

Knowledge, Attitudes and Preventive Practices of Dengue Fever among Secondary School Students in Jazan, Saudi Arabia

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ABSTRACT

Dengue fever (DF) is the most rapidly spreading mosquito-borne viral disease worldwide. Several confirmed dengue cases occurred in Jazan region in the last decade. Current study aims to assess the knowledge, attitudes and preventive practices of dengue fever among students of secondary schools in Jazan, Kingdom of Saudi Arabia. A cross-sectional study was conducted among students of six secondary schools in Jazan. Multistage stratified random sample method was used and seven hundred forty two (742) were taken as respondents in study. We collected information on the socio-demographic characteristics of the respondents about their knowledge, attitude and practice towards DF using a prestructured and self administered questionnaire. findings illustrate a poor DF knowledge among the secondary school students in Jazan. As to attitudes towards DF prevention and control, the majority of the respondents were having good attitudes and believed that DF could be controlled and prevented (93.2%), DF control is the responsibility of government and community (83.1%) and they themselves have an important role to play in DF prevention (78.5%). The most common practice to prevent mosquito breeding were found to be the disposing of water from breeding containers (85.5%) and covering of water containers (68.6%). A significant association between the practice of DF preventive and control measures and the gender of the respondents was found ($P < 0.005$). The top two common sources of DF knowledge were identified as primary health care centers and television (48.1% and 44.5%, respectively). Low prevalence of sufficient knowledge was evident among secondary school students in Jazan. Government authorities should strengthen its programs on massive educational campaigns to increase awareness and knowledge regarding dengue and preventive measures to reduce mosquito and prevent dengue. Knowledge of dengue epidemiology may be incorporated into the school curriculum.

Key words: Dengue fever, Knowledge, Attitudes and Practices, Schools, Jazan, Saudi Arabia.

INTRODUCTION

Dengue is a viral disease transmitted to humans by the bite of infected females of the main vector *Aedes aegypti* and to lesser extent *Aedes albopictus* mosquitoes¹ The World Health Organization has classified dengue into three categories according to disease severity; Dengue

Fever (DF), Dengue Hemorrhagic Fever (DHF), and Dengue Shock Syndrome (DSS)² Severe dengue (DHF and DSS) causes lethal complications that included severe hemorrhage, plasma leakage, organ impairment, fluid accumulation, or respiratory distress^{3, 4} The four genetically related viruses that cause dengue are single-stranded RNA, belonging to the Flaviviridae family and genus *Flavivirus*⁵ These

four viruses were designated as DEN-1, DEN-2, DEN-3, and DEN-4²

Globally, the disability-adjusted life years (DALYS) were estimated as 750,000 per annum lost years of healthy life due to dengue. The loss is mainly due to immobilization, absenteeism, or debilitation.^{6, 7, 8}

In some parts of the world (e.g. Americas), losses caused by dengue to the economies of these countries are similar to that caused by tuberculosis and malaria⁹ In Thailand, Malaysia, and Cambodia, the economic losses attributed to dengue are as much as \$89 million¹⁰, whereas, the loss is estimated to be \$2.1 billion in the Caribbean and Latin America.¹¹

The incidence of DF has increased more than 30 fold over the last five decades, thus, the dengue virus (DENV) infection has globally become a major public health threat. DF is now endemic in 128 countries¹² According to Bhatt *et al.*¹³, 390 million DENV infections are estimated to occur per year; over three times more than previous estimates by the World Health Organization (WHO) had suggested¹⁴ Although some progresses had been achieved towards the development and clinical evaluation of vaccines against DENV infection, no such vaccine is on the market yet¹⁵ and there is no specific treatment against DF. Thus, controlling the populations of DENV vector mosquitoes, especially *Aedes aegypti* and *Aedes albopictus*, and limiting their dispersal to new regions is crucial to prevent DENV transmission¹⁶

Case fatality rate of DHF is 5% in most countries and this rate is expected to increase during epidemics.

In Saudi Arabia, Jeddah has witnessed the first cases of DF in 1994 with DENV-2. Shortly after that, virus surveillance revealed 3 dengue serotypes.¹⁷ Endemicity of DF in Jeddah has been confirmed by Ministry of Health in the last decades and 1551 positive cases were notified in 2006-2007 with 1.1% and 0.5 % of DHF and DSS cases, respectively¹⁸

Jazan region, on other hand, had registered 832 confirmed DF cases in the period from 2005 to 2014 with the highest cases being in 2010 (290

cases). Alazragi *et al.*¹⁹ conducted study in Jazan to measure seroprevalence of dengue virus (DENV) infection among 965 persons. A seroprevalence of 31.7 % (306/965) for DENV specific IgG was found. They revealed that the significant risk factors were: age ≥ 20 years, being male, lack of electricity and having water basins in the house.

Ibrahim *et al.*²⁰ conducted a study to investigate knowledge, attitudes and practices (KAPs) relating to dengue fever among females in Jeddah high schools. They concluded that KAPs towards DF was deficient among target populations, especially students.

It is well known that the ecology and epidemiology of DF are pretty associated with human habits. Therefore, assessment of people's knowledge, attitude, and practice is an important tool in preventing the disease and it is also a vital component of the integrated vector control programmes²¹

In Jazan, the variation in local, community-level, environmental and socio-behavioral drivers have rarely been carefully investigated. In particular, the importance of people's knowledge, attitudes and practices (KAP) concerning DF prevention in these local contexts is poorly understood. In addition, there is a lack of relevant studies on the KAPs in Jazan region. Only one study by Bani *et al.*²² has been published on the topic but it focused primarily on households KAPs towards dengue.

Therefore, significant gaps in the literature on levels of awareness of students of Jazan on the KAPs of dengue fever are existed. The present study aimed to evaluate the knowledge, attitudes and practices regarding dengue infections among students of secondary schools in Jazan, Kingdom of Saudi Arabia (KSA).

MATERIALS AND METHODS

Study subjects and sample

The present study was conducted using a cross-sectional approach²³ in August 2015. This study design is appropriate as the main objective of this investigation was to assess the knowledge,

attitudes, and practices regarding DF among school students.

Six secondary schools were randomly selected (five in Jazan – 3 boy's schools and 2 girls' schools – and one in Samtah around 60 km south of Jazan).

Multistage stratified random sample method [24] was used to select the students sample by dividing schools according to geographic districts (north, south, east and west of Jazan city, in addition to Samtah to represent sub-urban schools), educational grade (first, second and third year). In addition, all teachers who were available in the selected schools on the day of interview and agreed to participate were also included in the study. A total of 742 respondents participated in this study (vast majority are student beside some few teachers).

The team followed the ethical standards of confidentiality and freedom to participate

The respondents were told that the research was voluntary and that they could choose to withdraw, and they were assured that their privacy and confidentiality would be protected.

Questionnaire

In addition to the socio-demographic information (age, sex, marital status, education level and employment), the questionnaire consists also of:

Respondents' knowledge

Multiple choices questions (MCQs) consisted of 32 items concerning the prior history, transmission methods, Symptoms, treatment, main vectors, mosquito's biting time, mosquito's breeding sites and vector's controlling methods of DF were used.

Respondents' attitudes

As the dengue fever is considered a significant public health problem in Jazan region, respondents attitudes on their roles in DF prevention and control, responsibility of DF control, and their agreement on other preventive and control measures of DF were sought.

Respondents' self-reported practices

Participating with your community in DF control campaigns, investigating and cleaning breeding sites in water filled containers under air conditions, covering water containers, disposing larvae from breeding containers, investigating Aedes larvae in water of cans and bottles around home, weekly changing of animal drinking water and disposing garbage in allocated garbage bins were reported by the respondents.

Statistical analysis

The collected data from the questionnaire were coded, reviewed and entered into a computerized data base and analyzed using SPSS, version 18 (SPSS Inc, Chicago, Ill., USA). Frequencies and percentages (descriptive statistics) were used for analyzing the selected socio-demographic data, while the means and t-test were used to assess responses of the participants on the questionnaire regarding practice scores in relation to demography. Chi-squared test was used to determine the significance of the relationship between socio-demographic characteristics and knowledge on DF, as well as, to assess the responses of the participants as for the sources of their information on DF. A p-value of equal to or less than 0.05 was considered statistically significant.

RESULTS

Socio-demographic characteristics of the study population of Jazan secondary schools

The socio-demographic characteristics of the respondents as obtained during the KAP student survey in Jazan secondary schools are illustrated in Table 1.

A total of seven hundred forty two (742) respondents were recruited to participate in the investigation consisting of 555 (74.8%) male and 187 (25.2%) female. Majority of the respondents belong to the age group of 16 to 20 years old ($n = 664$, 89.5%) and not married ($n = 686$, 93%). As to education, the majority of the respondents were at secondary level ($n = 686$, 92.5%). Of the total study respondents, 94.1% were unemployed and 5.9% were employed.

Knowledge of students on different dengue fever items

Only 26 (3.5%) of the research participants had prior history with DF (Table 2). More than half of the respondents knew that dengue is caused by a mosquito bite ($n = 430$, 58%), and it is more likely to feed/bite in the night ($n = 403$, 56%). While, 42% of the respondents do not know what are the methods of DF transmission. Less than half of the respondents cited that a person with dengue infections may develop typical symptoms of fever ($n = 343$, 46.7%), similarly less than half also ($n = 348$, 47.4%) do not know what are the symptoms of the DF.

As for the knowledge on DF treatment, 440 of the respondents (60%) knew that DF is curable, whereas 40% of them do not know.

More than half of the respondents do not know the principal vector of dengue fever ($n = 477$, 65%), while only little portion of them knew the vector ($n = 256$, 35%).

Table 1: Socio-demographic characteristics of the respondents (N=742)

Variable	Frequency	Percentage
Age (years):		
Less than 15	32	4.3
16 - 20 years	664	89.5
20-35 years	30	4.0
More than 35	16	2.2
Gender:		
Female	187	25.2
Male	555	74.8
Marital status*:		
Married	43	5.8
Unmarried	686	93
Divorced	9	1.2
Education:		
Intermediate	18	2.4
Secondary	686	92.5
University	35	4.7
Postgraduate	3	.4
Employment:		
Employed	44	5.9
Unemployed	698	94.1

*Four replies were missing ($n=738$)

Major proportion of the respondents cited swamps and ponds to be the DF mosquito's breeding sites, followed by sewage water and containers under air conditions ($n = 509$, 70.1%; $n = 264$, 36.3%; $n = 164$, 22.6%), respectively.

As far as DF's vector control methods is concerned, most of the respondents reported insecticides ($n = 426$, 72.3%), then covering water tanks ($n = 193$, 32.8%) and using repellents ($n = 183$, 31.1%).

Attitudes towards dengue fever

Respondents' attitudes towards DF are shown in Table 3. Vast majority of the respondents believed that DF could be prevented and controlled ($n = 680$, 93.2%) and they also cited that the control of DF is the responsibility of both government and community ($n = 599$, 83.1%).

Great proportion of the respondents does not think that elimination of breeding sites of the DF vector is complicated and time consumer process ($n = 527$, 71.7%). Less than half of the respondents do not know whether fogging is the only control method against DF or no, whereas more than third disagreed that it does. High percentage of the respondents thought that it is possible to recover from DF infection ($n = 545$, 74.5%). Around forty one percent of the respondents disagreed that healthy person cannot be infected by DF, while one third of them agreed.

In this study, it was found that three quarters of the respondents agreed that they have an important role to play in DF prevention ($n = 573$).

Self-reported preventive measures against dengue fever

Most of the respondents employed environmental preventive measures to reduce mosquitoes and hence dengue fever (Table 4). For example, the majority of the respondents disposed larvae from breeding containers ($n = 618$, 85.5%), covered water containers ($n = 502$, 68.6%), disposed garbage in allocated garbage bins ($n = 400$, 66%), and participate with the community in DF control campaigns ($n = 457$, 63.6%). While only about one third investigated Aedes larvae in water of cans and

Table 2: Knowledge of the respondents*

Variables	N (%)		
	Yes	NO	Don't know
Having prior history with DF	26 (3.5)	710 (96.5)	-
Knowledge of transmission methods of DF:			
Direct contact	20 (2.7)		-
Cough	30 (4)		-
Mosquitoes	430 (58)		-
Don't know	-	-	262 (35.3)
Symptoms of DF:			
Fever	343 (46.7)		-
Nausea and vomiting	36 (4.9)		-
Rash	45 (6.1)		-
Hemorrhage	25 (3.4)		-
Don't know	-	-	348 (47.4)
knowledge on DF treatment:			
Curable	440 (60)		-
Non-curable	16 (2.2)		-
Don't know	-	-	277 (37.8)
knowledge on the main DF vectors	256 (35)	35 (4.7)	442 (60.3)
knowledge on the mosquito's biting time:			
Morning	48 (6.7)		-
Evening	52 (7.2)		-
Sunset	88 (12.2)		-
Night	403 (56)		-
Don't know	-	-	129 (17.9)
knowledge on the mosquito's breeding sites:			
Sewage water	264 (36.3)		-
Containers under air conditions	164 (22.6)		-
Swamps and ponds	509 (70.1)		-
Discarded utensils	118 (16.3)		-
Tyres	84 (11.6)		-
Uncovered water tanks	157 (21.7)		-
Don't know	-	-	16 (2.2)
knowledge on the vector's controlling methods:			
Insecticides	426 (72.3)		-
Mosquito nets	97 (16.5)		-
Repellent	183 (31.1)		-
Covering water tanks	193 (32.8)		-
Appropriate disposal of empty bottles and cans	115 (19.5)		-
Changing animal drinking water periodically	106 (18)		-
Don't know	-	-	153 (20.6)

* Multiple responses.

bottles around home or weekly changed the animal drinking water (Table 4).

Practice Vs Socio-Demographic characteristics

Socio-demographic characteristics in relation to DF preventive practices are illustrated in Table 5. As gleaned on the table, means and test statistics show that only the gender characteristic is predictor of practice against DF (female mean=1.7672 ± 0.25, male mean=1.6287± 0.33) However, there is a highly significant difference between females and males in their practice (t = 4.247 , P<0.005).

Source of knowledge on DF among the respondents

Respondents' sources of information about

dengue are presented in Table 6. Less than half of the respondents or 48.1% and 44.5% cited Primary Health Care (PHC) and television as their main sources of information on dengue fever, respectively. However, no significant difference was found between the respondents regarding their answers on PHC (P>0.005). Third of the respondents found their information on dengue from Pamphlets. In addition, few respondents obtained such information from Radio, Friends or Relatives.

DISCUSSION

The present study evaluated the knowledge, attitude and preventive practices regarding dengue fever among secondary schools students in Jazan, Saudi Arabia.

Table 3: Attitudes of the respondents

Statements	N (%)		
	Agree	Disagree	Don't know
Believing that DF could be prevented and controlled	680 (93.2)	50 (6.8)	-
Responsibility of DF control			
<i>Government</i>	60 (8.3)	661 (91.7)	-
<i>Community</i>	62 (8.6)	559 (91.4)	-
<i>Government & community</i>	599 (83.1)	122 (16.9)	-
Elimination of breeding sites is complicated and time consumer	209 (28.3)	527 (71.7)	-
Believing that fogging is the only control method against DF	128 (17.6)	263 (36.2)	336 (46.2)
The possibility to recover from DF infection	545 (74.5)	24 (3.2)	163 (22.3)
Healthy person cannot be infected by DF	233 (31.7)	300 (40.9)	201(27.4)
You have an important role in DF prevention	573 (78.5)	157 (21.5)	-

Table 4:Self-reported prevention practices among the respondents

Statements	N (%)		
	Yes	NO	Not applicable
Covering water containers	502 (68.6)	63 (8.6)	167 (22.8)
Investigating and cleaning breeding sites in water filled containers under air conditions	253(34.6)	478(65.4)	-
Disposing water from breeding containers	618 (85.5)	105 (14.5)	-
Weekly changing of animal drinking water	234 (32.3)	42 (5.8)	448 (61.9)
Investigating <i>Aedes</i> larvae in water of cans and bottles around home	152 (20.9)	244 (33.6)	331 (45.5)
Disposing garbage in allocated garbage bins	400 (66)	206 (34)	-
Participating with your community in DF control campaigns	457 (63.6)	262 (36.4)	-

Our current study illustrates that only 3.5% of the respondents have a prior history of DF. This presumably justify that the respondents could not point out typical symptoms of dengue because they had not witnessed a case from a close relative or community's member nor had they personally experienced the disease. This in turn means that the disease may easily be undetected or confused with other similar causes of fever like influenza,

typhoid, etc. leading to delays in accessing health care centers and eventually to DF complications²⁵

More than half of the respondents (58%) in the present study have correctly identified mosquito bites as a transmission route. This result is in close relation to other studies conducted in Brazil (60.8%) [21] and Philippines (68.7%). [26] In contrast, higher percentages of correct answers than those

Table 5: Prevention Practice Vs Socio-Demographic characteristics

Variables	Mean ± SD	Test statistics	95% CI for Mean	
			Lower	Upper
Age (years):		1.819 (P>0.005)		
Less than 15	1.6713 ± 0.35719		1.5300	1.8126
16 - 20 years	1.6645 ± 0.31257		1.6369	1.6920
20-35 years	1.5750 ± 0.32036		1.4251	1.7249
More than 35	1.4792 ± 0.38374		1.2354	1.7230
Gender:		4.247 (P<0.005)	0.07446	0.20263
Male	1.6287 ± 0.32636			
Female	1.7672 ± 0.25318			
Marital status:		2.751 (P>0.005).		
Married	1.5259 ± 0.32967		1.4005	1.6513
Unmarried	1.6660 ± 0.31476		1.6389	1.6932
Divorced	1.6964 ± 0.35250		1.3704	2.0224
Education:		2.157 (P>0.005)		
Intermediate	1.6667 ± 0.40900		1.4633	1.8701
Secondary	1.6619 ± 0.31176		1.6348	1.6890
University	1.6050 ± 0.34172		1.4639	1.7461
Postgraduate	1.1250 ± 0.17678		-0.4633	2.7133
Employment:		-1.389 (P>0.005)..	- 0.19360	0.03323
Employed	1.5820 ± 0.35442			
Unemployed	1.6622 ± 0.31473			

Table 6: Sources of knowledge on DF

Source of information	knowledge of DF N (%)		χ^2 (P-value)
	Yes	NO	
TV	318 (44.5)	396 (55.5)	8.521 (P<0.005)
Radio	123(17.2)	591(82.8)	306.756 (P<0.005)
Newspapers and Magazines	169 (23.6)	546 (76.4)	198.782 (P<0.005)
Pamphlets	234(32.8)	480 (67.2)	84.756 (P<0.005)
Primary Health Care (PHC)	344 (48.1)	371 (51.9)	1.020 (P>0.005)
Friends	179 (25)	536 (75)	178.250 (P<0.005)
Relatives	163 (22.8)	552 (77.2)	211.638 (P<0.005)

of the present study were reported from Jeddah, Saudi Arabia (88.8%)²⁰ and 95.8% obtained from Hong Kong²⁷. More than third of respondents in the present study do not know what is the method of DF transmission indicating the need for educational campaigns.

Less than half of the respondents cited fever as the most common symptom of DF. This finding concurs with other studies carried out in Saudi Arabia²⁰, India²⁸, Hong Kong²⁶, Brazil²¹, Pakistan²⁹, northern Thailand³⁰ and Cambodia³¹. It is also worthy to note that 47.4% of the respondents do not know the DF symptoms although 60% of them agreed that DF is curable. However, isolated knowledge on symptoms may be considered somewhat adequate. Good knowledge of signs and symptoms of DF is essential in identifying the disease and to seeking early appropriate health care to save life³²

Surprisingly, more than half of respondents (56%) were unaware that dengue mosquitoes are more likely to bite in the afternoon; instead they reported night as the mosquito's biting time. Only 6.7% of respondents correctly identified the morning time. World Health Organization¹ pointed out that *Aedes* mosquito usually bites during the day. Moreover, majority of respondents (70.1%) correctly cited swamps and ponds as mosquitoes' breeding sites, while 36.3% of them were unaware and reported sewage water. Bridging this gap in knowledge in vector biology is important in planning and designing programs and activities to educate rural residents on preventive measures to combat dengue.

Regarding the knowledge on the mosquito controlling methods, it was found that the use of insecticides sprays, covering water tanks and use of mosquito repellents were the most commonly preferred preventive practices (72.3%, 32.8% and 31.1%, respectively). This finding is in accordance with the study conducted in Jazan²² where it revealed that 81.2% of the participants prefer to use spray to keep mosquitoes away. Itrat *et al*²⁹ in Pakistan revealed that mosquito sprays was considered the most common choices for prevention. Conversely in Philippines, only a little proportion of the respondents reported the use of pesticides³²

This investigation illustrates a poor overall DF knowledge among the secondary school students in Jazan. This may be attributed to the fact that the disease is only recently emerged in Jazan, Saudi Arabia, compared with other countries where the disease has been endemic for decades. This result coincides with the findings of Ibrahim *et al*²⁰ in Jeddah Saudi Arabia.

As to attitudes towards DF prevention and control, the majority of the respondents were having good attitudes and believed that DF could be controlled and prevented (93.2%), DF control is the responsibility of government and community (83.1%) and they themselves have an important role to play in DF prevention (78.5%). This on the other hand shows that the majority of the students had perceived a risk and health threat of DF and seemed supportive towards DF control and prevention³³

Concerning the self-reported prevention practices against DF, the most common practice to prevent mosquito breeding was found to be the disposing of water from breeding containers (85.5%). This is in accordance with the finding of Dhimal *et al*³³ in Nepal where 91% of the participants cited this practice to be useful in reducing the number of mosquitoes. While in Brazil, the most commonly reported preventive practice was elimination of water containers²¹ The second common DF preventive measure used by the respondents in the current study was the covering of water containers (68.6%). In Thailand, a survey of KAP of the prevention of DHF pointed out that covering water containers was the most common practice to prevent mosquito breeding in drinking-water containers³⁴ Disposing garbage in allocated garbage bins (66%) and participating with community in DF control campaigns (63.6) were also some of the preventive practices reported by the respondents in the present study.

We found a significant association between the practice of DF preventive and control measures and the gender (sex) of the respondents ($P < 0.005$). While in central Nepal, Dhimal *et al*³³ revealed that education level was associated with good practices among the respondents who had completed secondary or higher secondary education.

Contrary to this, a lack of significant association between socio-demographic factors and practice level was observed in Malaysia and Jamaica^{35, 25}

In the current study, the most common source of DF knowledge came from primary health care centers (PHCs) and television. These selected sources of disseminated information may reflect the impact of Saudi Arabian DF public educational campaigns launched in Jazan region. A round 45% of the respondents cited television as a source of their information, correlating with data gathered from Saudi Arabia²², Kuala Lumpur³⁵, Thailand³⁴ and partially coincides with the findings of Ibrahim *et al*²⁰ in Jeddah, Saudi Arabia. Conversely, lower percentages of participants cited radio, newspapers and magazines, friends and relatives as their primary sources of information about the disease. This may reflect the importance of targeting future educational campaigns in these areas by the government in order to change behaviors and effectively communicate DF preventive measures through information, education and communication (IECs).

CONCLUSION

Low prevalence of sufficient knowledge was evident among secondary school students in Jazan. Nevertheless, isolated knowledge on

symptoms, attitudes and prevention measures may be considered somewhat adequate. Good practice to prevent DF was related the gender.

The popular preventive measures were mainly the disposing of water from breeding containers and covering water containers.

It is evident from this study that primary health care centers (PHCs) and television were the most important source of information on DF among the study population. Based on this result, government authorities should strengthen its programs on massive educational campaign to increase awareness and knowledge regarding dengue and preventive measures to reduce mosquito and prevent dengue. Information, education and communication (IECs) materials maybe provided in areas like schools and health centers to make it more accessible for the residents to obtain. Knowledge of dengue, the vectors and transmission of disease may be incorporated into the school and university curriculum especially in areas where dengue is highly prevalent like Jazan. More intersectoral coordination should be obtained to identify possible partners for public education dengue control campaigns. Training of school teachers and community health workers should be conducted regularly to improve their technical skills and capabilities to supervise prevention and control activities.

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