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Attitudes towards Zika virus infection among medical doctors in Aceh province, Indonesia

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ABSTRACT

Zika virus (ZIKV) infection, a public health emergency of international concern, has recently been confirmed in Indonesia. However, to date, there has been no study to assess how prepared healthcare workers in Indonesia are to confront this emerging infectious disease. The aim of this study was to assess the attitudes of medical doctors in Indonesia towards ZIKV infection and its associated explanatory variables. A cross-sectional self-administered online survey was conducted from 3 May to 3 June 2016 in Aceh province, Indonesia. A pre-tested questionnaire was used to collect data on doctors' attitudes towards ZIKV infection and a range of explanatory variables (basic demographic data, professional characteristics, workplace characteristics and facilities, and medical experience related to ZIKV infection). Associations between attitude and explanatory variables were assessed using multiple-step logistic regression. We received 631 responses, 424 (67.19%) of which were included in the final analysis. Approximately 64% (271) of doctors had a poor attitude towards ZIKV infection. Experience considering ZIKV infection as a differential diagnosis and attendance at a national conference was associated with a good attitude, with odds ratios (OR) of 3.93 (95% confidence interval [CI]: 1.15–13.49) and 1.69 (95% CI: 1.03–2.76), respectively. Unexpectedly, doctors who had attended an international conference and those working at places that had molecular diagnostic (polymerase chain reaction based testing) facilities had lower odds of having a good attitude (OR: 0.35 [95% CI: 0.15–0.84] and 0.42 [95% CI: 0.19–0.95], respectively). In conclusion, the attitude towards ZIKV infection is relatively poor among doctors in Aceh. Therefore, strategies for enhancing their capacity to respond to ZIKV infection are needed. The survey concept and tools were well accepted by the participants of this study, suggesting that this rapid assessment could be rolled out across the Indonesian archipelago and elsewhere to identify and regionally differentiate unmet needs of disease and outbreak preparedness.

Introduction

On February 1, 2016, Zika virus (ZIKV) infection was declared a public health emergency of international concern by the World Health Organization (WHO). This designation was lifted on November 18, 2016 [1]. Zika virus infection was reported for the

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first time in humans in Nigeria in 1954 [2] and caused several outbreaks in Oceanian countries between 2007 and 2015 [3,4]. In May 2015, ZIKV infection was reported for the first time in the Americas (specifically, in Brazil) (although the virus seems to have been circulating there since 2013) [5–7], and currently, 59 countries and territories report continuing mosquito-borne transmission of ZIKV (cut-off date for updates: January 2017) [1]. Most of the ZIKV infection cases are asymptomatic. During a Zika outbreak in Yap Island, the symptomatic attack rate was only 18% of those infected (95% CI, 10–27) [3]. Acute ZIKV infection is usually mild with common symptoms including rash, fever, arthralgia, myalgia, fatigue, headache, and conjunctivitis. However, the infection can cause severe clinical complications and sequelae. ZIKV infection has been confirmed to be associated with microcephaly in neonates [8,9]. A study in Brazil reported a significant increase of microcephaly incidence during the Zika outbreak with more than 3800 cases of microcephaly (20 per 10,000 live births) [10]. In adults, ZIKV infection has been associated with severe neurological and non-neurological complications and sequelae including meningitis, meningoencephalitis, Guillain–Barré syndrome, loss of hearing, hypotension, and genito-urinary symptoms [4,11,12].

In Indonesia, the largest country of Southeast Asia and home to 254.9 million people, no Zika outbreak has been reported to date. However, Indonesia may be vulnerable for Zika outbreaks for at least two reasons: First, there is evidence indicating that ZIKV is already present in Indonesia. Serological studies found that serum samples from inhabitants in Central Java (1981) [13] and Lombok (1983) [14] contained a neutralizing antibody to ZIKV. In 2013 and 2014, two Australian travelers acquired confirmed ZIKV infection after visiting Indonesia [15,16], and in 2016, ZIKV was for the first time isolated from a patient in Indonesia (Jambi, Sumatra island) who had been suspected of suffering from dengue fever [17]. Second, the global risk of ZIKV infection depends critically on the suitability of *Aedes albopictus* mosquitoes as a vector of ZIKV in the field [18] and the potential for ZIKV to spread to all countries where *Aedes aegypti* and *A. albopictus* mosquitoes are established [19]. Co-circulation of ZIKV with dengue and chikungunya viruses most likely occurs throughout continents where the latter two are endemic [4]. In fact, Indonesia is one of the largest dengue endemic countries [20]; it has experienced several outbreaks of chikungunya fever [21–23] and is widely inhabited by both *A. aegypti* and *A. albopictus* mosquitoes.

As part of the rapid action plan on ZIKV infection as a public health emergency of international concern, WHO on March 24, 2016 released their guidelines and resource information pack for Knowledge, Attitudes and Practices (KAP) surveys on ZIKV infection [24]. Studies regarding the knowledge and attitudes of healthcare providers towards ZIKV infection are still rare. In Indonesia, our group recently published a report about knowledge on ZIKV infection among doctors in Aceh province, and we found that only 35.9% had good knowledge [25]. The aim of this study was to assess the attitude towards ZIKV infection and its associated explanatory variables among doctors in Aceh, Indonesia, to determine the appropriate target group(s) for a Zika prevention program.

Materials and methods

Survey design and data collection procedures

During 3 May to 3 June 2016, our group conducted the Aceh Zika Study. The study was a cross-sectional self-administered online survey to assess the knowledge and attitudes towards ZIKV infection among doctors in Aceh province, Indonesia. The target population was all medical doctors located in Aceh. To collect the data of interest, invitations to complete an anonymous online survey were sent by social media to the members of doctor organizations or groups. If no response was received, up to four reminders were sent after the initial message over a period of one month. An introduction explained the aims of the study and its expected benefits, emphasizing that participation was voluntary and anonymous, and answers were treated confidentially. The online survey was estimated to take approximately 10 min to complete. No financial compensation was offered. The data presented in this article were the attitudinal part of the Aceh Zika Study, while the report on knowledge of ZIKV infection has been published elsewhere [25].

Survey instrument

A questionnaire to collect data on doctors' attitudes towards ZIKV infection and a range of potential explanatory variables (basic demographic data, educational attainment, type of workplace, characteristics of the workplace and experience related to Zika disease) was developed. The questionnaire also covered knowledge of ZIKV infection [25]. To ensure the questions and pre-defined answers were sufficiently clear and relevant, the questionnaire was tested for its reliability among 30 participants during a pilot study. Data from the pilot study were not included in the final analysis.

Study variables

The response variable in this study was attitude towards ZIKV infection. To measure attitude, a questionnaire consisting of eight statements was used. Participants were asked to respond to the statements on a five-point Likert-like scale as follows: 1 = strongly disagree; 2 = disagree somewhat; 3 = neither agree nor disagree; 4 = agree somewhat; and 5 = strongly agree. Some questions were phrased in an opposite manner from the majority of the questions. A high score was given when agreement with the statement defined a positive attitude. The attitude score of each participant was computed as the total sum of responses so that higher scores indicated a better attitude.

The explanatory variables included basic demographic data (age, gender, educational attainment and type of occupation), and characteristics of the workplace included department, location (district, regency and province) and facilities. Questions on workplace facilities asked about the availability of specific testing procedures, such as polymerase chain reaction (PCR) and enzyme-linked immunosorbent assay (ELISA), and access to scientific journals. In addition, information on professional experience, including years practicing medicine, attendance at medical conferences/trainings in the last five months, and diagnosis of ZIKV infection in a clinical setting was collected from each participant. Knowledge of ZIKV infection was assessed using a set of 11 questions; details about this assessment have been published elsewhere [25].

Statistical analysis

The additive score for attitude towards ZIKV infection ranged from 8 to 40. For each participant, the level of attitude was dichotomized into "good" and "poor" based on a 75% cut-off point (using the highest score achieved). The associations between attitude towards ZIKV infection and explanatory variables were assessed using two-step logistic regression. All explanatory variables were included in univariate logistic regression, and all explanatory variables with $P \leq 0.25$ in univariate analysis were entered into multivariate analysis. The regression coefficients were expressed as an odds ratio (OR) with 95% confidence intervals (CI). The estimated crude OR of univariate and adjusted OR (aOR) of multivariate analysis were interpreted in relation to one of the categories, which was designated as the reference category (R).

Table 1
Univariate logistic regression analysis showing predictors of attitude towards Zika virus infection (good vs. poor) ($N = 424$).

Variable	*n* (%)	Good attitude	Univariate	
		n (%)	OR (95% CI)	*P*–value
Gender				
Male (R)	181 (42.7)	65 (35.9)	1	
Female	243 (57.3)	88 (36.2)	1.01 (0.68–1.51)	0.949
Age group				
Less than 30 years (R)	226 (53.3)	76 (33.6)	1	
30 or more years	198 (46.7)	77 (38.9)	1.26 (0.84–1.87)	0.261
Education				
General practitioner (GP) (R)	339(80.0)	112 (33.0)	1	
GP with master or doctoral degree	33 (7.8)	19 (57.6)	2.75 (1.33–5.69)	0.006
Specialist	33 (7.8)	14 (42.4)	1.49 (0.72–3.09)	0.279
Specialist with master or doctoral degree	19 (4.5)	8 (42.1)	1.47 (0.58–3.77)	0.418
Occupation				
GP or specialist, non university staff (R)	305 (71.9)	104 (34.1)	1	
GP or specialist, university staff	82 (19.3)	41 (50.0)	1.93 (1.18–3.16)	0.009
Specialist residency	37 (8.7)	8 (21.6)	0.53 (0.23–1.21)	0.132
Department				
Community health centre (R)	143 (33.7)	51 (35.7)	1	
Emergency unit	119 (28.1)	39 (32.8)	0.88 (0.53–1.47)	0.625
Other specialist departments	87 (20.5)	29 (33.3)	0.90 (0.51–1.58)	0.902
Others	75 (17.7)	34 (45.3)	1.50 (0.85–2.64)	0.165
Type of workplace				
Community health centre (R)	85 (20.0)	31 (36.5)	1	
Private clinic or hospital	156 (36.8)	58 (37.2)	1.03 (0.60–1.78)	0.913
Government hospital	183 (43.2)	64 (35.0)	0.94 (0.55–1.60)	0.811
Location of workplace				
District (R)	113 (26.7)	36 (31.9)	1	
Regency	150 (35.4)	62 (41.3)	1.51 (0.90–2.51)	0.117
Province	161 (38.0)	55 (34.2)	1.11 (0.66–1.85)	0.690
Attended province-level conference				
No (R)	136 (32.1)	51 (37.5)	1	
Yes	288 (67.9)	102 (35.4)	0.914 (0.60–1.39)	0.677
Attended national conference				
No (R)	259 (61.1)	86 (33.2)	1	
Yes	165 (38.9)	67 (40.6)	1.37 (0.92–2.06)	0.122
Attended international conference				
No (R)	383 (90.3)	142 (37.1)	1	
Yes	41 (9.7)	11 (26.8)	0.62 (0.30–1.28)	0.197
Medical practice experience (years)				
Less than 5 years (R)	252 (59.4)	86 (34.1)	1	
5–10 years	140 (33.0)	56 (40.0)	1.29 (0.84–1.97)	0.247
More than 10 years	32 (7.5)	11 (34.4)	1.01 (0.47–2.19)	0.978
Workplace has PCR facility				
No (R)	343 (80.9)	135 (39.4)	1	
Yes	81 (19.1)	18 (22.2)	0.44 (0.25–0.776)	0.005
Workplace has ELISA facility				
No (R)	325 (76.7)	125 (38.5)	1	
Yes	99 (23.3)	28 (28.3)	0.631 (0.39–1.03)	0.066
Workplace has access to medical journals				
No (R)	309 (72.9)	114 (36.9)	1	
Yes	115 (27.1)	39 (33.9)	0.88 (0.56–1.38)	0.570
Had contact with patient(s) presenting signs and symptoms of Zika virus infection				
No (R)	396 (93.4)	142 (35.9)	1	
Yes	28 (6.6)	11 (39.3)	1.16 (0.53–2.54)	0.715
Had experience considering Zika as differential diagnosis				
No (R)	411 (96.9)	144 (35.0)	1	
Yes	13 (3.1)	9 (69.2)	4.17 (1.26–13.78)	0.019

In addition, the correlation and association between knowledge and attitude regarding ZIKV infection were assessed using Spearman's rank correlation (r_s) and the Chi-square test, respectively. This correlation was chosen because the scores of knowledge and attitude were not normally distributed as revealed by the Kolmogorov–Smirnov test ($P < 0.001$ for each domain). The confidence intervals for Spearman's rank correlation were calculated as previously described [26]. For all analyses, *P*-values of less than 0.05 were regarded as statistically significant. All analyses were conducted using the Statistical Package of Social Sciences 17.0 software (SPSS Inc., Chicago, IL, USA).

Ethics approval

The protocol used in this study was approved by the Ethical Clearance Committee of the School of Medicine, Syiah Kuala University, Banda Aceh, Indonesia, in compliance with national legislation and the code of ethical principles for medical research involving human subjects in the Declaration of Helsinki (No. 19/KE/FK/2016). Informed consent was obtained from all participants prior to their participation in the survey.

Table 2
Multivariate logistic regression analysis showing predictors of attitude towards Zika virus infection (good vs. poor) ($N = 424$).

Variable	Multivariate OR (95% CI)	P–value
Education		
GP (R)	1	
GP with master or doctoral degree	1.52 (0.60–3.87)	0.377
Specialist	1.95 (0.52–7.26)	0.319
Specialist with master or doctoral degree	1.74 (0.40–7.58)	0.463
Occupation		
GP or specialist, non university staff (R)	1	
GP or specialist, university staff	1.95 (0.94–4.06)	0.075
Specialist residency	0.63 (0.17–2.29)	0.480
Department		
Community health centre (R)	1	
Emergency unit	0.64 (0.34–1.21)	0.171
Other specialist departments	0.99 (0.27–3.64)	0.991
Others	1.11 (0.55–2.24)	0.772
Location of workplace		
District (R)	1	
Regency	1.71 (0.91–3.23)	0.097
Province	1.21 (0.58–2.49)	0.614
Attended national conference		
No (R)	1	
Yes	1.69 (1.03–2.76)	0.037
Attended international conference		
No (R)	1	
Yes	0.35 (0.15–0.84)	0.019
Medical practice experience (years)		
Less than 5 years (R)	1	
5–10 years	1.20 (0.71–2.03)	0.505
More than 10 years	0.48 (0.16–1.46)	0.198
Workplace has PCR facility		
No (R)	1	
Yes	0.42 (0.19–0.95)	0.037
Workplace has ELISA facility		
No (R)	1	
Yes	0.92 (0.42–2.01)	0.838
Had experience considering Zika as differential diagnosis		
No (R)	1	
Yes	3.93 (1.15–13.49)	0.029

Results

Demographic characteristics

During the survey, responses were received from 631 participants. Among these, 207 were excluded due to missing information. A total of 424 (67.2%) complete datasets were analyzed. These data represented 14.7% of the doctors (specialists and GPs) in Aceh, totaling 2872 in 2015 [27]. There were 1550 GPs and 1.322 specialists in Indonesia [27] and in this study, 372 GPs and 52 specialists, representing 24.0% and 3.9%, respectively, were included in the analysis. Approximately 57% of the participants were female and more than half were less than 30 years old (Table 1). The vast majority of the participants (87.7%) were general practitioners with or without master or PhD degrees. Approximately 20% of the total participants were university staff. The workplaces of approximately 19% and 23% of the participants had PCR and ELISA facilities, respectively. Less than 10% of the participants stated that they had prior contact with patients presenting signs and symptoms compatible with ZIKV infection.

Attitude towards Zika virus infection and associated factors

In total, only 153 (36.1%) of the participants had a good attitude towards ZIKV infection. The majority of participants had an inappropriate attitude regarding ZIKV infection. For example, approximately 52% of the respondents believed that ZIKV infection was a deadly infectious disease, and 53% stated that patients with ZIKV infection should be kept in isolation rooms to avoid contagion. Additionally, 60% believed that Zika patients should be treated by specialists.

We found that, to some degree, the variables educational attainment, type of occupation, workplace facilities (having PCR-based diagnostic testing), and experience considering Zika disease as a differential diagnosis were associated with attitudes towards ZIKV infection based on univariate analysis (Table 1). Our multivariate analysis model revealed that only two of these factors (workplace facilities and experience considering Zika as a differential diagnosis) were associated with attitude towards ZIKV infection (Table 2). Interestingly, the multivariate model revealed that two additional variables were associated with attitude: attendance at national and international conferences within the last five months (Table 2).

As expected, a doctor who had thought about Zika disease as a differential diagnosis in their clinical settings had better attitudes towards ZIKV infection (OR: 3.93; 95% CI: 1.15–13.49). In addition, doctors who had attended a national conference within the last five months before the survey had higher odds of having a good attitude (OR: 1.69; 95% CI: 1.03–2.76). However, there were also two very unexpected findings: The doctors who had attended an international conference and those working at healthcare centers that had PCR diagnostic facilities had lower odds of having a good attitude towards ZIKV infection (OR: 0.35; 95% CI: 0.15–0.84 and OR: 0.42; 95% CI: 0.19–0.95, respectively).

Surprisingly, our additional analysis revealed that the correlation between knowledge and attitude was very weak with $r_s = -0.001$ (95% CI: −0.083–0.081, $P = 0.991$). To confirm this finding, the association between knowledge and attitude towards ZIKV infection was also assessed again after separating "good" and "poor" attitude based on a 75% cut-off point. Using this approach, we found that there was no association at all between the knowledge and attitude domains (OR: −0.003; 95% CI: −0.519–0.513, $P = 0.991$).

Discussion

Although the first evidence of ZIKV infection in humans was reported as early as 1952 [28], it is a new topic at the global level [29], and only a few studies have reported on the knowledge of ZIKV infection among different groups of respondents, e.g., dental practitioners in India [30], healthcare students and workers (general practitioners, specialists and nurses) in Colombia [31,32], medical, dental and pharmacy students in a university in Malaysia [33] and recently doctors in Indonesia [25]. However, no proper study on attitudes towards ZIKV infection is available. The only study of this kind, published in the form of an abstract, was conducted among medical, dental and pharmacy students in a university in Kedah, Malaysia [33]. Although conducted to evaluate the knowledge, attitude and perception of university students, the abstract of that study did not present data regarding attitude. To the best of our knowledge, the study reported herein is thus the first full report on attitudes towards ZIKV infection among doctors.

Our study reveals that the attitude towards ZIKV infection among doctors in Aceh was relatively low and doctors who had attended a national conference and who had experience considering ZIKV infection as a differential diagnosis had better attitudes compared to their counterparts. Surprisingly, however, doctors who had attended an international conference and who were working at healthcare centers that had PCR facilities for diagnosis had lower odds of having a good attitude.

The factor most robustly associated with positive attitude was experience considering ZIKV infection as a differential diagnosis. This factor is also associated with knowledge of ZIKV infection [25]. It is understandably stable because a previous study explained that experience with an issue should be a moderator of the structure and relationships involving expectancy-value attitudes [34]. In addition, our findings suggest that attending a conference may have dual associations in the context of Zika (i.e., attending national conferences had a positive association with attitude whereas attending international conferences had a negative association). Possible explanations for this include the following: First, our findings revealed that there was no association between knowledge and attitude regarding ZIKV infection and therefore the knowledge on ZIKV (if any) that was received from a conference could not change the attitude among doctors towards ZIKV infection. Second, and the most likely reason in our opinion, is that the conference a participant attended may not have been related to the topic of ZIKV infection and, therefore, had no association with attitude towards this topic. A previous study also found that attending conferences had no association with knowledge on ZIKV infection [25]. In addition, only 2.1% of the participants in that study received their information regarding ZIKV from conferences [25].

We hypothesized that doctors who were working in healthcare centers with better facilities would have better attitudes towards ZIKV infection. However, our study suggests that doctors who are working at workplaces that have PCR facilities have poorer attitudes. A possible explanation for this might be that the majority of doctors who are working at better facilities are specialists who are less active assessing updated information related to ZIKV infection from the internet [25]. However, the reason for this observation remains unclear.

This study together with our previous publication [25] reveals that knowledge and attitudes towards ZIKV infection among doctors in Aceh is poor. Therefore, strategies for enhancing the capacity of medical doctors (and healthcare staff in general) in Aceh and other regions of Indonesia to respond to ZIKV infection may be needed.

Conclusions

The attitude towards ZIKV infection among doctors in Indonesia's Aceh province is relatively low. Experience including Zika disease as a differential diagnosis and attending a national conference was associated with a better attitude. Doctors working at healthcare centres with better diagnostic facilities seemed to have less support through information on ZIKV infection. Although the global emergency regarding ZIKV infection has been lifted, transmission of this virus will continue to expand in the world, including Southeast Asia, rendering medical education about ZIKV still highly important and relevant for prevention and control efforts. The acceptance of the survey concept and methods by the participants of this study suggest that this assessment could be rolled out across the Indonesian archipelago and elsewhere to rapidly identify, regionally and culturally differentiate, and address unmet needs of disease and outbreak preparedness.

Conflict of interest

None declared.

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Appendix A

Questions used for assessing attitudes towards Zika virus infection (Table A1).

Table A1
Questions used for assessing the attitude towards Zika infection.

No	Question
1	Do you think Zika virus infection is a deadly infectious disease?
2	Do you think Indonesia's population currently are at high risk of Zika infection?
3	Do you think Zika disease will easily spread in Indonesia?
4	Do you think there is no possibility of Zika be epidemic in Indonesia?
5	Do you think you will treat Zika patients in isolation ward because it is very infectious?
6	Do you think Zika patients need to be treated by Infectious Disease specialist?
7	Do you think the best way to prevent Zika infection is to protect from mosquito bites?
8	Do you think Indonesia government should ban foreigners to enter Indonesia if they show symptoms of Zika disease?

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