KAP STUDY

Knowledge, attitudes, and practices among university students in relation to dengue fever: A multi-center study across Vietnamese regions

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Abstract

Objective: Dengue fever (DF) is a serious illness worldwide that can spread rapidly and become a dangerous epidemic. Vietnam is an endemic country affected by the health and economic burden of dengue. This study was conducted to assess the knowledge, attitudes, and practices related to DF among university students across Vietnam.

Methods: A student-based cross-sectional study was performed with a structured questionnaire in Vietnam between July and September 2018. A Chi-square test and Fisher's exact test were used to compare different issues between two student groups, including medical and non-medical student, and P-values of <0.05 were considered significant.

Results: A total of 1,542 students from universities in Vietnam responded to the survey, which was reflective of 315 medical students learning in public schools, 689 medical students learning in private schools, and 538 non-medical students. The majority of participants had good knowledge on the transmission of DF, good attitudes toward DF, and good practices to prevent the disease. Medical students had better knowledge of the signs and symptoms than non-medical students. However, both student groups' knowledge of signs and symptoms was low.

Conclusion: Quality of education is a key determinant of the knowledge of the disease, as well as of attitudes and practices. This study supported the government's implementation of intervention projects and DF prevention campaigns and its positive participation in the community.

Keywords: Attitude, Dengue fever, Knowledge, Practice, Student, Vietnam. (JPMA 69: S-96 (Suppl. 2); 2019)

Introduction

Dengue fever (DF) is a serious human arboviral infection that threatens global public health and is the leading cause of deaths among arboviral diseases.[1] The dengue virus (DV) is carried and spread by *Aedes* mosquitoes,with the primary vector being *Aedes aegypti* and other *Aedes* species that transmit dengue including *Aedes albopictus*, *Aedes polynesiensis*, and *Aedes scutellaris*, and humans act as the accidental hosts and the main victims. Past efforts to control the mosquito vector have proven challenging, highlighting the need for a multi-sectoral approach. Indeed, risks and vulnerability are high, and the epidemic is on the rise. In 1997, the World Health Organization (WHO) defined the symptomatic DV infection into three classifications: dengue fever, dengue haemorrhagic fever, and dengue shock syndrome.[2] However, the geographic spreading of dengue and its enlarged incidence in older age groups have contributed to the limited applicability of the 1997 criteria. Based on clinical experience, DF presents as a spectrum of disease despite specific phases. To shed light on the perceived limitations of the 1997 case definitions,the international Dengue Control (DENCO) study was designed to develop an evidence-based categorization that would better reflect the clinical severity in all age groups in Southeast Asia and Latin America.[3,4] Findings of this study with over 1,700 authenticated cases of dengue were classified into one of three intervention groups according to disease severity. By comparing the number of patients who did and did not progress to severe disease, the study concluded that 22% of patients with shock did not satisfy all the criteria for dengue haemorrhagic fever.[3] Acquiring this information, no doubt could support modifying the 2009 WHO classification scheme. The 2009 WHO criteria classified dengue according to levels of severity, including dengue without warning signs; dengue with warning signs, such as abdominal pain, fluid accumulation, persistent vomiting, mucosal bleeding, liver enlargement, lethargy, and increasing haematocrit with decreasing platelets; and severe dengue, such as dengue with severe bleeding, severe plasma leakage, or organ failure.[5] It is essential to recognize that the new classification was particularly effective with respect to triage and management of dengue, reporting during superintendence, and endpoint measurements in dengue clinical trials.[5,6]

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In addition, DV infection is of top concern to healthcare staff professionals and governments since the incidence of DF has increased more than 30-fold and has expanded from a desultory disease into a global public health problem over the past 50 years.[5] Simultaneously, the disease is endemic in 128 countries and growing worldwide.[7] According to a 2012 study on the prevalence of dengue, an estimated 3.9 billion people in 128 countries were at risk of DV infection.[7] Moreover, the actual number of dengue cases were believed to be underreported and many cases misclassified. The tropical and subtropical regions of the world occasionally have a DF outbreak, so the Southeast Asian countries patently share the dengue burden.[1] Over a period of 10 years, from 2001 to 2010, the region lost 214,000 disability-adjusted-life-years, and 950 million US dollar (USD) per year were attributed to dengue.[8] Little is known as the rate of morbidity, mortality, economic burden of DF is higher than the rate of these of upper respiratory infections and many other diseases. Particularly in developing countries, DF is responsible for adverse health care outcomes.[8] In recent years in Vietnam, epidemiological investigations on DF have shown that the disease's status has decreased, and the country has the lowest incidence and mortality compared to other countries in the region, but annually, an average of 50,000 to 100,000 cases have been recorded, with 50 to 100 deaths.[9] Once a year, the DF peak usually falls from September to November. However, from the beginning of the year to August 2017, the country recorded 80,555 cases, an increase of 35.5% compared to the same period in 2016 (51,742 infected cases) and 22 cases of death, an increase of five cases.[10] Even so, this number was nearly equal to the total number of patients with DF in 2016 (43 deaths among 126,090 cases).[10] Based on the account of the General Department of Preventive Medicine of Vietnam, this was already the largest outbreak of DF in the last decade. Accumulated from the beginning of 2018 to date, the country has recorded 20,522 cases, with four deaths.[11] The number is significantly reduced compared to 2017, but it remains a national health challenge.

The *Aedes* mosquito rests indoors, can breed in small collections of water, and bites during the daytime. Thus, people can contribute the principal preventive measure of reducing the burden of DF by controlling the breeding places of mosquitoes.[12] However, one of the barriers is the lack of awareness about the severity of dengue in the population, which is causally linked to the actual biggest challenge-controlling the vector.[13] In this context, the WHO has only stressed on the importance of adequate knowledge and positive attitudes connected with practicing prevention programmes to protect people against possible risks. Given this challenge, the WHO promoted an approach to communication, advocacy, and social mobilization in neighborhoods, educational, and field work settings known as the Communication for Behavioural Impact (COMBI).[14] In addition, at the Association of Southeast Asian Nations (ASEAN) Ministerial on Health Meeting held in Singapore in July 2010, the WHO, the ASEAN organization, and representatives of ASEAN countries agreed to make June 15 ASEAN Day to Prevent DF.[15] This policy is one of the pillars that places the vital responsibility and role of DF prevention on the communities, authorities, and sectors, not only in Vietnam but also in all international communities and ASEAN countries. Dengue control is more likely to be achieved if the level of knowledge regarding DF has increased.

Among the previous reports, there was a study designed to investigate DF prevention related to knowledge, attitudes, and practices (KAP) before and after implementing an educational intervention project in Tan Hung High School, Cai Be District, Tien Giang Province, in Vietnam in 2009.[16] The data collected throughout this study were an argument for pursuing further research into dengue. In this regard, the results illustrated that the percentage of students receiving information about DF from teachers was 81.2% and receiving it after the intervention was 98.4%. Before interference, the rate of students with the KAP high was respectively 58.6%, 75.9%, and 48.7%, and after intervention, the rate was 93.2%, 82.2%, 80.1%, respectively. The difference was statistically significant. The proportion of understanding about water containers was 13.4% before intervention, and that rose dramatically to 49.7% after intervention. This study showed interesting results that communication interventions and intensive educational campaigns can reach many students and increase their level of KAP. In-depth knowledge of the issues is indispensable, and obtaining this information will contribute to developing preventive programmes to reduce the burden (economic, health, etc.). As a matter of fact, a university has the potential to become a disease hotspot, as there are active transmission factors and a direct connection with larger communities. In particular, frontline undergraduate students are intrinsically linked to the success of DF control programs.[17] With a large university community, establishing and assessing the students' dengue KAP levels as well as behavioural impact programmes is of the utmost importance among public strategies and should be high on the agenda for health policy-makers. In this sense, universities are key venues for implementing standard precaution for health promotion. There were not many studies that conducted

related to KAP towards DF in Vietnam, especially in university students. Therefore, the current study aimed to investigate the KAP regarding DF among a large group of university students across Vietnam, which was also part of a baseline measurement for an educational intervention study aimed at increasing awareness of DF and reduce risks. It is expected that the findings of this study will be helpful to direct the future development of adequate DF awareness among students and will be part of the components of a national standard precaution against dengue.

Subjects and Methods

This was a cross-sectional study to assess KAP related to DF among university students and was undertaken from July to September 2018 in Vietnam. As a brief introduction, this country covers a total area of approximately 331,210 square kilometersand had an estimated 96.2 million inhabitants in 2017.[18] Vietnam is the world's 15th most populous country and the 9th most populous country in Asia.[18] In addition, education in Vietnam is now trying to integrate with other countries in Southeast Asia and even around the world. Specific evidence has suggested that Vietnam had 235 universities in the 2016-2017 academic year.[19] This confirms that the proportion of university students was not low, and furthermore, students are seen as the frontline in the government's DF propaganda campaign. Therefore, universities are a key priority to investigate the KAP level in Vietnam. The present study implemented a survey across Vietnam that particularly was concentrated in large cities, where many universities in the country are located. Inclusion criteria for this study were age 18 years and above and being undergraduate students in Vietnam. Exclusion criteria were a reluctance to participate in the study, and people who were foreigners, mute, or deaf, did not communicate in Vietnamese, or have been suffering from DF. All participants voluntarily answered a standard questionnaire and were not previously provided the answer.

Sample Size Determination

A single population proportion formula (20) was used to estimate the minimum sample size (N) by taking the proportion of good KAP regarding dengue (P=0.5). The following assumptions of a 95% confidence interval ($Z_{\alpha/2}$=1.96) and a 5% margin of error (d) have been made.

$$N = \frac{(Z_{\alpha/2})^2 \times P(1-P)}{d^2} = \frac{(1.96)^2 \times 0.5(1-0.5)}{0.05^2} = 385$$

By adding 10% for a non-response rate, the estimated target sample size was 423 study participants. Then, a systematic random sampling technique was used to choose the study participants, and the sample size was proportionally distributed across Vietnam. In fact, this study collected 1,542 samples to increase credibility in the research process.

The KAP questionnaire used in a previous study by Dhimal et al.[21] was adapted for the current study. In the following stage, it was modified for content, wording, and cultural appropriateness conforming to research in Vietnam and ensuring that participants could easily comprehend it. The questionnaire was pre-tested with 200 participants in Ho Chi Minh City, the largest city in Vietnam, to evaluate for timing, interpretation, and clarity of questions and instructions. The data were collected from 200 participants using a set of validated and pre-tested questionnaires to facilitate the primary interviews and were not included in the final analysis. Running Cronbach's alpha, items were extruded if they had a coefficient less than 0.3 or if the Cronbach's alpha of a deleted item was larger than the current Cronbach's alpha. Therefore, from the original 45 items, this study was finalized at 40 items for the standard questionnaire. This standardized questionnaire began with a preamble of the study, was separated into four sections, and it took 10-15 minutes to administer, with external assistance not permitted. For analysis, the first section focused on the socio-demographic characteristics of the respondents. Likewise, the second section, which contained 19 items, was designed to explore students' knowledge of DF's route of transmission, signs and symptoms, as well as their misperceptions about DF. The options of the responses were "right," "wrong." In the same manner, the third section consisted of 13 items to assess participants' attitudes toward DF and was designed as a five-point Likert scale ranging from 1= "strongly disagree" to 5= "strongly agree" with a mid-point of "uncertain." Finally, the fourth section collected information on practice to prevent DF and comprised eight items presented by dichotomous choice questions. A minimum of Cronbach's alpha of 0.7, 0.65, and 0.7 for knowledge, attitude, and practice, respectively, was considered to reflect acceptable internal reliability.[22]

In order to assemble the exact information from participants, the questionnaire was practically administered through face-to-face interviews and groups interviews by the research assistants. All members of the data collection team were recruited and experienced a professional brief training prior to the actual study, and to avoid unfairness, no correct answers to the survey questions were provided. The study subjects who met the inclusion criteria but were not eliminated by the exclusion criteria stated above were enrolled at the universities,

Table-1: Socio-demographic characteristics of included students (n, %).

	Medical students (N= 1,004)				Non-medical students		Total		P-value
	Public school (N= 315)		Private school (N= 689)		(N= 538)		(N= 1,542)		
Training programme (TP)									
Undergraduate programme (TP1)	310	98.4	394	57.2	491	91.3	1195	77.5	<0.001
Second bachelor's degreeb (TP2)	5	1.6	-	-	-	-	5	0.3	
Course articulationc (TP3)	-	-	295	42.8	6	1.1	301	19.5	
Otherd(TP4)	-	-	-	-	41	7.6	41	2.7	
Year in Academics (YA)									
First year (YA1)	24	7.6	60	8.7	88	16.4	172	11.2	<0.001
Second year (YA2)	37	11.7	202	29.3	82	15.2	321	20.8	
Third year (YA3)	69	21.9	84	12.2	140	26.0	293	19.0	
Fourth year (YA4)	97	30.8	170	24.7	209	38.8	476	30.9	
Fifth year (YA5)	65	20.6	170	24.7	19	3.5	254	16.5	
Sixth year (YA6)	23	7.3	3	0.4	-	-	26	1.7	
Gender (G)									
Male (G1)	111	35.2	209	30.3	179	33.3	499	32.4	0.261
Female (G2)	204	64.8	480	69.7	359	66.7	1043	67.6	
Type of residence (TR)									
City (TR1)	272	86.3	543	78.8	460	85.5	1275	82.7	0.001
Suburb (TR2)	43	13.7	146	21.2	78	14.5	267	17.3	
Religion (R)									
None (R1)	237	75.2	490	71.1	368	68.4	1095	71.0	<0.001
Buddhist (R2)	39	12.4	102	14.8	112	20.8	253	16.4	
Christian (R3)	7	2.2	91	13.2	21	3.9	119	7.7	
Catholic (R4)	21	6.7	3	0.4	22	4.1	46	3.0	
Other religions (R5)	11	3.5	3	0.4	15	2.8	29	1.9	
Ethnicity (E)									
Kinhe (E1)	285	90.5	654	94.9	491	91.3	1430	92.7	0.002
Khmerf (E2)	6	1.9	6	0.9	18	3.3	30	1.9	
Hoag (E3)	12	3.8	14	2.0	7	1.3	33	2.1	
Chamh (E4)	6	1.9	2	0.3	9	1.7	17	1.1	
Other ethnicity (E5)	6	1.9	13	1.9	13	2.4	32	2.1	
Part- time job (PJ)									
Yes (PJ1)	113	35.9	302	43.8	288	53.5	703	45.6	<0.001
No (PJ2)	202	64.1	387	56.2	250	46.5	839	54.4	
Living with (LW)									
Parents (LW1)	110	34.9	345	50.1	190	35.3	645	41.8	<0.001
Relative (LW2)	48	15.2	46	6.7	54	10.0	148	9.6	
Friends (LW3)	103	32.7	97	14.1	204	37.9	404	26.2	
Alone (LW4)	46	14.6	89	12.9	75	13.9	210	13.6	
Otheri (LW5)	8	2.5	112	16.3	15	2.8	135	8.8	
Spending (USD per month) (S)									
<130 (S1)	134	42.5	202	29.3	210	39.0	546	35.4	<0.001
130 - <220 (S2)	136	43.2	220	31.9	206	38.3	562	36.4	
220 - <300 (S3)	18	5.7	97	14.1	73	13.6	188	12.2	
300 - <450 (S4)	4	1.3	20	2.9	6	1.1	30	1.9	
450 - <650 (S5)	-	-	14	2.0	-	-	14	0.9	
≥650 (S6)	-	-	18	2.6	-	-	18	1.2	
No answer (S7)	23	7.3	118	17.1	43	8.0	184	11.9	
History of dengueinfection (HI)									
Self-reported (HI1)	113	35.9	235	34.1	188	34.9	536	34.8	0.857
Relative (HI2)	260	82.5	471	68.4	399	74.2	1130	73.3	<0.001
None (HI3)	28	8.9	136	19.7	63	11.7	227	14.7	<0.001

Note: All P-values are based on chi-square analysis of medical students in public school, medical students in private school, and non-medical students' categories.

a: People who go to universities fresh out of high school to get bachelor's (BCS) degrees.

b: People who received one BCS degree after that they got another BCS degree.

c: People who received vocational diplomas from vocational schools from colleges looking to get BCS degrees from universities.

d: People who received intermediate or college degree which were lower level than BSC degree.

e,f,g,h: These are the name of human race living in Vietnam.

i: People who live with their husband/ wife and/or their children.

parks, commercial centers, and elsewhere. Before answering, participants were given and explained the study aims, risks, and benefits of joining this study. Once approved, the interviewers proceeded with a structured interview assisted by a validated questionnaire. The completeness, consistency, and accuracy of the collected data were examined by principal investigators on a daily basis.

Data Analysis

The data were subsequently imported into and analyzed in SPSS® software version 20.0 (SPSS, Chicago, IL, USA) from the completed questionnaires. The KAP level ("good" or "poor") between socio-demographic characteristics groups as well as between groups of students were compared using a chi-square test and a fisher's exact due to skewed distributions. In short, with respect to knowledge questions, each correct answer was scored one point. This study pooled incorrect answers with "do not know" responses and scored them with a zero. For the five-point Likert scale in the attitude section, if the response was either 1, 2, or 3, they were given zero points, and if the answer was 4 or 5, they were scored one point. In the preventive measures against DF section, a "yes" response was given a score of one whereas a "no" response was given a score of zero. The KAP score was computed as the sum of participant responses, and based on this, participants' KAP levels were defined as "good" or "poor" based on an 80% cut-off point.[21] A P-value of 0.05 or less was used to indicate statistical significance.

Ethical Consideration

The study protocol was approved by the Faculty of Pharmacy of the University of Medicine and Pharmacy at Ho Chi Minh City. Undergraduate students were invited to participate, and participants were also informed about the voluntary and anonymous basis of the participation. Those who agreed to participate were required to sign an informed consent form, and they were free to leave out questions if they did not wish to answer.

Results

Table-1 illustrates the study sample's socio-demographic characteristics. In total, the study included 1,701

Table-2: Participants' correct responses to the knowledge on transmission, symptoms, and signs of dengue fever (stratified by student groups [n, %]).

Question		Correct answer								
				Medical students (N= 1,004)						
		Total correct answer (N= 1,542)		Public school (N= 315)		Private school (N= 689)		Non-medical students (N= 538)		P-value
K1	Is headache a symptom of DF?	1,214	78.7	252	80.0	541	78.5	421	78.3	0.821
K2	Is joint pain a symptom of DF?	377	24.4	115	36.5	170	24.7	92	17.1	<0.001
K3	Is muscle pain a symptom of DF?	697	45.2	207	65.7	306	44.4	184	34.2	<0.001
K4	Is bone soreness a symptom of DF?	184	11.9	45	14.3	102	14.8	37	6.9	<0.001
K5	Dengue is caused by a virus.	1,298	84.2	268	85.1	574	83.3	456	84.8	0.698
K6	Do insecticides sprays reduce mosquitoes and prevent DF?	1,292	83.8	253	80.3	591	85.8	448	83.3	0.086
K7	Do mosquito repellents prevent mosquito bites?	1,392	90.3	290	92.1	630	91.4	472	87.7	0.046
K8	Is the dengue virus transmitted to humans by the bite of female Aedes mosquitoes that have been infected?	1,067	69.2	259	82.2	503	73.0	305	56.7	<0.001
K9	Can you identify Aedes mosquitoes?	1,167	75.7	258	81.9	532	77.2	377	70.1	<0.001
K10	Can a person suffer from DF more than once?	1,308	84.8	288	91.4	601	87.2	419	77.9	<0.001
K11	Does DF affect infants, children, and adults?	1,508	97.8	310	98.4	676	98.1	522	97.0	0.308
Do you know the following activities could prevent DF? (K12-K19)										
K12	Use fish to eat mosquitoes to reduce mosquitoes.	1,178	76.4	266	84.4	515	74.7	397	73.8	0.001
K13	Cover water containers in the home.	1,404	91.1	298	94.6	642	93.2	464	86.2	<0.001
K14	Prevent water stagnation.	1,471	95.4	307	97.5	661	95.9	503	93.5	0.019
K15	Change the water in flower containers.	1,350	87.5	293	93.0	575	83.5	482	89.6	<0.001
K16	Dispose of water-holding containers, such as tires, parts of automobiles, plastic bottles, and cracked pots.	1,352	87.7	297	94.3	631	91.6	424	78.8	<0.001
K17	Change the water in plant containers in the house every week.	1,117	72.4	234	74.3	496	72.0	387	71.9	0.713
K18	Check the waste / garbage that can block the flow of water around home.	1,346	87.3	278	88.3	625	90.7	443	82.3	<0.001
K19	Check and clean the drains / gutters and roofs during the rainy season.	1,375	89.2	276	87.6	634	92.0	465	86.4	0.005

Note: All P-values are based on chi-square analysis of medical students in public school, medical students in private school, and non-medical students' categories.
Correct answer is "Yes" answer for each question.

Table-3: Participants' positive attitude toward dengue fever (stratified by student groups [n, %]).

Question		Positive answer								
				Medical students (N= 1,004)						
		Total positive answer (N= 1,542)		Public school (N= 315)		Private school (N= 689)		Non-medical students (N= 538)		P-value
A1	Is DF a serious illness?	1,442	93.5	294	93.3	650	94.3	498	92.6	0.023
A2	Can DF be prevented?	1,477	95.8	303	96.2	661	95.9	513	95.4	0.630
A3	Is controlling the breeding places of mosquitoes a good strategy to prevent DF?	1,408	91.3	296	94.0	636	92.3	476	88.5	0.016
A4	Do you think that stagnant water around houses in discarded tires, broken pots, and bottles are breeding places for Aedes mosquitoes?	1,497	97.1	309	98.1	673	97.7	515	95.7	<0.001
A5	Do you think communitiesshould actively participate in controlling the vectors of DF?	1,528	99.1	313	99.4	677	98.3	538	100.0	0.023
A6	Everyone has the possibility of suffering from DF.	1,511	98.0	311	98.7	671	97.4	529	98.3	0.045
A7	If you experience signs and symptoms of DF, you should immediately come to Community Health Centre.	1,502	97.4	306	97.1	671	97.4	525	97.6	<0.001
A8	You are the key individuals in preventing DF.	1,361	88.3	289	91.7	614	89.1	458	85.1	0.003
A9	All DF patients have a chance for a full recovery.	935	60.6	184	58.4	418	60.7	333	61.9	<0.001
A10	The government is doing their best to prevent DF.	1,280	83.0	261	82.9	611	88.7	408	75.8	<0.001
A11	Community members are capable of preventing DF.	827	53.6	116	36.8	456	66.2	255	47.4	<0.001
A12	You are capable of preventing DF.	1,326	86.0	282	89.5	621	90.1	423	78.6	<0.001
A13	Government actions are needed for DF prevention.	1,387	89.9	268	85.1	645	93.6	474	88.1	<0.001

Note: All P-values are based on chi-square test of medical students in public school, medical students in private school, and non-medical students categories.

Table-4: Participants' "yes" responses related to preventing measures against dengue fever (stratified by student groups [n, %]).

Question		'Yes' response								
				Medical students (N= 1,004)						
		Total 'Yes' response (N= 1,542)		Public school (N= 315)		Private school (N= 689)		Non-medical students (N= 538)		P-value
P1	Use screen windows to reduce mosquitoes.	1,176	76.3	262	83.2	519	75.3	395	73.4	0.004
P2	Use mosquito coils to reduce mosquitoes.	1,038	67.3	207	65.7	471	68.4	360	66.9	0.688
P3	Use mosquito repellents/cream.	1,334	86.5	274	87.0	608	88.2	452	84.0	0.095
P4	Cover body with clothes when working in the bush, farm, or forest.	1,313	85.1	286	90.8	587	85.2	440	81.8	0.002
P5	Use bed net when sleeping during the day.	1,168	75.7	261	82.9	562	81.6	345	64.1	<0.001
P6	Participate in any of the dengue infection campaigns in the community.	1,229	79.7	249	79.0	584	84.8	396	73.6	<0.001
P7	Cut down bushes in the yard to reduce mosquitoes.	1,363	88.4	282	89.5	641	93.0	440	81.8	<0.001
P8	Clean up garbage/trash.	1,452	94.2	307	97.5	661	95.9	484	90.0	<0.001

Note: All P-values are based on chi-square analysis of medical students in public school, medical students in private school, and non-medical students categories.

respondents. After eliminating missing data replies in order to increase the credibility of the research process, there were exactly 1,542 samples, among which there were 315 medical students learning in public schools, 689 medical students learning in private schools, and 538 non-medical students from which to conduct the analysis (Table-1).

The correct answers from the knowledge section, the positive behaviour toward DF, and the "yes" responses regarding DF preventive practice are respectively presented in Table-2, Table-3, and Table-4. Table-5 provides the study subjects' KAP scores and KAP levels (good or poor) according to different characteristic variables (Table 2, Table 3, Table 4, and Table 5).

Figure-1 reveals the rate of students with good KAP levels and the relationships among the students' rates of having good knowledge, good attitude, and good practice. Figure-2 shows sources of information that have provided participants with issues related to DF.

Table-5: Examining the association among survey characteristics and good knowledge, good attitude, and good practice level (n, %).

Socio-demographic characteristics	Good level					
	Medical students (N= 1,004)					
	Mean (SD)	Public school (N= 315)		Private school (N= 689)		Non-medical students (N= 538)	
KNOWLEDGE							
Training programme							
TP1	14.2 (2.5)	210	67.7	204	51.8	185	37.7
TP2	14.4 (1.1)	2	40.0	-	-	-	-
TP3	14.9 (2.4)	-	-	194	65.8	3	50.0
TP4	13.6 (2.0)	-	-	-	-	18	43.9
Year in Academics							
YA1	13.4 (2.5)	12	50.0	31	51.7	18	20.5*
YA2	14.6 (2.3)	28	75.7	123	60.9	33	40.2*
YA3	14.5 (2.5)	45	65.2	46	54.8	53	37.9*
YA4	14.4 (2.6)	67	69.1	117	68.8	90	43.1*
YA5	14.2 (2.4)	39	60.0	78	45.9	12	63.2*
YA6	16.4 (1.7)	21	91.3	3	100.0	-	-
Gender							
G1	14.5 (2.4)	72	64.9	123	58.9	84	46.9*
G2	14.2 (2.5)	140	68.6	275	57.3	122	34.0*
Type of residence							
TR1	14.3 (2.5)	180	66.2	309	56.9	178	38.7
TR2	14.5 (2.4)	32	74.4	89	61.0	28	35.9
Religion							
R1	14.5 (2.4)	158	66.7*	293	59.8	145	39.4*
R2	14.0 (2.6)	27	69.2*	52	51.0	45	40.2*
R3	13.8 (2.8)	4	57.1*	50	54.9	-	-
R4	14.3 (3.2)	14	66.7*	2	66.7	10	45.5*
R5	14.3 (2.1)	9	81.8*	1	33.3	6	40.0*
Ethnicity							
E1	14.4 (2.5)	192	67.4	382	58.4	191	38.9
E2	13.7 (2.5)	5	83.3	3	50.0	6	33.3
E3	13.3 (2.6)	6	50.0	4	28.6	-	-
E4	14.4 (2.1)	5	83.3	1	50.0	6	66.7
E5	13.9 (2.2)	4	66.7	8	61.5	3	23.1

Socio-demographic characteristics	Good level					
	Medical students (N= 1,004)					
	Mean (SD)	Public school (N= 315)		Private school (N= 689)		Non-medical students (N= 538)	
ATTITUDE							
Training programme							
TP1	11.2 (1.3)	273	88.1	360	91.4	406	82.7*
TP2	10.4 (1.1)	4	80	-	-	-	-
TP3	11.8 (1.2)	-	-	282	95.6	6	100.0*
TP4	11.3 (1.4)	-	-	-	-	33	80.5*
Year in Academics							
YA1	11.3 (1.3)	22	91.7*	56	93.3*	75	85.2*
YA2	11.4 (1.3)	32	86.5*	195	96.5*	60	73.2*
YA3	11.3 (1.4)	59	85.5*	76	90.5*	109	77.9*
YA4	11.3 (1.3)	80	82.5*	160	94.1*	182	87.1*
YA5	11.4 (1.2)	61	93.8*	152	89.4*	19	100.0*
YA6	11.8 (0.8)	23	100.0*	3	100.0*	-	-

Contd. on next page >>>

Gender							
G1	11.3 (1.3)	95	85.6	192	91.9	158	88.3
G2	11.4 (1.3)	182	89.2	450	93.8	287	79.9
Type of residence							
TR1	11.3 (1.3)	238	87.5	504	92.8	373	81.1
TR2	11.5 (1.2)	39	90.7	138	94.5	72	92.3
Religion							
R1	11.5 (1.2)	211	89	462	94.3*	324	88.0*
R2	11.1 (1.4)	31	79.5	93	91.2*	87	77.7*
R3	11.2 (1.4)	7	100	82	90.1*	9	42.9*
R4	10.4 (1.2)	17	81	3	100.0*	13	59.1*
R5	11.0 (1.3)	11	100	2	66.7*	12	80.0*
Ethnicity							
E1	11.4 (1.3)	252	88.4	611	93.4	412	83.9*
E2	10.9 (1.6)	6	100	6	100	7	38.9*
E3	10.9 (1.4)	7	58.3	11	78.6	7	100.0*
E4	11.0 (1.4)	6	100	2	100	6	66.7*
E5	11.7 (1.0)	6	100	12	92.3	13	100.0*

Socio-demographic characteristics	Good level			
	Medical students (N= 1,004)			
	Mean (SD)	Public school (N= 315)	Private school (N= 689)	Non-medical students (N= 538)
PRACTICE				
Training programme				
TP1	6.5 (1.6)	250 80.6	315 79.9*	310 63.1*
TP2	6.2 (2.0)	3 60	- -	- -
TP3	6.7 (1.5)	- -	235 79.7*	6 100.0*
TP4	6.2 (1.8)	- -	- -	21 51.2*
Year in Academics				
YA1	6.5 (1.5)	20 83.3	55 91.7*	61 69.3*
YA2	6.6 (1.4)	30 81.1	164 81.2*	61 74.4*
YA3	6.3 (1.8)	55 79.7	65 77.4*	71 50.7*
YA4	6.5 (1.6)	74 76.3	138 81.2*	125 59.8*
YA5	6.7 (1.7)	52 80	125 73.5*	19 100.0*
YA6	7.4 (1.0)	22 95.7	3 100.0*	- -
Gender				
G1	6.4 (1.7)	85 76.6	163 78	103 57.5
G2	6.6 (1.6)	168 82.4	387 80.6	234 65.2
Type of residence				
TR1	6.5 (1.6)	215 79	428 78.8	281 61.1
TR2	6.8 (1.4)	38 88.4	122 83.6	56 71.8
Religion				
R1	6.6 (1.6)	190 80.2	395 80.6	240 65.2*
R2	6.5 (1.6)	33 84.6	83 81.4	66 58.9*
R3	6.3 (1.8)	5 71.4	68 74.7	9 42.9*
R4	6.2 (1.5)	16 76.2	2 66.7	13 59.1*
R5	6.6 (1.6)	9 81.8	2 66.7	9 60.0*
Ethnicity				
E1	6.6 (1.6)	231 81.1	529 80.9	311 63.3
E2	6.0 (1.8)	5 83.3	5 83.3	10 55.6
E3	5.6 (2.0)	7 58.3	4 28.6	4 57.1
E4	6.7 (1.3)	5 83.3	2 100	6 66.7
E5	6.3 (1.4)	5 83.3	10 76.9	6 46.2

Note: *P <0.05 is considered statistically significant.

All P-values are based on chi-square analysis of medical students in public school, medical students in private school, and non-medical students categories.

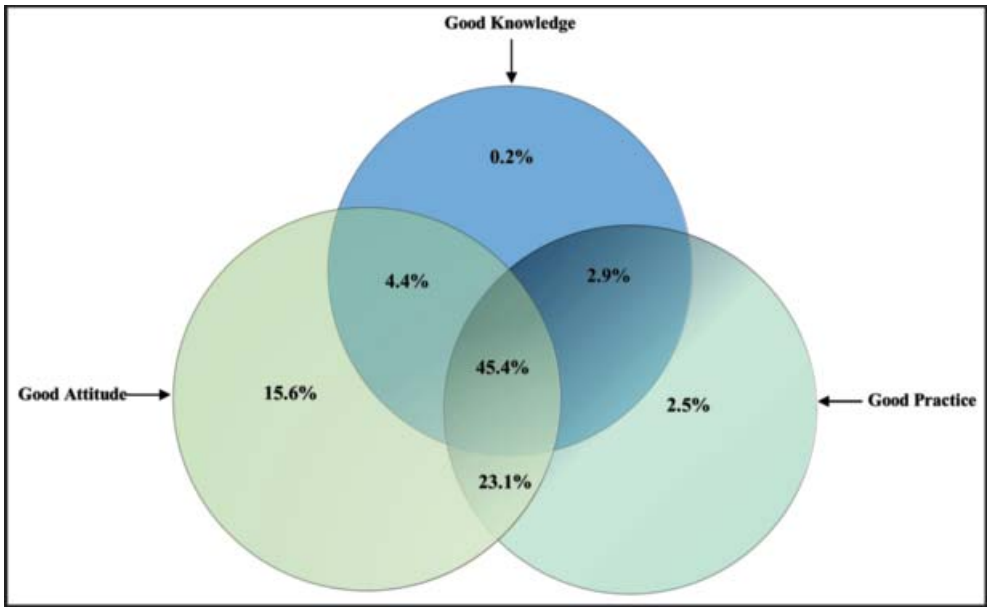

Figure-1: Venn diagram showing the percentages of students in Vietnam with good KAP levels.

dengue can be a central tool in forming dengue interventions and educational materials. This survey helped elucidate the knowledge of and attitudes toward DF held by Vietnamese undergraduate students and appraise the participants' prevention measures against this disease. The results from the current study indicate attitude and practice are positively associated with knowledge scores.

Among the 1,542 participants interviewed using the structured questionnaire, 20.4% were medical students learning in public schools,

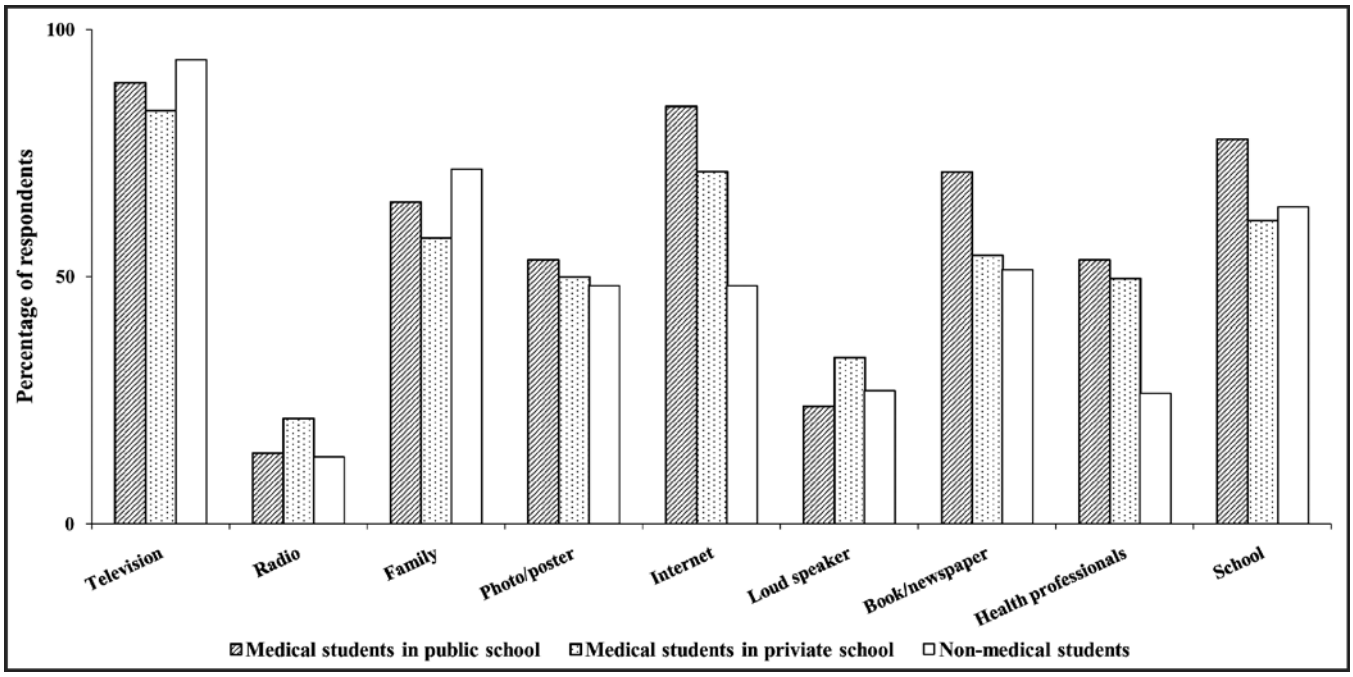

Figure-2: Sources of information on dengue fever.

Discussion

DV infection is one of the most important challenges in health institutions. For this, the study assessed KAP related to DF among university students, who are frontline circulators of information regarding DF to the community. Indeed, developing an understanding of a community's awareness of

44.7% were medical students learning in private schools, and 34.9% were non-medical students. Of the total study participants, a huge majority (77.5%) were in an undergraduate training program, but only a minority of participants were studying for a second bachelor's degree (0.3%), taking course articulation (19.5%), or in a non-

university training program (2.7%). In the questions about year in academics, most of the participants were in their first through fifth years of school; however, only medical students in some majors must learn in six years, so the number of sixth-year students were limited. Nearly two thirds (67.6%) of the participants were female, while the remainder were male. This gender ratio was similar to that of an Indonesian study in 2018 by Harapan et al.[23] One reason that 82.7% of the participants resided in the city could be explained by the fact that most universities are located in large cities in Vietnam. For ethnicity, the overwhelming majority of the participants (92.7%) were Kinh, with very few participants being from other ethnic groups. This is logical, as 85.7% of the Vietnamese population is Kinh.[18] More than half of the participants (54.4%) had no part-time job while approximately 46% had jobs after learning hours. It is essential to note that the majority of the participants were undergraduate students who spent money from their parents or had part-time jobs, so barely more than one third of the total participants (35.4%) spent less than USD 130 per month, and similarly, 36.4% of participants spent USD 130-220 per month. Similar to previously published studies in Nepal and Indonesia,[21,23] a higher number of participants had low to moderate income. When participants were asked about their history of dengue infection, 73.3% participants stated that their relatives had experienced DF, and 34.8% participants had already been infected with the DV. Of the remaining (14.7%), participants and their relatives,there was no history of DF.

Most of the participants' knowledge was moderate and could be improved because many participants were expected to be given correct answers after they completed the questionnaire. Students demonstrated knowledge on the correct modes of DF transmission but misconceptions about knowledge on DF signs and symptoms. The vast majority of participants (84.2%) knew that dengue is caused by a virus, and most participants acknowledged that *Aedes* mosquitoes transmit the DV. Taken together, a large majority of participants (69.2%) knew that the DV is transmitted to humans by the bite of female *Aedes* mosquitoes that have been infected. These findings were similar to a previous study by Dhimal et al. in Nepal in 2014.[21] Notably, the current study is in contrast to those findings that very few people in Nepal can identify *Aedes* mosquitoes,[21] as the current study reported a huge majority of participants (75.7%) can identify *Aedes* mosquitoes, which is commonly called "stripped mosquitoes." The participants showed enough knowledge on transmission of DF to explain the fact that their awareness of prevention was passable. The overwhelming majority of participants agreed with the anti-mosquito activities suggested in the questionnaire. Conversely, knowledge on signs and symptoms of DF was low. The headache symptom was recognized by the majority of participants (78.7%), and nearly half of the participants (45.2%) stated that muscle pain is a symptom of DF. Nevertheless, most participants expressed that they had not heard of joint pain and bone soreness as symptoms of DF, so a small minority of participants (24.4% and 11.9%, respectively) gave the correct answers for those questions. Regarding knowledge on signs and symptoms, the proportion of correct answers by medical students was double compared to the results of non-medical students. It is, therefore, evident that medical students had better expert knowledge than non-medical students. However, the rate of medical students with correct answers related to knowledge on signs and symptoms was not too high. These feedbacks suggest a demand for interventions to develop people's knowledge on these important matters underlining the signs and symptoms of DF in order to detect the disease on time and distinguish it from other infectious diseases or the flu. Especially, universities should improve the quality of education for medical students, who will be future healthcare workers e.g., concentrating on the importance of DF lessons in education programme; organizing the competitions regarding DF prevention; training the skills on public preaching.

Regarding attitudes toward DF, all the participants had a positive attitude. Most participants (93.5%) perceived that DF is a serious illness. This is in accordance with a previous study in Nepal,[21] but was the opposite of the results of a study in Western Jamaica in 2015.[24] This behaviour towards the seriousness of the disease was sufficiently powered in order to conduct robust national campaigns to control the dengue vector and reduce its burden. The overwhelming majority of participants strongly agreed that everyone can potentially suffer from DF. For this, it is not surprising that nearly all participants (99.1%) thought that communities should actively participate in controlling the vectors of DF. It is clear that participants had good knowledge of prevention measures against DF. Hence, the majority of participants reported that DF can be prevented, and they were capable of preventing dengue using a good strategy, namely, controlling the breeding places of mosquitoes. There were inequalities in the education and knowledge of the two student groups, and these results in the attitude section encouraged a positive outlook to close the information gaps about DF.

More than half of the total study participants provided "yes" responses for all questions when they were asked which possible actions, they had taken to prevent DF. In comparison, in a study conducted by Dhimal et al.,[21] most

of the participants chose to control the breeding places of mosquitoes to prevent the dengue vector, for example, by covering water containers, cutting down bushes, and cleaning up garbage/trash. However, a lower rate of participants in Nepal choses to protect themselves by using coils or mosquito repellent/cream and covering their bodies with clothes. In contrast, the majority of the current study's participants in Vietnam practiced not only controlling the breeding places of mosquitoes but also protecting themselves to reduce the DF vector. These differences may be attributed to the population sampled. These results showed that the majority of people perceived a risk of DF and seemed supportive toward dengue vector control.

From the observations in this study, the good attitude and good practice level were nearly double the good knowledge level. Nonetheless, over half of the total study participants had a good level in at least one of the three sections, and 45.4% of the participants had good scores in three domains. Table-5 shows the results regarding the association between a good KAP level and socio-demographic characteristics. The current KAP study found that good knowledge on transmission of DF was slightly high but good knowledge on sign and symptoms was scarce, while good practice levels were fairly high and good attitudes toward DF control was very high. Among all socio-demographic variables, the overall knowledge of the participants was significantly associated with the year in academics and spending per month. It increased with year in academics and was significantly better in participants who had completed lower years in school. There was no significant association of knowledge with sex, type of residence, or other characteristics, a finding consistent with results from Indonesia and Nepal.[21,23] The medical students had better knowledge than the non-medical students. These may be explained by the fact that formal school and university curricula in health education do not have contents on DF and participants obtained information elsewhere (e.g., from radio and television). Also, a significant association was observed among participants' attitudes, practices, and the socio-demographic factors of year in academics and spending per month. There are some of the hypothesized factors for why the higher participants' spending per month, the lower their knowledge, but the higher their spending, the higher their good attitudes and practices. For example, most of students in Vietnam who had lower spending per month were undergraduate students, the majority of these students were young and paid certain attention and had a good memory for the knowledge learned in school or heard from outside sources. Thus, young students scored high on the knowledge section, but these students did not really care about their health. Conversely, most of the participants who had higher spending were older and maybe had children and a family to take care, so they perceived the seriousness of DF.

Despite extensive efforts made to minimize the possible shortcomings of this study, the findings could be interpreted in the presence of some inevitable limitations. The generalization of the results was limited, as the sample of students was taken from North Vietnam. Since the method was a self-administered questionnaire, response bias was likely. In addition, surveys were inherently limited by response bias, as participants could answer questions with how they should practice instead of how they actually practice. Not with standing these limitations, the results of this study will aid the government in assessing and spreading messages to help reduce the gaps in knowledge and conducting education programmes and dengue prevention campaigns across key endemic areas in Vietnam.

Conclusion

The issue that emerged in this study is the participants' lack of knowledge regarding DF. As a result, it is concluded that educational interventions are important and should be implemented to address the adequate knowledge of populations. However, this study has demonstrated that behaviour is one of the prerequisites for the success of campaigns aimed at controlling the spread of DF. Future studies could be aimed toward determining the need to establish a sustainable awareness campaign concerning the prevention of DF in student communities and could further emphasize the importance of a nationwide population-based screening prevention programme across Vietnam.

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