability of access to medical journals and experience making Zika disease as differential diagnosis were associated with knowledge (Table 1). However, the multivariate model revealed that only type of occupation, type of workplace, availability of access to medical journals and experience made Zika disease as differential diagnose were associated with knowledge on Zika infection (Table 1).

Table 1

Univariate logistic regression analysis showing predictors of knowledge on Zika disease (Good *vs.* Poor) (n = 442).

Variable	*n* (%)	Good knowledge *n* (%)	Univariate		Multivariate	
			OR (95% CI)	*P*–value	OR (95% CI)	*P*–value
Gender						
Male (R)	188 (42.5)	57 (30.3)	1			
Female	254 (57.5)	102 (40.1)	1.54 (1.03–2.30)	0.032	1.21 (0.75–1.94)	0.421
Age group				0.034		0.668
Less than 30 (R)	238 (53.8)	79 (33.1)	1			
31-40	181 (41.0)	76 (41.9)	1.45 (0.97–2.17)	0.065	1.28 (0.70–2.33)	0.423
30 or more	23 (5.2)	4 (17.3)	0.42 (0.13–1.28)	0.424	1.93 (0.19–19.80)	0.576
Education				0.031		0.261
GP (R)	354 (80.1)	132 (37.2)	1			
GP with master or doctoral degree	35 (7.9)	17 (48.5)	1.58 (0.79–3.18)	0.193	1.88 (0.70–5.06)	0.207
Specialist	33 (7.5)	6 (18.2)	0.37 (0.15–0.92)	0.034	4.92 (0.69–35.02)	0.111
Specialist with master or doctoral degree	20 (4.5)	4 (20.0)	0.42 (0.13–1.28)	0.128	3.17 (0.54–18.65)	0.200
Occupation				0.020		0.109
GP (R)	301 (68.1)	119 (39.5)	1		1	
Specialist	16 (3.6)	1 (6.3)	0.10 (0.01–0.78)	0.028	0.01 (0.01–0.34)	0.008
GP plus university staff	40 (9.1)	12 (30.0)	0.65 (0.32–1.33)	0.247	0.46 (0.10–2.16)	0.330
Specialist plus university staff	54 (12.2)	22 (40.7)	1.05 (0.58–1.89)	0.868	0.81 (0.33–2.01)	0.664
Specialist residency	31 (7.0)	5 (16.1)	0.29 (0.11–0.78)	0.015	0.08 (0.08–0.90)	0.410
Department				<0.001		0.320
Community health centre (R)	152 (34.4)	72 (47.3)	1		1	
Emergency unit	121 (27.4)	34 (28)	0.43 (0.26–0.72)	0.001	1.27 (0.53–3.03)	0.578
Other departments[a]	92 (20.8)	22 (23.9)	0.34 (0.19–0.62)	<0.001	3.41 (0.71–16.31)	0.124
Others	77 (17.4)	31 (40.2)	0.74 (0.43–1.30)	0.308	1.70 (0.76–3.78)	0.190
Type of work place				<0.001		0.001
Community health centre (R)	89 (20.1)	57 (64)	1		1	
Private clinic or hospital	164 (37.1)	54 (32.9)	0.27 (0.16–0.47)	<0.001	0.22 (0.10–0.49)	<0.001
Government hospital	189 (42.8)	48 (25.3)	0.19 (0.11–0.32)	<0.001	0.18 (0.06–0.50)	0.001
Location of workplace				<0.001		0.115
District (R)	120 (27.1)	63 (52.5)	1		1	
Regency	156 (35.3)	42 (26.9)	0.33 (0.20–0.55)	<0.001	0.61 (0.30–1.25)	0.180
Province	166 (37.6)	54 (32.5)	0.43 (0.26–0.70)	0.001	1.10 (0.52–2.36)	0.790
Attended province level conference						
No (R)	145 (32.8)	48 (33.1)	1		–	
Yes	297 (67.2)	111 (37.3)	1.20 (0.79–1.83)	0.380	–	–
Attended national conference						
No (R)	270 (61.1)	112 (41.4)	1		1	
Yes (2)	172 (38.9)	47 (27.3)	0.53 (0.35–0.80)	0.003	0.74 (0.43–1.27)	0.287

(*continued on next page*)

Table 1 (*continued*)

Variable	*n* (%)	Good knowledge *n* (%)	Univariate		Multivariate	
			OR (95% CI)	*P*–value	OR (95% CI)	*P*–value
Attended international conference						
No (R)	398 (90.0)	147 (36.9)	1		1	
Yes	44 (10.0)	12 (27.2)	0.64 (0.32–1.28)	0.208	1.27 (0.51–3.15)	0.605
Medical experience (year)				0.002		0.072
1–2 (R)	159 (36.0)	47 (29.5)	1		1	
3–4	250 (56.6)	108 (43.2)	1.81 (1.18–2.76)	0.006	1.66 (0.93–2.94)	0.081
11–15	16 (3.6)	2 (12.5)	0.34 (0.07–1.55)	0.165	0.30 (0.04–1.92)	0.206
More than 15	17 (3.8)	2 (11.8)	0.31 (0.07–1.44)	0.138	0.20 (0.01–3.40)	0.268
Workplace has PCR facility						
No (R)	359 (81.5)	133 (37)	1		–	
Yes	83 (18.8)	26 (31.3)	0.77 (0.46–1.29)	0.328	–	–
Workplace has ELISA facility						
No (R)	340 (76.9)	126 (37)	1		–	
Yes	102 (23.1)	33 (32.3)	0.81 (0.50–1.29)	0.386	–	–
Workplace has access to medical journals						
No (R)	322 (72.9)	130 (40.3)	1		1	
Yes	120 (27.1)	29 (24.1)	0.47 (0.29–0.75)	0.002	0.38 (0.20–0.73)	0.003
Had contact with patient(s) presenting signs and symptoms of Zika						
No (R)	413 (9.4)	145 (35.1)	1		1	
Yes	29 (6.6)	14 (48.2)	1.72 (0.81–3.67)	0.157	1.33 (0.53–3.37)	0.535
Had experienced making Zika as differential diagnose						
No (R)	429 (97.1)	150 (35.0)				
Yes	13 (2.9)	9 (69.2)	4.18 (1.26–13.81)	0.019	10.66 (2.35–48.19)	0.002

CI: confidence interval, ELISA: enzyme-linked immunosorbent assay, GP: general practitioner, OR: odds ratio, PCR: polymerase chain reaction, R: reference group.

[a] Including pediatric, obstetrics and gynecology, surgery, internal medicine, pulmonology, neurology and others.

Participants who were working as specialist doctors (without double job as teaching staff) had lower odds of having a good knowledge on Zika infection compared to general practitioners (*OR*: 0.01; 95% CI: 0.01–0.34). Compared to doctors who were working in community health centers, the odds of having a good knowledge decreased among doctors who were working in private clinics or private hospitals (*OR*: 0.22; 95% *CI*: 0.10–0.49) or in the governmental hospitals (*OR*: 0.18; 95% *CI*: 0.06–0.50). In addition, as expected, doctors who had experience diagnosing at least one patient with differential diagnosis of Zika disease had significant higher odds having a good knowledge, approximately 11 times. Interestingly, having access to medical journals was associated with a poor knowledge.

3.3. Source of information

We included 462 participants to assess the main source of information regarding Zika infection. Approximately 60% of the participants received the information from online media followed by medical article or medical news (16.2%) and television (13.2%). Printed media seems had no significant role as information source regarding Zika. In addition, only less than 5% of the participants received Zika information by attending medical seminar.

4. Discussion

There is enough evidence to indicate that Zika virus is present in Indonesia. Zika infection has been confirmed from a patient in Indonesia [13] or from travelers returning from Indonesia [11,12]. However, there is no study has been conducted to assess the knowledge of healthcare workers in the country for this new emerging infectious disease. This study was conducted to assess the knowledge on Zika infection among doctors in Aceh province, Indonesia. We found that only 35.9% of the participants had good knowledge and being general practitioner, working in community health centers and had experience making a difference diagnose of Zika disease to patient(s) were associated with good knowledge.

Currently, reports regarding knowledge on Zika infection have been published among dental practitioners in India [27] and healthcare students and workers in Colombia [28,29]. In India, the study tried to assess the factors associated with knowledge on Zika infection and found that qualification of dental practitioners was associated with knowledge [27]. In this present study, education attainment had no association with knowledge regarding Zika infection. There are, at least, two explanations. First, Zika infection is a new emerging infectious disease and therefore it has not been included in the medical curriculum even in higher qualification in medical education system. Second, our study reveled that online media was the most predominant information source of the information related to Zika infection. In context of Aceh and Indonesia, the senior healthcare workers are less active in accessing online media compared to their junior counterparts. These explain that higher medical education had no association with a better knowledge on Zika infection. The second explanation might also explain the finding that being general practitioners had significant higher odds of having good knowledge on Zika infection.

In addition, having contacted with patients presenting the signs and symptoms of Zika disease also had no association with knowledge on Zika infection. Interestingly, 13 of the participants had experienced making Zika disease as differential diagnosis to their patients and this associated with higher knowledge on Zika disease. Indonesia is a hyper-endemic country for dengue including Aceh province and chikungunya outbreak has been reported previously in Aceh [20]. In fact, the signs and symptoms of Zika infection are very similar with dengue and chikungunya infection [30]. Although, those patients could be dengue infection, it should be noted that, the first confirmed Zika patient in Jambi province was also suspected as dengue patient [13]. In addition, there is no established diagnostic system for Zika in Aceh, indeed in Indonesia. These might cause Zika infection could be missed being diagnosed during clinical visit.

We also found that general practitioners had higher odds of having a good knowledge compared to specialist doctors and doctor who were working in community health centers had better good knowledge compared to those who were working in private clinics or private hospitals or in the governmental hospitals. The explanation for these findings may be underpinned by two plausible reasons: the nature of ZIKV diagnosis and the survey respondent's characteristic. As the clinical symptoms of Zika disease highly resemble other arbovirus diseases such as dengue and chikungunya, as well other tropical diseases (e.g. malaria), detections of Zika disease may be regarded within general practitioner competence. General practitioners would feel that they are expected to have a sufficient knowledge about Zika disease, as well as other arbovirus diseases, which is outlined in the Indonesian Standard of General Practitioners Competence (SKDI) and would try to find information regarding Zika. This might result in better knowledge of Zika amongst general practitioner. Most of Zika prevention measures, including the strategic response set out by WHO (mosquito control/risk communications/community engagement) are also within the community health centre area of work, where general practitioners are based. Government hospitals role may be limited to referral centre for advanced cases and private clinics were not involved in strategic response for arbovirus diseases as much as community health centre. In addition, specialization department that is associated with the management of Zika disease as recommended by CDC includes obstetric-gynecologist and pediatrician. However, the numbers of specialist doctors from these departments who participate in the survey are significantly less than the number of general practitioners or other specialist doctor, which may affect the final result.

Finally, as expected, doctors who had experience diagnosing at least one patient with differential diagnosis of Zika disease had significant higher odds having a good knowledge. Interestingly, having access to medical journals was associated with a poor knowledge. The ability to established Zika disease as differential diagnosis is associated with better knowledge of ZIKV, because it requires specific information to differentiate diagnosis of Zika disease and other similar arbovirus diseases.

The knowledge of the doctors in Aceh regarding Zika disease is relatively low; approximately only 40% participants who had a good knowledge on Zika infection. General practitioners have a higher knowledge compared to specialist and doctors who are working in community health centers also have a better knowledge compared to their counterparts in private clinics or private hospitals or in the governmental hospitals. Doctors know have a good knowledge are more confident to established Zika disease as differential diagnosis in their clinical setting.

Conflict of interest statement

Authors have no conflict of interest to be reported.

Acknowledgment

We thank the participants of this study for their willingness to participate.

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