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## DENGUE KNOWLEDGE, ATTITUDES AND PREVENTIVE PRACTICES AMONG SECONDARY SCHOOL STUDENTS IN JAZAN, SAUDI ARABIA

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### ABSTRACT

To assess the knowledge, attitudes and preventive practices of dengue fever among students of secondary schools in Jazan, Kingdom of Saudi Arabia (KSA), the study was done.

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 (sex) of the respondents was found ( $P < 0.005$ ). The top two common sources of DF knowledge were identified as primary health care centers (PHCs) and Television (48.1% and 44.5%, respectively).

Low prevalence of sufficient knowledge was evident among secondary school students in Jazan. 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 campaigns to increase awareness and knowledge regarding dengue and preventive measures to reduce mosquito and prevent dengue. Knowledge of dengue, the vectors and transmission of disease may be incorporated into the school curriculum.

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### 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* mosquitoes<sup>25</sup>.

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)<sup>24</sup>.

Severe dengue (DHF and DSS) causes lethal complications that included severe

hemorrhage, plasma leakage, organ impairment, fluid accumulation, or respiratory distress<sup>26,28</sup>.

The four genetically related viruses that cause dengue are single-stranded RNA, belonging to the Flaviviridae family and genus Flavivirus<sup>10</sup>. These<sup>24</sup> four viruses were designated as DEN-1, DEN-2, DEN-3, and DEN-4.

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<sup>5,16,17</sup>.

In some parts of the world (e.g. America), losses caused by dengue to the economies of these countries are similar to that caused by tuberculosis and malaria<sup>22</sup>. In Thailand, Malaysia, and Cambodia, the economic losses attributed to dengue are as much as \$89 million<sup>20</sup>, whereas, the loss is estimated to be \$2.1 billion in the Caribbean and Latin America<sup>18</sup>.

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 countries<sup>4</sup>. 390 million DENV infections are estimated to occur per year<sup>3</sup>; over three times more than previous estimates by the World Health Organization<sup>26</sup>. Although some progresses had been achieved towards the development and clinical evaluation of vaccines against DENV infection, no such vaccine is on the market yet<sup>12</sup> 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 transmission<sup>27</sup>.

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. 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, respectively<sup>7</sup>.

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

**TABLE-1: Socio-demographic characteristics of the study sample (N=742)**

Variable	Frequency	Percentage
<b>Age (years):</b>		
Less than 15	32	4.3
16 - 20 years	664	89.5
20-35 years	30	4.0
More than 35	16	2.2
<b>Gender:</b>		
Female	187	25.2
Male	555	74.8
<b>Marital status:</b>		
Married	43	5.8
Unmarried	686	93.0
Divorced	9	1.2
<b>Education:</b>		
Intermediate	18	2.4
Secondary	686	92.5
University	35	4.7
Postgraduate	3	.4
<b>Employment:</b>		
Employed	44	5.9
Unemployed	698	94.1

cases). A study was conducted in Jazan to measure seroprevalence of dengue virus (DENV) infection among 965 persons<sup>1</sup>. 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.

Researchers<sup>12</sup> 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 programmes<sup>6</sup>.

In Jazan, the variation in local, community-level, environmental and socio-behavioral drivers has 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 focused primarily on households KAPs towards dengue<sup>2</sup>.

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 samples

The present study was conducted using a cross-sectional approach in December 2011. 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 Samttah around 60 km south of Jazan).

Multistage stratified random sample method 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 Samttah 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 were students besides few teachers).

### Questionnaire

In addition to the socio-demographic

information (age, sex, marital status, education level and employment), the questionnaire consisted 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 was sought.

#### Respondents' self-reported practices

Participating with 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

Table 1 presents the socio-demographic characteristics of the study sample as obtained

**TABLE-2:** Knowledge of different DF items among the study samples

Variables	N (%)		
	Yes	NO	Don't know
<b>Having prior history with DF</b>	<b>26 (3.5)</b>	<b>710 (96.5)</b>	-
<b>Knowledge of transmission methods of DF:</b>			
Direct contact	20 (2.7)	722 (97.3)	-
Cough	30 (4)	712 (96)	-
Mosquitoes	430 (58)	312 (42)	-
Don't know	-	-	262 (35.3)
<b>Symptoms of DF:</b>			
Fever	343 (46.7)	391 (53.3)	-
Nausea and vomiting	36 (4.9)	698 (95.1)	-
Rash	45 (6.1)	689 (93.9)	-
Hemorrhage	25 (3.4)	709 (96.6)	-
Don't know	-	-	348 (47.4)
<b>Knowledge on DF treatment:</b>			
Curable	440 (60)	293(40)	-
Non-curable	16 (2.2)	717 (97.8)	-
Don't know	-	-	277 (37.8)
<b>Knowledge on the main DF vectors</b>	<b>256 (35)</b>	<b>35 (4.7)</b>	<b>442 (60.3)</b>
knowledge on the mosquito's biting time:			
Morning	48 (6.7)	672 (93.3)	-
Evening	52 (7.2)	668 (92.8)	-
Sunset	88 (12.2)	632 (87.8)	-
Night	403 (56)	317 (44)	-
Don't know	-	-	129 (17.9)
<b>Knowledge on the mosquito's breeding sites:</b>			
Sewage water	264 (36.3)	463 (63.7)	-
Containers under air conditions	164 (22.6)	562 (77.4)	-
Swamps and ponds	509 (70.1)	217 (29.9)	-
Discarded utensils	118 (16.3)	608 (83.7)	-
Tyres	84 (11.6)	642 (88.4)	-
Uncovered water tanks	157 (21.7)	567 (78.2)	-
Don't know	-	-	16 (2.2)
<b>Knowledge on the vector's controlling methods:</b>			
Insecticides	426 (72.3)	163 (27.7)	-
Mosquito nets	97 (16.5)	492 (83.5)	-
Repellent	183 (31.1)	406 (68.9)	-
Covering water tanks	193 (32.8)	396 (67.2)	-
Appropriate disposal of empty bottles and cans	115 (19.5)	474 (80.5)	-
Changing animal drinking water periodically	106 (18)	483 (82)	-
Don't know	-	-	153 (20.6)

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during the KAP student survey in Jazan secondary schools.

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 belonged 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:

Table 2 demonstrates the knowledge of the respondents on different DF items. Only 26 (3.5%) of the research participants had prior history with DF. More than half of the respondents knew that dengue was caused by a mosquito bite ( $n = 430, 58\%$ ), and it was more likely to feed/bite in the evening ( $n = 403, 56\%$ ). While, 35.3% of the respondents did not know the methods of DF transmission. Less than half of the respondents cited that a person with dengue infections might develop typical symptoms of fever ( $n = 343, 46.7\%$ ),

similarly less than half also ( $n = 348, 47.4\%$ ) did not know the symptoms of the DF.

As for the knowledge on DF treatment, 440 of the respondents (60%) knew that DF was curable, whereas 37.8% of them did not know.

More than half of the respondents did not know the principal vector of dengue fever ( $n = 442, 60.3\%$ ), while only little portion of them knew the vector ( $n = 256, 35\%$ ).

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

Table 3 portrays respondents' attitudes towards DF. Vast majority of the respondents believed that DF could be prevented and controlled ( $n = 680, 93.2\%$ ) and they also cited that the control

**TABLE- 3: Attitudes of the study respondents towards control and preventive measures against DF**

Statements	N (%)		
	Agree	Disagree	Don't know
Believing that DF could be prevented and controlled Responsibility of DF control	680 (93.2)	50 (6.8)	-
<i>Government</i>	60 (8.3)	661 (91.7)	-
<i>Community</i>	62 (8.6)	559 (91.4)	-
<i>Government &amp; 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)	-

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of DF was the responsibility of both government and community (n= 599, 83.1%).

Great proportion of the respondents did not think that elimination of breeding sites of the DF vector was complicated and time consumer process (n= 527, 71.7%). Less than half of the respondents did 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 was possible to recover from DF infection (n= 545, 74.5%). Around forty one percent of the respondents disagreed that healthy person could not 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 had an important role to play in DF prevention (n= 573).

Self-reported preventive measures against dengue fever

Table 4 shows that most of the respondents employed environmental preventive measures to reduce mosquitoes and hence dengue fever. 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 bottles around home or weekly changed the animal drinking water.

#### 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

Table 6 presented respondents' sources of information about dengue. 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

**TABLE-4 : Self-reported DF's prevention practices among the study sample**

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)	-

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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.

Our current study illustrates that only 3.5% of the respondents had 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 complications<sup>19</sup>.

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<sup>6,15</sup> conducted in Brazil (60.8%) and Philippines (68.7%). In contrast, higher

**TABLE-5: Practice Vs Socio-Demographic characteristics**

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

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percentages of correct answers than those of the present study were reported from Jeddah, Saudi Arabia<sup>12</sup> (88.8%) and 95.8% obtained from Hong Kong<sup>11</sup>. More than third of respondents in the present study did not know 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 Arabia<sup>12</sup>, India<sup>14</sup>, Hong Kong<sup>11</sup>, Brazil<sup>6</sup>, Pakistan<sup>13</sup> northern Thailand<sup>23</sup>. 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 seeking early appropriate health care to save life<sup>29</sup>.

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 Organization (WHO, 2009) pointed out that *Aedes* mosquito usually bites during the day<sup>29</sup>. 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 Jazan<sup>2</sup> where it was revealed that 81.2% of the participants preferred to use spray to keep mosquitoes away. In Pakistan it was revealed that mosquito sprays were considered the most common choices for prevention. Conversely in Philippines, only a little proportion of the respondents reported the use of pesticides<sup>29</sup>.

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 earlier findings in Jeddah

**TABLE- 6: Source of knowledge on DF among the respondents**

Source of information	Knowledge of DF		
	N (%)		$\chi^2$ (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)



Saudi Arabia<sup>12</sup>.

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 prevention.

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%). In Nepal 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 containers<sup>6</sup>. 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 containers<sup>21</sup>. 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 ( $P < 0.005$ ).

Contrary to this, a lack of significant association between socio-demographic factors and practice level was observed in Malaysia and Jamaica<sup>8,19</sup>.

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. Around 45% of the respondents cited Television as

a source of their information, correlating with data gathered from Saudi Arabia<sup>2</sup>, Kuala Lumpur<sup>8</sup>, Thailand<sup>21</sup> and partially coincides with the findings about Jeddah, Saudi Arabia<sup>12</sup>. 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 may be 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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