Research Article

Knowledge and practice of primary care physicians about preventive and clinical aspect of dengue fever in Jeddah city, 2014

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Abstract

Background: Dengue fever (DF) remains a significant public health concern in Jeddah, Saudi Arabia. Proper, well-timed diagnosis and risk stratification for severe disease play vital role in the appropriate management of this illness. The responsibility of the primary care physician is important in the diagnosis, management, and prevention of dengue.

Objective: To assess the knowledge and practice of the primary care physicians in Saudi Arabian Ministry of Health regarding the preventive and clinical aspects of DF in Jeddah city, 2014.

Materials and Methods: A cross-sectional study was conducted including all primary health-care physicians working in the PHC centres of the MOH in Jeddah, during the period of the study. Self-administered questionnaire consisted of three main parts: sociodemographic data, questions to assess knowledge regarding preventive and clinical part of DF, and questions to assess the practice regarding preventive and clinical part of DF.

Results: Of the 168 physicians invited to participate in the study, 138 returned completed questionnaire, giving a response rate of 82.1%. Almost one-third of them (34.8%) were aged 25–30 years, and only 8.6% were older than 45 years. Almost two-thirds of them (65.9%) were women. Female physicians showed higher significant overall DF knowledge score when compared with male physicians (10.49 ± 1.84 vs. 9.85 ± 1.72; $p < 0.05$). Most of the physicians (80.5%) always or most of the time performed dengue test if they suspect dengue compared with 7.2% never perform dengue test for suspected cases. Among those who always or most of the time perform a dengue test for suspected cases, leukocyte, platelets, and hematocrit were commonly utilized (75.7%), followed by dengue serology (IgM/IgG) (31.5%). Among those who did not perform dengue test and responded to the question, the most common reported cause was the unavailability of the test at their workplace (75%). Almost two-thirds of physicians (62.3%) cited that their center did not provide to the patients any type of preventive method (repellent, nets, etc.) to avoid mosquito bite.

Conclusion: Primary heath care physicians in Jeddah, KSA, demonstrated adequate general knowledge on select dengue topics. However, a knowledge gap has been reported regarding important issues in clinical presentation, treatment, prevention, and control. Practices regarding frequent clinical monitoring were consistent with local and international guidelines.

KEY WORDS: Dengue fever, knowledge, practice, primary care, physicians, Saudi Arabia

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Introduction

Dengue is a mosquito-borne infection found in tropical and subtropical regions around the world. In recent years, there has been a predominant increase in the transmission in urban and semi-urban areas, making it a major international public health concern.[1] Severe dengue was previously known as dengue hemorrhagic fever (DHF) and first

identified during the 1950s dengue epidemics in the Philippines and Thailand. Nowadays, Most Asian and Latin American countries have been affected by severe dengue, which forms the major cause of hospitalization and death among children in these regions.[1]

Dengue is caused by four distinct but closely related serotypes of the virus (DEN-1, DEN-2, DEN-3, and DEN-4). Although recovery from infection by one serotype results in lifelong immunity against that particular serotype, only partial and temporary cross-immunity is confined to the other serotypes. Hence, the occurrence of severe dengue increases owing to subsequent infections by other serotypes.[1] Recent years have seen dramatic increase in the incidence of dengue around the world in recent decades. More than 2.5 billion people—over 40% of the world's population—are now at risk from dengue. According to WHO, 50–100 million dengue infections can be found worldwide every year.[1] Every year, almost 500,000 people with severe dengue require hospitalization, with the majority being children and 2.5% of mortality from those affected.[1]

In the late eighteenth century, the Arabian Peninsula showed epidemic of a dengue-like disease. The disease was described in Zanzibar, Dar el-salaam, the east African coast, and Saudi Arabia (Aden, Mecca, Medina, and Jeddah).[2] The first case of DHF died in Jeddah in 1993. Since then, Saudi Arabia has reported three major epidemics: in 1994, a DEN-2 epidemic with 469 cases of dengue, 23 cases of DHF, two cases of dengue shock syndrome (DSS), and two deaths; in 2006, a DEN-1 epidemic with 1,269 cases of dengue, 27 cases of DHF, 12 cases of DSS, and six deaths; and in 2008, a DEN-3 epidemic with 775 cases of dengue, nine cases of DHF, four cases of DSS, and four deaths. Jeddah being a Hajj entry point is a pertinent issue for the International Health Regulations (IHR)—in addition to being the largest commercial port in the country and the largest city with the busiest airport in the western region. Thereby, more numbers of people from high-burden dengue countries such as Indonesia, Malaysia, and Thailand visit Jeddah, in addition to the dengue-affected countries of the region.[3]

The incidence of dengue fever (DF) in Saudi Arabia by 2010 was 11.85 of 100,000 among Saudi and 18.3 of 100,000 among non-Saudi population. The total number of cases was 3,526.[4] The incidence of DF and DHF has increased significantly in Jeddah over the last few years,[5] and endemic occurrence of the disease in the city was recently confirmed.[6]

Laboratory confirmation is required for appropriate diagnosis of dengue infection, either by isolating the virus or detecting dengue-specific antibodies. Virus isolation or detection of DENV RNA in serum specimens can be performed by serotype-specific, real-time reverse transcriptase polymerase chain reaction (RT-PCR), which requires collection of an acute-phase serum specimen within 5 days of symptom onset. Failure of isolation or detection of virus from this sample requires a convalescent-phase serum specimen at least 6 days after the onset of symptoms to perform a serologic diagnosis by testing for IgM antibodies to dengue using an IgM antibody-capture enzyme-linked immunosorbent assay (MAC-ELISA).[7]

No specific treatment is available for DF.[1] Treatment by medical care by physicians and nurses experienced with the effects and progression of the disease can save lives in severe dengue cases, thereby reducing the mortality rates from more than 20% to less than 1%. In severe dengue care, the critical measure is to maintain the patient's body fluid volume.[1]

This study aimed to assess the knowledge and practice of the primary care physicians in Ministry of Health (MOH) regarding the preventive and clinical aspects of DF in Jeddah city, 2014.

Materials and Methods

A cross-sectional descriptive study including all the primary health-care (PHC) physicians who worked in PHC centers (PHCCs), MOH, Jeddah city, during the period of the study conduction, was carried out. Thirty-two physicians were out of the work either internally or externally. Thus, the total number of physicians invited to participate in the study was 168 physicians. Jeddah is the second largest city in Saudi Arabia; it forms the main port of the Kingdom on the Red Sea and the main gate through which many pilgrims arrive by air and sea to perform Umrah and Hajj or to visit the two holy mosques. Area inhabited is more than 1,500 km, and population is more than 3.4 millions. In Jeddah, there are around 12 governmental hospitals, 38 PHCCs, more than 30 private hospitals, and 128 polyclinics. The study was conducted in the MOH PHCCs in Jeddah city, which have four supervisory sectors that contain 38 PHCCs and around 200 physicians.

A self-administered questionnaire was modified from that used in the study conducted in Singapore.[8] Permission to utilize the questionnaire has been obtained through e-mail communication with the corresponding author. The questionnaire consists of three main parts: sociodemographic data, questions to assess knowledge regarding preventive and clinical part of DF, and questions to assess the practice regarding preventive and clinical part of DF. The researcher distributed the self-administered questionnaire during the working hours; care was taken to not disturb the physicians. The researcher was available to clarify any issue, and the questionnaires were collected on the same day. This was done over 1-month period. The data were verified by hand, then coded, and entered to a personal computer.

Written permissions from concerned authority in MOH PHC were obtained before conduction of the research. Individual consent was a prerequisite for data collection. All information will be kept confidential and will not be accessed except for the purpose of scientific research.

Data were entered and analyzed by SPSS, version 19. Continuous variables were presented as mean and standard deviation (SD), while categorical variables were presented as frequency and percentage. Student's *t* test was utilized

Table 1: Demographic and baseline characteristics of the participants (n = 138)

Characteristics	Frequency	Percentage
Age in years		
25–30	48	34.8
31–35	40	29
36–40	19	13.8
41–45	19	13.8
>45	12	8.6
Gender		
Male	47	34.1
Female	91	65.9
Nationality		
Saudi	105	76.1
Non-Saudi	33	23.9
Type of PHCC practice		
Regular	104	75.4
Family	34	24.6
Highest qualification		
MBBS or equivalent	106	76.8
Diploma in Family Medicine	10	7.2
Board in Family Medicine	22	15.9

to compare the means of two independent quantitative variables, and ANOVA test was applied to compare the means of more than two independent quantitative variables. The χ^2 test was used for testing the difference or association between two categorical variables. Significance was determined at p value <0.05. This statistical analysis was done with the assistance of statistical advisor.

Results

Of the 168 physicians invited to participate in the study, 138 returned completed questionnaire, giving a response rate of 82.1%. Table 1 presents the demographic and baseline characteristics of the PHC physicians. Almost one-third of them (34.8%) were aged 25–30 years, and only 8.6% were older than 45 years. Almost two-thirds of them (65.9%) were women. Most of them were Saudi (76.1%), practice regularly in PHCCs (75.4%), and have MBBS or equivalent qualification (76.8%).

Regarding DF clinical presentation, most of the physicians knew correctly that they should suspect DF in patients presenting with retro-orbital pain, general body aches, and fever (84.1%); persistent vomiting and abdominal pain are warning signs of severe dengue (81.2%), and the classical dengue rash typically does not appear on the same day of fever (71%).

Concerning DF investigations, the majority of the PHC physicians (96.4%) knew correctly that platelet count is one of the criteria for classifying DHF. More than 70% of them recognized correctly that monitoring hematocrit in patients with suspected or confirmed DF is important and leukopenia is one of the World Health Organization criteria for diagnosing probable dengue. Only 29.7% of them reported correctly that isolation in cell culture using immunofluorescence is not the most sensitive and specific method for diagnosis of acute DF, while regarding DF treatment, majority of them answered correctly that rehydration and rest is the mainstay in the treatment of DF without warning sign (90.6%) and they should refer any patient of dengue with warning sign (92%). Most of them (79.7%) answered correctly that they should not prescribe aspirin or ibuprofen for confirmed dengue cases.

Regarding DF prevention and control, 92% of the physicians knew correctly that there is no effective vaccination for DF and 83.3% of them recognized correctly that DF cannot be transmitted from person to person. However, almost half of them (52.2%) knew correctly that dengue infection by one serotype will not give lifelong immunity against the all serotypes. More than two-thirds of PHC physicians (68.8%) answered wrongly that *Aedes aegypti* mosquito typically bites after dark.

There was no statistically significant difference in the main score of knowledge regarding clinical presentation and investigations of DF between physicians of different age groups, genders, nationalities, types of PHCC practice, and their highest qualifications. Regarding treatment, female physicians showed higher significant score regarding treatment of DF when compared with male physicians (2.70 ± 0.59 vs. 2.47 ± 0.78; $p < 0.05$). Similarly, regarding prevention and control, female physicians showed higher significant score regarding prevention and control of DF when compared with male physicians (2.70 ± 0.93 vs. 2.36 ± 0.99; $p < 0.05$).

There was no statistically significant difference in the main score of overall DF knowledge between physicians of different age groups, nationalities, types of PHCC practice, and their highest qualifications. However, female physicians showed higher significant overall DF knowledge score when compared with male physicians (10.49 ± 1.84 vs. 9.85 ± 1.72; $p < 0.05$), as shown in Table 2.

Regarding practice in clinical presentation of DF, 18.8% of PHC physicians did not see any suspected cases of DF, while most of them (79%) saw between one case and five cases. Most of the physicians (77.5%) look always or most of the time for skin or mucous membrane manifestation if they suspected dengue, while 8.7% of them never look at these manifestations. Similarly, most of them (84.7%) always or most of the time performed blood pressure in any suspected DF case, and only 3.6% never perform them; when regarding practice in investigations of DF, most of the physicians (80.5%) always or most of the time performed dengue test if they suspect dengue compared with 7.2% who never perform dengue test for the suspected cases. Among those who always or most of the time perform a dengue test for suspected cases, leukocyte, platelets, and hematocrit were commonly utilized (75.7%), followed by dengue serology (IgM/IgG) (31.5%). Among those who did not perform dengue test and responded to the question, the most common reported

Table 2: Association of physician's demographic and baseline characteristics with overall knowledge regarding dengue fever

	Total knowledge score of dengue fever (0–14), mean ± SD	*p*
Age in years		
25–30	10.38 ± 1.67	0.587**
31–35	10.07 ± 2.01	
36–40	10.58 ± 1.92	
41–45	10.53 ± 1.74	
>45	9.67 ± 1.78	
Gender		
Male	9.85 ± 1.72	0.049*
Female	10.49 ± 1.84	
Nationality		
Saudi	10.44 ± 1.73	0.061*
Non-Saudi	9.76 ± 2.03	
Type of PHCC practice		
Regular	10.28 ± 1.69	0.969*
Family	10.26 ± 2.21	
Highest qualification		
MBBS or equivalent	10.18 ± 1.75	0.440**
Diploma in Family Medicine	10.30 ± 2.00	
Board in Family Medicine	10.73 ± 2.07	

*Student's *t* test; **ANOVA test.

cause was the unavailability of the test at their workplace (75%). Regarding platelet count needed for patients referral, there was no definite answer obtained from physicians as approximately one-third of them chose the platelet count <100,000/mm^3 (34.8%), 39.9% chose the platelet count 50.000/mm^3, and 20.3% chose the platelet count <80,000/mm^3. Seven physicians (5.1%) reported that platelet count is not an indicator for referral of DF cases.

In their practice regarding DF treatment, majority of physicians (97.1%) cited that they always or most of the time advised oral fluids and rest to dengue patients. Similarly, 93.5% of them always or most of the time prescribed paracetamol to dengue patients. Almost two-thirds of them (65.9%) always or most of the time performed daily full blood counts to monitor patients with suspected or confirmed dengue, and in prevention and control, majority of physicians (95%) always or most of the time advised their patients to avoid mosquitoes bite. Almost two-thirds of the physicians (62.3%) cited that their center did not provide to the patients any type of preventive method (repellent, nets, etc.) to avoid mosquito bite.

There was a statistically significant difference between male and female physicians regarding number of suspected dengue cases seen per week as 26.4% of female physicians compared with only 4.3% of male physicians did not see any suspected cases. On the other hand, the majority of male physicians (91.4%) compared with 72.5% of female physicians have seen between one case and five cases per week, $p = 0.004$. Similarly, 42.4 of non-Saudi physicians compared with 11.4% of Saudi physicians did not see any suspected cases, while 86.7% and 54.5% of Saudi and non-Saudi physicians, respectively, have seen between one case and five cases per week, $p < 0.001$. Physicians' age, type of PHCC practice, and highest qualifications were not significantly associated with the number of suspected dengue cases seen per week. Regarding looking for skin or mucous membrane manifestation if they suspect dengue, 60.4% and 29.8% of female and male physicians, respectively, reported that they always look for skin or mucous membrane manifestation if they suspect dengue, $p < 0.001$. Seven non-Saudi physicians (21.2%) compared with five Saudi physicians (4.8%) reported that they never look for skin or mucous membrane manifestation if they suspect dengue, $p = 0.020$. Physicians' age, type of PHCC practice, and highest qualifications were not significantly associated with the looking for skin or mucous membrane manifestation of suspected dengue cases.

Regarding DF treatment, 81% of Saudi physicians compared with 69.7% of non-Saudi physician always advised their dengue patients to have rest and oral fluids, $p = 0.022$. Physicians' age, gender, type of PHCC practices, and highest qualification were not significantly associated with advice oral fluids and rest to dengue patients. Similarly, 68.3% of Saudi physicians compared with 42.4% of non-Saudi physicians always prescribed paracetamol to dengue patients, $p = 0.002$. Physicians working in regular PHCC tended to prescribe paracetamol more than those working in family PHCC (64.1% vs. 55.9%; $p = 0.018$). Physicians' age, gender, and highest qualification were not significantly associated with prescribing paracetamol to dengue patients; 14.6% compared with 8.3% of physician in the age group 25–30 and >45 years, respectively, never perform daily full blood counts to monitor patients with suspected or confirmed dengue, $p = 0.044$. Physicians' gender, nationality, type of PHCC practice, and highest qualification were not significantly associated performing daily full blood counts to monitor patients with suspected or confirmed dengue.

Discussion

Primary health-care physicians in Jeddah, KSAS, showed an overall satisfactory level of knowledge regarding clinical presentation, investigation, treatment, prevention, and control of DF. However, we have identified some major gaps of knowledge regarding some important issues that need reconsideration such as believing that *A. aegypti*, the mosquito vector for dengue virus, typically bites after dark, prescription of aspirin or ibuprofen for confirmed dengue case, dengue infection by one serotype (DEN-1, 2, 3, and 4) will give lifelong immunity against the all serotypes and reporting that the most sensitive and specific method of acute dengue infection diagnosis is isolation in cell culture using immunofluorescence.

The results of the current survey demonstrate that dengue knowledge did not vary among physicians. However, better

knowledge regarding treatment, prevention, and control of DF has been observed among female physicians. Another similar study conducted in Singapore[8] did not confirm our finding and they reported instead that physician's age and practice setting as important indicators for DF knowledge.

More than 65% of physicians who responded to the survey were noted to perform full blood counts frequently to monitor patients with suspected or confirmed dengue. This reflects somewhat good clinical practice; leukopenia (<6.0 × 10^3 cells/mm^3) and lymphopenia (<0.58 × 10^3 cells/mm^3) have previously been identified as useful predictors of dengue during the early phase of the illness.[9] The responses showing that physicians monitor patients with proven or suspected dengue regularly represent good clinical practice in concordance with WHO recommendations. However, additional risk stratifications are required to identify those patients requiring more frequent and meticulous follow-up, based on criteria such as platelet counts <100 × 10^3/mm^3 within the first 3 days of illness, 10 warning signs, and published guidelines for outpatient management of dengue.[3]

In this study, most of the physicians performed dengue test if they suspect dengue cases. This is very essential as early diagnosis being a crucial first step. This finding could be attributed to the fact that the incidence of DF and DHF has increased significantly in Jeddah over the last few years[5] and endemic occurrence of the disease in the city was recently confirmed,[6] which has risen the physicians' suspicion of the disease. In addition, results of the Saudi Arabian MOH study showed that, during the period 2006–2007, 1,551 notified cases were positive for dengue in Jeddah. Classical DF occurred among 98.4% of the cases, while DHF and DSS represented 1.1% and 0.5%, respectively. The overall case fatality rate was 0.52% with dramatic increase among cases with DHF and DSS (47%).[5]

Leukocyte, platelets, and hematocrit were commonly utilized followed by dengue serology as the diagnostic test of choice rather than the PCR or NS1 antigen test.[10] Several issues are associated with dengue serology tests; it can be falsely negative during the febrile early stage of illness, which is characterized by dengue viremia or antigenemia (hence dengue PCR/NS1).[11,12] In addition, dengue serology has been shown to have low specificity.[11,12] Because patients typically present to PHC physicians during the acute phase of illness, underusing PCR and NS1 testing may hinder the early diagnosis. The latter tests are usually available in hospital laboratory services but may be less accessible or affordable in the clinics. Thus, tools such as the full blood count, clinical predictors of dengue,[9] and serial follow-up of suspected cases become even more important. Increasing physician awareness about the appropriate timing of dengue diagnostic tests is a key area for improvement. In Singapore, dengue diagnostic tests were ordered always or often by less than half of the surveyed physicians.

A considerable proportion of physicians who did not perform dengue test have mentioned that the reason was unavailability of the test in their settings. The availability and affordability of serologic testing may represent limited understanding in the value of early diagnosis of dengue.

Among the survey physicians, 5.1% did not view low platelet count as an indicator for hospital referral. In another study conducted among PHC physicians in Singapore, a lower rate has been reported (0.8%).[9] The lack of correlation between the presence and degree of thrombocytopenia in dengue and risk of bleeding or severe illness has been well documented,[13,14] as has been the lack of benefit of prophylactic platelet transfusion in dengue.[15,16] For improving dengue patient management, the fact that thrombocytopenia necessitates hospital admission is another key area with great potential.

Early recognition of the disease and its management and referral when necessary in an organized manner reduces dengue mortality. The delivery of good clinical services at all levels of health care, from primary to tertiary levels, plays a vital role in the process. Although most patients with dengue recover without requiring hospital admission, some develop severe disease. Identifying those at risk for developing severe disease and requiring hospital admission can be achieved by simple but effective triage principles and management decisions during their visits at the primary and secondary care levels. The referral centers should harmonize by timely and proper management of severe dengues.[3] In this survey, 18.8% of physicians did not recognize that persistent vomiting and abdominal pain are warning signs of severe dengue. However, the majority of them recognize that platelet count is one of the criteria for classifying DHF and they should refer any patient of dengue with warning sign.

Control measures combined with strong local health systems can help in transferring the responsibility, authority, resources, and knowledge from central to local level. Moreover, the responsibility transfer should be accomplished by the transfer of financial and technical resources, as it is very important. For example, capacity-strengthening workshops or training courses in vector biology and control, epidemiology, and communication among other topics at the local level can be given along with the responsibility transfer. The dengue control program is usually a part of the local health system of all the administrative levels of government (state, provincial, departmental, and local), in which lies the responsibility for planning, implementing, monitoring, and evaluating the local program.[17,18] Unexpected finding is documented in the current study that almost two-thirds of physicians claimed that their center never provided the patient with any type of preventive method (repellent, nets, etc.) to avoid mosquito bite.

Conclusion

Conclusively, PHC physicians in Jeddah, KSA, demonstrated adequate general knowledge on select dengue topics. However, a knowledge gap has been reported regarding important issues in clinical presentation, treatment,

prevention, and control. Practices regarding frequent clinical monitoring were consistent with local and international guidelines. However, the utility of early diagnostic tests should be recognized. Female and Saudi physicians showed better knowledge and practice especially in the fields of diagnosis and treatment.

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