A cross-sectional survey of knowledge, attitude, and practices toward dengue fever among health workers in a tertiary health institution in Sokoto state, Nigeria

Oche Mansur Oche¹,², Musa Yahaya¹, Remi Abiola Oladigbolu³, Jessica Timane Ango², Christina Nneka Okafoagu², Zainab Ezenwoko², Adamu Ijapa², Abdulaziz Muhammad Danmadami²

¹Department of Community Health, Usmanu Danfodiyo University Sokoto, ²Department of Community Medicine, Usmanu Danfodiyo University Teaching Hospital Sokoto, Nigeria

ABSTRACT

Introduction: Dengue fever (DF) has become a disease of public health concern. It is a mosquito-borne virus infection caused by one of the four serotypes of the dengue virus, and the disease is prevalent in the tropical and subtropical regions of the world, with a global burden in the Americas. Yearly, about 390 million cases of new infection are estimated to occur. Aims of the Study: This study was aimed at determining the knowledge, attitude and practices regarding dengue fever amongst health workers in a tertiary health institution in Sokoto state, Nigeria. Methods: A descriptive cross-sectional study was carried out at the Usmanu Danfodiyo University Teaching Hospital, Sokoto, among 367 health-care workers who had worked in the hospital for at least 1 year before the study were selected using a systematic sampling method. Data were collected by trained resident doctors using a standardized, pretested questionnaire and analyzed using SPSS version 20 with a significance set at P > 0.05. Results: There was high awareness (95.1%) among the respondents, with seminars and lectures in school as the most familiar information sources. A more significant proportion, 87.8%, 93.2%, and 76.6%, of the respondents had adequate knowledge, positive attitude, and appropriate DF practice, respectively. Nurses and laboratory scientists had higher practice scores compared to other health-care workers (P = 0.016). Conclusion: Capacity building of health-care workers, especially the primary care physicians on surveillance, proper diagnosis, and treatment, is needed to avoid missing cases or misdiagnosis of cases, especially in developing and underdeveloped countries with limited health resources care service delivery.

Keywords: Dengue fever, health workers, knowledge, practices, Sokoto

Introduction

Dengue fever (DF) has become a disease of public health concern—the most important arboviral infection globally.[9] It is a mosquito-borne viral infection caused by one of the four serotypes of the dengue virus.[9] The disease is prevalent in the tropical and subtropical regions of the world.[5,6] It has been estimated that around 50% of the world population lives in areas where the disease transmission is favorable.[5,6] The global burden is seen in the Americas region with annual 1.5 million cases, and around 3 million cases of the disease were reported in 2019 by the Pan America Health Organization.[7,8] Africa is...
another region with notable cases,[1] and currently, the disease is endemic in 128 countries.[5,11] Yearly, about 390 million new infection cases are estimated to occur,[5,12] more than estimated by the WHO.[9]

_Aedes aegypti_ and _Aedes albopictus_ transmit DF—the two mosquitoes responsible for transmitting the disease among humans.[2] DF can develop into a severe form of infection called dengue hemorrhagic fever and can lead to severe complications and even death.[3]

There are two main types of dengue diseases, DF and dengue hemorrhagic fever, and infection due to a particular serotype confers immunity against it; however, an individual can still be infected by other serotypes.[13] Currently, there is no vaccine neither specific treatment for the disease; therefore, controlling the mosquito vectors is critical in the prevention of the disease.[14,15]

In Nigeria, the first case of dengue was isolated in the 1960s, but the disease is not among the list of reportable cases in Nigeria,[14] despite the number of diagnosed fevers of unknown cause. A seroprevalence of 30.8, 17.2, and the recent report of 73 among febrile patients have been reported.[17–19]

Knowledge, attitude, and health-care workers’ practices on the disease are critical for early diagnosis and disease prevention, especially by family physicians who are usually the first contacts for patients.[20,21] The purpose of the current study is to assess the knowledge, attitude, and practices regarding DF among health-care workers (HCWs) in a tertiary health institution in Sokoto, northwestern Nigeria. It is hoped that this will further deepen the study subjects’ knowledge and help identify gaps for further interventional studies.

**Methods**

**Study Area and Design:** A cross-sectional descriptive study design was carried out among health workers at the Usmanu Danfodiyo University Teaching Hospital (UDUTH), located within Sokoto city. UDUTH is a tertiary health center and serves as a referral center to many hospitals from Nigeria’s northwestern region.

**Study population and Eligibility:** The study population comprises health workers (doctors, pharmacists, laboratory scientists, and nurses) who had worked in the hospital for at least 1 year before this study and came in contact with patients from time to time (inclusion criteria).

**Sample Size and Sampling Technique:** A sample size of 367 was calculated for the study based on an assumption of 35% from a previous study[22] who had adequate knowledge of the disease. The various health workers’ list was obtained from the institution’s staff officer, and study subjects were selected proportional to size using a systematic sampling method.

**Data Collection and Analysis:** Participants’ knowledge, attitude, and practices regarding DF that were assessed using a standardized pretested semistructured questionnaire consisting the questions on knowledge, attitude, and practice were administered by trained research assistants. Consent was obtained from the participants before the application of the instrument. Sociodemographic characteristics were also collected. The questionnaires were checked for completeness and entered into SPSS version 20 for subsequent analysis. Mean, standard deviations, proportions calculated, and logistic regression analysis were conducted to identify the relationships among the interests’ variables. Correct responses to each question on knowledge and practice attract one mark and zero for incorrect answers, and a cut-off score of >60% was considered for adequate knowledge and appropriate practice. Similarly, concerning attitude, a correct response to strongly agree or agree was given a score of 1, while any response to strongly disagree, disagree, or not sure was awarded 0 scores. The attitude scores were finally graded as a percentage, with ≥60% being positive attitude. The level of significance was set at _P_ < 0.05.

**Ethical approval**

The approval to conduct the study was granted by the Research Ethics Committee of Usmanu Danfodiyo University, Sokoto, Nigeria.

**Table 1: Sociodemographic Characteristics of Respondents**

| Variables     | Frequency (%) |
|---------------|---------------|
| Age in years  |               |
| <30           | 140 (38.8)    |
| 30–34         | 58 (16.0)     |
| 35–39         | 66 (18.3)     |
| 40–44         | 41 (11.4)     |
| 45–49         | 29 (8.0)      |
| ≥50           | 27 (7.5)      |
| Total         | 361 (100)     |
| Mean±SD       | 35±8.3        |
| Gender        |               |
| Female        | 142 (40.0)    |
| Male          | 219 (60.0)    |
| Total         | 365 (100)     |
| Religion      |               |
| Christianity  | 119 (32.8)    |
| Islam         | 242 (67.2)    |
| Total         | 361 (100)     |
| Marital status|               |
| Single        | 105 (26.9)    |
| Married       | 248 (60.0)    |
| Separated     | 3 (0.9)       |
| Divorced      | 1 (0.3)       |
| Widowed       | 4 (1.1)       |
| Total         | 361 (100)     |
| Tribe         |               |
| Hausa         | 170 (47.6)    |
| Fulani        | 43 (12.0)     |
| Yoruba        | 48 (13.4)     |
| Igbo          | 45 (12.6)     |
| ‘Others’      | 55 (14.3)     |
| Total         | 357 (100)     |

<sup>Others-To, Zuru, Kabba, Edo</sup>
Oche, et al.: Knowledge, attitude and practices regarding dengue fever

and Ethics committee of the Usman Danfodiyo University Teaching hospital. Participation was voluntary, and all the information collected from the respondents was treated with uttermost confidentiality. Before the data collection, informed consent was obtained from the respondents.

Results

Over a third, 128 (36.7%) of the respondents were below 30 years of age, and only 27 (7.7%) were 50 years and above; the mean age was 35.1 ± 8.3 years. Majority of the respondents were males 219 (60.0%), practiced Islam 242 (67.2%), and married 248 (70.9%). Almost half 170 (47.6%) of the respondents were Hausa by tribe [Table 1]. Over half, 203 (57.3%) of the respondents were nurses, and only 6 (1.7%) were pharmacists [Figure 1].

More than 90% (347) of the respondents heard of DF, with seminars and lectures in school being the commonest sources of information regarding the disease. However, less than half 167 (48.1%) had experience in reporting suspected DF cases. The majority of the respondents, 309 (84.0%), knew DF is transmitted when mosquito bites and more than half 208 (56.7%) knew Aedes mosquito as the responsible vector for the transmission of the disease. A total of 144 (44.4%) of the subjects knew that ponds and rivers are breeding grounds for the vector. The majority of the respondents (75.4%) knew that DF could be spread from human to human. They also knew that fever 341 (94.7%), nausea and vomiting 331 (93.8%), bleeding 325 (91.3%), headache 329 (94.3%), rash 257 (75.4%), and abdominal pain 275 (79.5%) are symptoms of DF [Table 2].

Almost all the respondents knew that mosquito spray with insecticides 338 (95.8%), mosquito mat/coil/vaporizers 295 (86.0%), windows and door screen 307 (87.4%), cleaning of garbage/trash 318 (91.9%), preventing water stagnation 344 (96.6%), and pouring chemical in standing water 299 (86.9%) can prevent DF infection.

Almost all the respondents were knowledgeable about the vector characteristics. However, 141 (46.1%) of the respondents knew that the vector frequently bites during the morning and daytime 175 (55.2%) [Table 3].

There were some misconceptions concerning the treatment of DF as only a third 116 (34.0%) felt that patients with the

| Table 2: Knowledge of HCWs Regarding Dengue Fever | Table 2: Contd... |
|-------------------------------------------------|-------------------|
| Knowledge of causes, spread, and symptoms of dengue fever | Knowledge of causes, spread, and symptoms of dengue fever |
| Variables | Frequency | Variables | Frequency |
| Ever heard of dengue fever | | Graded knowledge on causes, spread, and symptoms |
| Yes | 347 (95.1) | Inadequate knowledge (<60%) | 36 (10.0) |
| No | 18 (4.9) | Adequate knowledge (≥60%) | 325 (90.0) |
| Source of information regarding DF | | *Multiple responses |
| Radio/Television | 74 (20.3) | |
| Seminars | 181 (49.6) | |
| Lectures in school | 94 (25.8) | |
| Others | 16 (4.4) | |
| Experience in reporting suspected dengue fever case | | |
| Yes | 167 (48.1) | |
| No | 180 (51.9) | |
| Transmission of dengue fever | | |
| Bite of mosquito | 309 (84.0) | |
| Needle stick injury | 5 (1.3) | |
| Through sexual intercourse | 6 (1.5) | |
| Through the bite of ticks | 7 (2.1) | |
| Airborne | 9 (2.5) | |
| Drinking dirty water | 14 (3.9) | |
| Houseflies | 2 (0.5) | |
| Don’t know | 16 (4.4) | |
| Type of mosquito involved in transmission | | |
| Aedes | 208 (56.7) | |
| Culex | 37 (9.9) | |
| Anopheles | 51 (13.8) | |
| Don’t know | 72 (19.6) | |
| Breeding ground for the vector* | | |
| Pond/Rivers | 144 (44.4) | |
| Cans | 38 (11.7) | |
| Roof gutters | 97 (29.9) | |
| Water containers | 105 (32.4) | |
| DF can be spread from human to human | | |
| Yes | 261 (75.4) | |
| No | 85 (24.6) | |
| Fever is a symptom of DF | | |
| Yes | 341 (94.7) | |
| No | 19 (5.3) | |
| Nausea and vomiting are symptoms of DF | | |
| Yes | 331 (93.8) | |
| No | 22 (6.2) | |
| Bleeding is a symptom of DF | | |
| Yes | 325 (91.3) | |
| No | 31 (8.7) | |
| Muscular pain is a symptom of DF | | |
| Yes | 330 (93.5) | |
| No | 23 (6.5) | |
| Headache is a symptom of DF | | |
| Yes | 329 (94.3) | |
| No | 20 (5.7) | |
| Rash is associated with DF | | |
| Yes | 257 (75.4) | |
| No | 84 (24.6) | |
| Abdominal pain is a symptom of DF | | |
| Yes | 275 (79.5) | |
| No | 71 (20.5) | |

Contd...
disease who had no warning signs should be hospitalized and that antibacterial (36.5%) and antiviral drugs (44.3%) should be given to patients suspected of having DF.

Overall, most 318 (87.8%) of the respondents had adequate DF knowledge [Table 4].

The sociodemographic variables had no significant impact on years of experience and overall (graded) knowledge of HCWs regarding the disease. Less than half (45.0%) of the respondents with adequate knowledge had ≥10 years of experience, and this was statistically significant \( (P = 0.011) \) [Table 5].

The association between respondents’ cadres and overall DF knowledge was significant \( (P < 0.001) \). Consultants, resident doctors, house officers, pharmacists, and nurses had higher knowledge scores than the laboratory scientists.

The majority of the respondents opined that DF is a serious illness 275 (78.2%) but can be prevented, 233 (66.6%) and there is a need for treatment, and hospitalization 224 (65.9%) and 246 (73.7%) agreed that any community with suspected symptoms should seek for medical advice. Almost all 330 (93.2%) respondents had a positive attitude toward DF. The majority (76.2%) of the subjects strongly believed that DF is a serious health problem and were of the strong belief that they were at risk of contracting the illness; similarly, a greater proportion (65.7%) believed that the government has a responsibility in ensuring that the vector breeding places are adequately controlled.

Overall, 330 (93.2%) of the study subjects had a positive attitude toward the illness. However, no significant relationship was seen between the sociodemographic variables, including years of experience and overall (graded) attitude of HCWs regarding DF. Nurses had higher attitude scores compared with laboratory scientists, and this was statistically significant \( (P = 0.025) \) [Tables 6 and 7].

The majority of the respondents, 269 (76.6%), had appropriate practice concerning DF. However, about half 160 (48.6%) of them would admit patients with DF without warning signs,

### Table 3: Knowledge of HCWs Prevention and Vector Characteristics

| Variables                                      | Frequency |
|------------------------------------------------|-----------|
| Prevention of dengue fever                     |           |
| Mosquito spray with insecticides can prevent DF|           |
| Yes                                            | 338 (95.8)|
| No                                             | 15 (4.2) |
| Mosquito mat/coil/liquid vaporizer can prevent DF|           |
| Yes                                            | 295 (86.0)|
| No                                             | 48 (14.0)|
| Windows and door screen can prevent DF          |           |
| Yes                                            | 304 (87.4)|
| No                                             | 44 (12.6)|
| Cleaning house can prevent DF                   |           |
| Yes                                            | 329 (93.2)|
| No                                             | 24 (6.8) |
| Cleaning of garbage/trash can prevent DF        |           |
| Yes                                            | 318 (91.9)|
| No                                             | 28 (8.1) |
| Preventing water stagnation can prevent DF      |           |
| Yes                                            | 344 (96.6)|
| No                                             | 12 (3.4) |
| Application of mosquito-eating fish can prevent DF|           |
| Yes                                            | 218 (64.7)|
| No                                             | 119 (35.3)|
| Pouring chemicals in standing water can prevent mosquito breeding |   |
| Yes                                            | 299 (86.9)|
| No                                             | 45 (13.1)|
| Covering water containers can prevent breeding of mosquitoes| |
| Yes                                            | 311 (90.4)|
| No                                             | 33 (9.4) |
| Cutting bushes around the house can prevent breeding of mosquitoes| |
| Yes                                            | 337 (94.9)|
| No                                             | 18 (5.1) |
| Vector characteristics of dengue                |           |
| The vector breeds in water storage jars/containers| |
| Yes                                            | 303 (88.9)|
| No                                             | 38 (11.1)|
| The vector breeds in coolers, tires, and pots   |           |
| Yes                                            | 236 (70.7)|
| No                                             | 98 (29.3)|
| The vector breeds in dirty water                |           |
| Yes                                            | 324 (93.6)|
| No                                             | 22 (6.4) |
| The vector breeds in garbage/trash              |           |
| Yes                                            | 288 (83.5)|
| No                                             | 57 (16.5)|
| The vector breeds in plants/vegetation          |           |
| Yes                                            | 266 (79.9)|
| No                                             | 67 (20.1)|
| The vector frequently bite in the morning       |           |
| Yes                                            | 141 (46.1)|
| No                                             | 162 (53.5)|

### Table 3: Contd...

| Variables                                      | Frequency |
|------------------------------------------------|-----------|
| The vector frequently bite in the day time     |           |
| Yes                                            | 175 (55.2)|
| No                                             | 142 (44.8)|
| The vector frequently bite in the evening      |           |
| Yes                                            | 188 (60.3)|
| No                                             | 124 (39.7)|
| The vector frequently bite at night            |           |
| Yes                                            | 146 (47.2)|
| No                                             | 163 (52.8)|
| The vector bites both day and night            |           |
| Yes                                            | 88 (27.8) |
| No                                             | 228 (72.2)|

Contd...
Oche, et al.: Knowledge, attitude and practices regarding dengue fever

Our study investigated the knowledge, attitude, and practice of DF among HCWs in Sokoto. As shown in the data, and similar to another study carried out in Abidjan, Cote de’Ivoire, more than half (54.8%) of the respondents were below 35 years of age, the active period of life with high chances of exposure to the outside environment. As expected, males constituted the majority (60%) of the study subjects, and this agrees with the findings of Tan et al.; however, similar studies conducted in Tanzania and Quebec, Canada, showed female preponderance. Our study’s male dominance may not be unconnected with the low female school enrollment and our study area’s sociocultural milieu.

Similar to another study elsewhere, it was observed from our study that more than half (57.3%) of our respondents were nurses who also constituted the majority of the health workforce in the teaching hospital, but in contrast with other studies where doctors were the majority.

Our study’s findings showed that less than half (42%) of the study subjects had more than 10 years of working experience as health professionals. 115 (35.1%) would give antibacterial drugs, while another 143 (43.6%) of the respondents will give antiviral drugs to patients suspected to have DF. Less than half (45%) of the HCWs agreed to have received any training on hemorrhagic fevers, including DF, in the last year [Tables 8 and 9].

Most 48 (70.6%) of the respondents with inappropriate practice had <10 years of experience and this was statistically significant ($\chi^2=5.82$, $P=0.018$). Nurses and laboratory scientists had higher practice scores compared with other health professionals, and this was statistically significant ($P=0.016$) [Table 10].

### Discussion

DF is a global infection of public health importance, endemic in about 128 countries with an estimated prevalence of 3.9 billion. HCWs, especially family physicians being the gatekeepers on health issues and first contacts with patients, are the core workforce expected to change this trend. Their overall operational capacity in dealing with DF is therefore of paramount importance. Our study investigated the knowledge, attitude, and practice of DF among HCWs in Sokoto. As shown in the data, and similar to another study carried out in Abidjan, Cote de’Ivoire, more than half (54.8%) of the respondents were below 35 years of age, the active period of life with high chances of exposure to the outside environment. As expected, males constituted the majority (60%) of the study subjects, and this agrees with the findings of Tan et al.; however, similar studies conducted in Tanzania and Quebec, Canada, showed female preponderance. Our study’s male dominance may not be unconnected with the low female school enrollment and our study area’s sociocultural milieu. Similar to another study elsewhere, it was observed from our study that more than half (57.3%) of our respondents were nurses who also constituted the majority of the health workforce in the teaching hospital, but in contrast with other studies where doctors were the majority.

Our study’s findings showed that less than half (42%) of the study subjects had more than 10 years of working experience as health professionals. 115 (35.1%) would give antibacterial drugs, while another 143 (43.6%) of the respondents will give antiviral drugs to patients suspected to have DF. Less than half (45%) of the HCWs agreed to have received any training on hemorrhagic fevers, including DF, in the last year [Tables 8 and 9].

Most 48 (70.6%) of the respondents with inappropriate practice had <10 years of experience and this was statistically significant ($\chi^2=5.82$, $P=0.018$). Nurses and laboratory scientists had higher practice scores compared with other health professionals, and this was statistically significant ($P=0.016$) [Table 10].

### Table 4: Knowledge of HCWs on the Treatment of Dengue Fever

| Variables | Frequency |
|-----------|-----------|
| Patients with dengue fever without warning signs should be hospitalized | 34.0 % |
| Yes | 116 |
| No | 225 |
| Patients with dengue without warning signs but with other existing diseases should be hospitalized | 89.7 % |
| Yes | 306 |
| No | 35 |
| Patients with dengue fever with warning signs should be hospitalized | 95.3 % |
| Yes | 328 |
| No | 16 |
| Intravenous fluids hydration should be given to patients suspected to have dengue fever | 90.9 % |
| Yes | 310 |
| No | 31 |
| Paracetamol should be given to patients suspected to have dengue fever | 75.1 % |
| Yes | 254 |
| No | 84 |
| Antibacterial drugs should be given to patients suspected to have dengue fever | 36.5 % |
| Yes | 123 |
| No | 214 |
| Antiviral drugs should be given to patients suspected to have dengue fever | 44.3 % |
| Yes | 148 |
| No | 186 |
| Overall graded knowledge of HCWs | 12.2 % |
| Inadequate knowledge (<60%) | 44 |
| Adequate knowledge (≥60%) | 318 |

### Table 5: Correlates of Overall Graded Knowledge of HCWs Regarding Dengue Fever

| Variables | Overall graded knowledge |
|-----------|-------------------------|
| Age (years) | Inadequate (<60%) | Adequate (≥60%) |
| <34 | 23 (54.8) | 147 (48.7) |
| ≥34 | 19 (45.2) | 155 (51.3) |
| Gender | $\chi^2=0.55$ | $P=0.51$ |
| Female | 19 (44.2) | 123 (38.8) |
| Male | 24 (55.8) | 194 (61.2) |
| Religion | $\chi^2=0.46$ | $P=0.51$ |
| None | 0 (0.0) | 2 (0.6) |
| Christian | 13 (30.2) | 99 (31.6) |
| Islam | 28 (65.1) | 205 (65.5) |
| Others | 2 (4.7) | 7 (2.2) |
| Marital status | $\chi^2=1.26$ | $P=0.74$ |
| Unmarried | 11 (26.8) | 89 (29.3) |
| Married | 30 (73.2) | 215 (70.7) |
| Years of experience | $\chi^2=6.78$ | $P=0.011$ |
| <10 | 28 (77.8) | 154 (55.0) |
| ≥10 | 8 (22.2) | 126 (45.0) |

* $P<0.05$
workers. Ekra et al. found a lower figure of 31% amongst their subjects.\[24\] In contrast to our findings, higher figures (51% and 65%) were observed in other studies elsewhere.\[26,28\]

The majority of our study subjects (95.1%) were aware of DF before now; varying levels of awareness ranging from 34.5% to 77% had been recorded in previous studies.\[30‑32\]

In contrast to our findings, higher scores were reported from Pakistan and India.\[34,35\]

The commonest source of information on DF by our respondents was through hospital seminars and training during outbreaks, especially on other hemorrhagic fevers. This is in agreement with the findings of Ekra et al. in Abidjan, Cote d'Ivoire.\[24\]

Table 6: The attitude of HCWs toward Dengue Fever

| Variables                                                                            | Frequency (%) |
|--------------------------------------------------------------------------------------|---------------|
| Dengue is a serious illness                                                          |               |
| Strongly agree                                                                       | 275 (78.2)    |
| Agree                                                                                | 66 (18.8)     |
| Disagree                                                                             | 4 (1.1)       |
| Strongly disagree                                                                    | 2 (0.6)       |
| Not sure                                                                             | 5 (1.4)       |
| You are at risk of getting dengue fever                                              |               |
| Strongly agree                                                                       | 147 (42.6)    |
| Agree                                                                                | 116 (33.6)    |
| Disagree                                                                             | 35 (10.1)     |
| Strongly disagree                                                                    | 22 (6.4)      |
| Not sure                                                                             | 25 (7.2)      |
| Dengue fever can be prevented                                                        |               |
| Strongly agree                                                                       | 233 (66.6)    |
| Agree                                                                                | 100 (28.6)    |
| Disagree                                                                             | 5 (1.4)       |
| Strongly disagree                                                                    | 8 (2.3)       |
| Not sure                                                                             | 4 (1.1)       |
| There is a need for treatment and hospitalized for dengue fever                      |               |
| Strongly agree                                                                       | 224 (65.9)    |
| Agree                                                                                | 104 (30.6)    |
| Disagree                                                                             | 3 (0.9)       |
| Strongly disagree                                                                    | 7 (2.1)       |
| Not sure                                                                             | 2 (0.6)       |
| Government has a responsibility for the control of mosquito breeds                  |               |
| Strongly agree                                                                       | 228 (65.7)    |
| Agree                                                                                | 94 (27.1)     |
| Disagree                                                                             | 15 (4.3)      |
| Strongly disagree                                                                    | 5 (1.4)       |
| Not sure                                                                             | 5 (1.4)       |
| Do you feel that dengue is a major problem for your patient population               |               |
| Strongly agree                                                                       | 138 (39.7)    |
| Agree                                                                                | 110 (31.6)    |
| Disagree                                                                             | 69 (19.8)     |
| Strongly disagree                                                                    | 12 (3.4)      |
| Not sure                                                                             | 19 (5.5)      |
| Your patient feel that dengue infection is a major problem for their health         |               |
| Strongly agree                                                                       | 127 (36.4)    |
| Agree                                                                                | 121 (34.7)    |
| Disagree                                                                             | 56 (16.0)     |
| Strongly disagree                                                                    | 13 (3.7)      |
| Not sure                                                                             | 32 (9.2)      |
| In your experience, do you think that a member of the community who exhibits symptoms of DF should seek medical attention |               |
| Strongly agree                                                                       | 246 (73.7)    |
| Agree                                                                                | 66 (19.8)     |
| Disagree                                                                             | 14 (4.2)      |
| Strongly disagree                                                                    | 6 (1.8)       |
| Not sure                                                                             | 2 (0.6)       |

Table 7: Correlates of Overall Graded Attitude of HCWs Regarding Dengue Fever

| Variables | Overall graded attitude | Test statistics |
|-----------|-------------------------|-----------------|
|           | Poor (<60%) | Good (≥60%) | P  |
| Age (years) |            |             |    |
| <34        | 9 (40.9)    | 158 (50.2)  | $\chi^2$=0.70 |
| ≥34        | 13 (59.1)   | 157 (49.8)  | $P$=0.51     |
| Gender     |             |             |    |
| Female     | 9 (37.5)    | 131 (39.9)  | $\chi^2$=0.05 |
| Male       | 15 (62.5)   | 197 (60.1)  | $P$=1.00     |
| Religion   |             |             |    |
| None       | 0 (0.0)     | 2 (0.6)     | $\chi^2$=1.44 |
| Christianity| 7 (30.4)   | 103 (31.7)  | $P$=0.698   |
| Islam      | 16 (69.6)   | 212 (65.2)  |             |
| Others     | 0 (0.0)     | 8 (2.5)     |             |
| Marital status |        |             |    |
| Unmarried  | 7 (29.2)    | 91 (29.1)   | $\chi^2$=0.00 |
| Married    | 17 (70.8)   | 222 (70.9)  | $P$=1.00     |
| Years of experience |           |             |    |
| <10        | 12 (54.5)   | 166 (57.8)  | $\chi^2$=0.09 |
| ≥10        | 10 (45.5)   | 121 (42.2)  | $P$=0.83     |

$p<0.05$
Table 8: The practice of HCWs Regarding Dengue Fever

| Variables | Frequency |
|-----------|-----------|
| Use mosquito spray to prevent mosquito bite | 313 (91.5) 29 (8.5) |
| Yes | No |
| Clean garbage/trash to prevent mosquito bite | 322 (94.7) 18 (5.3) |
| Yes | No |
| Prevent water stagnation at home | 339 (98.3) 6 (1.6) |
| Yes | No |
| Use window and/or door screens to prevent access to mosquitoes | 316 (93.2) 23 (6.8) |
| Yes | No |
| Admit patients with DF without warning signs | 160 (48.6) 169 (51.4) |
| Yes | No |
| Admit patients with DF without warning signs but with co-morbidities | 236 (72.6) 89 (27.4) |
| Yes | No |
| Admit patients with DF with warning signs | 277 (83.4) 55 (16.6) |
| Yes | No |
| Give IV fluid hydration to patients suspected to have DF | 257 (78.1) 72 (21.9) |
| Yes | No |
| Give Paracetamol to patients suspected to have DF | 230 (70.6) 96 (29.4) |
| Yes | No |
| Give antibacterial drugs to patients suspected to have DF | 115 (35.1) 213 (64.9) |
| Yes | No |
| Give antiviral to patients suspected to have DF | 143 (43.6) 185 (56.4) |
| Yes | No |
| Graded Practice of HCWs regarding DF | 269 (76.6) 82 (23.4) |
| Appropriate practice (≥60%) | Inappropriate practice (<60%) |

Overall, the majority (87.8%) of our respondents had adequate knowledge of the cause, transmission, treatment, and prevention of DF. This contrasts with other studies that found only 10.3% with high knowledge[44] and other studies with low knowledge levels from India, Pakistan, Thailand, and Jamaica.[32,33,40‑44]

Findings from our study showed that the knowledge of DF treatment was good, with 67.7% of the participants scoring 75% and above; however, Kajeguka et al.[25] in 2017, reported over treatment of malaria in the absence of diagnosis. Another study by Nguyen and his coresearchers revealed missed opportunities by primary health physicians to improve dengue prevention through communication.[49]

In terms of correlates of overall graded knowledge and attitudes of the HCWs, there was no statistically significant association between sociodemographic variables, including years of experience. However, in terms of practice, HCWs

Table 9: Correlates of Overall Graded Practice of HCWs Regarding Dengue Fever

| Variables | Overall Graded Practice | Test statistics |
|-----------|-------------------------|----------------|
| Age (years) | | |
| <34 | 41 (51.9) 125 (49.0) | $\chi^2=0.20$ |
| $\geq 34$ | 38 (48.1) 130 (51.0) | $P=0.70$ |
| Gender | | |
| Female | 36 (43.9) 104 (39.0) | $\chi^2=0.64$ |
| Male | 46 (56.1) 163 (61.0) | $P=0.44$ |
| Religion | | |
| None | 0 (0.0) 2 (0.8) | $\chi^2=2.76$ |
| Christianity | 29 (36.7) 80 (30.2) | $P=0.43$ |
| Islam | 49 (62.0) 176 (66.4) |
| Others | 1 (1.3) 7 (2.6) |
| Marital status | | |
| Unmarried | 23 (30.3) 74 (28.7) | $\chi^2=0.07$ |
| Married | 53 (69.7) 184 (71.3) | $P=0.78$ |
| Years of experience | | |
| <10 | 48 (70.6) 129 (54.2) | $\chi^2=5.82$ |
| $\geq 10$ | 20 (29.4) 109 (45.8) | $P=0.018^*$ |

Furthermore, it was observed from our study that the majority of our subjects expressed a positive attitude toward DF. Studies elsewhere observed similar positive attitudes, although not as high as observed in this study.[33,40,44] The proportion of respondents that showed a positive attitude toward DF is not surprising, although it has been shown that good knowledge about DF could translate to positive attitudes.[46]

On the overall graded practice of preventing DF, most study subjects (76.6%) had appropriate practices. This is in agreement with findings from other studies elsewhere.[45,47] On the other hand, some other studies observed varying practice levels from 49.6% to 57.3%,[36,38,40] The difference between our study and these other studies may not be unrelated to the fact that ours was among health workers while these others were from community-based studies. The health workers are usually the first contacts of patients in all health facilities; therefore, the perception of being at risk of infection, frequent training, and continuous provision of information, education, and communication invariably strengthen good practices. Although education plays an essential role in enhancing good practices, it has been observed that education alone cannot be correlated with knowledge.[48] It is therefore not surprising that nurses in our study had better practice than other health workers. Ekra et al. observed similar findings from their study.[25]
with more than 10 years’ experience were two times more likely to have fair practice compared with others. The overall knowledge score of DF between respondents’ cadres was found significant \( P < 0.001 \) among consultants, resident doctors, house officers, pharmacist, and nurses and had a higher knowledge score than the laboratory scientist probably due to the few numbers of cases seen or wrong laboratory investigation and diagnosis. Nurses had a significant higher attitude score compared with laboratory scientists \( P = 0.025 \); however, nurses and laboratory scientists had significant higher practice scores compared with other health professionals \( P = 0.016 \), and this could be due to safety precautions adopted, especially by these cadres of HCWs to limit exposure and contact with suspected patients and samples.

**Summary**

Findings from our study indicated that the respondents had high awareness about DF with seminars and lectures in school as the commonest sources of information. A greater proportion of the respondents had adequate knowledge, a positive attitude, and appropriate DF practice, respectively. The need to increase sensitization of HCWs on attitude and practice of DF prevention is timely and essential considering the population at risk globally and the impact of population growth, urbanization, and climate change. Surveillance, proper diagnosis, and treatment are needed to avoid missing cases or misdiagnosed cases, especially in developing and underdeveloped countries with limited resources in terms of health-care service delivery. Communicating the regular geographical distribution and global burden to alert HCWs is equally essential. The need to develop programs and activities aimed at capacity development of HCWs, especially the primary health-care physicians, to avoid missing or misdiagnosed cases of DF is critical.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Yusuf AM, Ibrahim NA. Knowledge, attitude and practice towards dengue fever prevention and associated factors among public health sector health-care professionals in Dire Dawa, Eastern Ethiopia. Risk Manag Healthc Policy 2019;12:91-104.
2. Elson WH, Ortega E, Kreutzberg-Martinez M, Jacquieroz F, Cabrera LN, Oberhelman RA, et al. Cross-sectional study of dengue-related knowledge, attitudes and practices in Villa El Salvador, Lima, Peru. BMJ Open 2020;10:e037408.
3. Lugova H, Wallis S. Cross-sectional survey on the dengue knowledge, attitudes and preventive practices among students and staff of a public university in Malaysia. J Community Health 2017;42:413-20.
4. Selvarajoo S, Liew JW, Tan W, Lim XY, Refai WF, Zaki RA, et al. Knowledge, attitude and practice on dengue prevention and dengue seroprevalence in a dengue hotspot in Malaysia: A cross-sectional study. Sci Rep 2020;10:9534.
5. World Health Organization. Dengue and Severe Dengue. WHO Factsheet. 2012.
6. Messina JP, Brady OJ, Golding N, Kraemer MU, Wint GR, Ray SE, et al. The current and future global distribution and population at risk of dengue. Nat Microbiol 2019;4:1508-15.
7. PAHO. Reported cases of dengue fever in the Americas. PAHO. Available: http://www.paho.org/data/index.php/en/nnu-topics/indicadores-dengue-en/dengue-nacional-en/252-dengue-pais-ano-en.html?showall=&start=1. [Last accessed on 2020 Dec 10].
8. Pan American Health Organization (PAHO). Epidemiological update dengue, 2019. Available from: https://www.paho.org/hq/index.php?option=com_topics and view=rmore and cid=2217 and item=dengue and type=alerts and Itemid=40734 and lang=en.
9. WHO/TDR. Dengue: Guidelines for Diagnosis, Treatment, Prevention and Control. Geneva: World Health Organization (WHO) and the Special Programme for Research and Training in Tropical Diseases; 2009.
10. Brady OJ, Gething PW, Bhatt S, Messina JP, Brownstein JS, Hoen AG, et al. Refining the global spatial limits of dengue virus transmission by evidence-based consensus. PLoS Negl Trop Dis 2012;6:e1760.
11. Gubler DJ. Emerging vector-borne flavivirus diseases: Are vaccines the solution? Expert Rev Vaccines 2011;10:563-5.
12. Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL, et al. The global distribution and burden of dengue. Nature 2013;496:504-7.
13. Reich NG, Shrestha S, King AA, Rohani P, Lessler J, Kalayanarooj S, et al. Interactions between serotypes of dengue highlight epidemiological impact of cross-immunity. J R Soc Interface 2013;10:20130414. doi: 10.1098/rsif.2013.0414.
14. Halstead SB. Dengue vaccine development: A 75% solution?. Lancet 2012;380:1535-6.
15. WHO/SEARO. Comprehensive Guidelines for Prevention and Control of Dengue and Dengue Haemorrhagic Fever (revised and expanded edition). New Delhi: World Health Organization, Regional Office for South East Asia; 2011.
16. Amarasingshe A, Kuritsk JN, Letson GW, Margolis HS. Dengue virus infection in Africa. Emerg Infect Dis 2011;17:1349-54.
17. Faneye A, Idika N, Motayo BO, Adesammi A, Afocha E. Serological evidence of recent dengue virus infection in Africa. Emerg Infect Dis 2011;17:1349-54.
18. PAHO. Reported cases of dengue fever in the Americas. PAHO. Available: http://www.paho.org/data/index.php/en/nnu-topics/indicadores-dengue-en/dengue-nacional-en/252-dengue-pais-ano-en.html?showall=&start=1. [Last accessed on 2020 Dec 10].
19. PAHO. Dengue-related knowledge, attitudes and practices in Villa El Salvador, Lima, Peru. BMJ Open 2020;10:e037408.
20. PAHO. Reported cases of dengue fever in the Americas. PAHO. Available: http://www.paho.org/data/index.php/en/nnu-topics/indicadores-dengue-en/dengue-nacional-en/252-dengue-pais-ano-en.html?showall=&start=1. [Last accessed on 2020 Dec 10].
21. PAHO. Dengue-related knowledge, attitudes and practices in Villa El Salvador, Lima, Peru. BMJ Open 2020;10:e037408.
among febrile children in a semi arid zone. Am J Infect Dis 2013;9:7-10.

18. Odilipo EK, Amanetru C, Gbadero TA, Oloke JK. Detectable anti-dengue virus IgM antibodies among healthy individuals in Ogbomosho, Oyo state, Nigeria. Am J Infect Dis 2014;10:64-7.

19. Oyero OG, Ayukekbong JA. High dengue NS1 antigenemia in febrile patients in Ibadan, Nigeria. Virus Res 2014;191:59-61.

20. Lee LK, Thein TL, Kurukuralatne C, Gan V, Lye DC, Leo YS. Dengue knowledge, attitudes, and practices among primary care physicians in Singapore. Ann Acad Med Singapore 2011;40:333-8.

21. Tan HF, Yeh CY, Chang HW, Chang CK, Tseng HF. Private doctors' practices, knowledge, and attitude to reporting of communicable diseases: A national survey in Taiwan. BMC Infect Dis 2009;9:11.

22. Alzahrani A. Knowledge and practice of primary health-care physicians regarding the dengue fever in Makkah Al-Mokarramah city, 2013. Int J Med Sci Public Health 2015;4:266-74.

23. PAHO/WHO. Dengue Guidelines for Patient Care in the Region of the Americas. 2nd Edition. Washington, DC. 2016. Available from: http://iris.paho.org/xmlui/handle/123456789/31207.

24. Ekra DK, Cherif D, Damus Paquin Kouassi DP, Konan YL, Coulibaly D, Traore Y, et al. Determinants of practices for dengue diagnosis among healthcare professionals working in public hospitals of Abidjan, Cote d'Ivoire. Journal of Public Health and Epidemiology 2017;9:212-8.

25. Kajeguka DC, Desrochers RE, Mwangi R, Mgabo MR, Alfrangis M, Kavishe RA, et al. Knowledge and practice regarding dengue and chikungunya: A cross-sectional study among Healthcare workers and community in Northern Tanzania. Trop Med Int Health 2017;22:583-93.

26. Dubé E, Defay F, Kiely M. Connaissances, attitudes et pratiques d’infirmiers, d’infirmières, de pédiatres et d’omnipraticiens québécois sur la grippe A (H1N1) et la grippe saisonnière. Institut National de Santé Publique du Québec INSPO. 2011.

27. National Population Commission (NPC) [Nigeria] and ICF Macro. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria: NPC and ICF Macro. 2018.

28. Ho TS, Huang MC, Wang SM, Hsu HC, Liu CC. Knowledge, attitude, and practices related to dengue in rural and slum areas of Delhi after the dengue epidemic of 1996. J Commun Dis 1998;30:107-12.

29. Gupta P, Kumar P, Aggarwal OP. Knowledge, attitude and practices related to dengue in rural and slum areas of Delhi after the dengue epidemic of 1996. J Commun Dis 1998;30:107-12.

30. Pradeep C, Achuth KS, Manjula S. Awareness and practice towards dengue fever in Kannamangala village, Bangalore, Karnataka, India. Int J Community Med Public Health 2016;3:1847-50.

31. Kumar AV, Rajendran R, Manavalan R, Tewari SC, Arunachalam N, Ayanar K, et al. Studies on community knowledge and behavior following a dengue epidemic in Chennai city, Tamil Nadu, India. Trop Biomed 2018;25:330-6.

32. Dhimal M, Aryal KK, Dhimal ML, Gautam I, Singh SP, Bhusal CL, et al. Knowledge, Attitude and practice regarding dengue fever among the healthy population of highland and lowland communities in Central Nepal. PLoS One 2014;9:e102028.

33. Shuaib F, Todd D, Campbell-Stennett D, Ehiri J, Jolly PE. Knowledge, attitudes and practices regarding dengue infection in Westmoreland, Jamaica West Indian Med J 2010;59:139-46.

34. Badar S, Yasmeen S, Hussain W, Amjad MA. Dengue fever: Knowledge and practices of preventive measures among students of Bahawalpur city, Pakistan. Professional Med J 2014;21:106-10.

35. Jogand SK, Yerpude NP. The community knowledge and practices regarding dengue fever in an urban area of south India. Peoples J Sci Res 2013;6:13-5.

36. Alhoot MA, Baobaib MF, Al-Maleki AR, Abdelqader MA, Paran LR, Kannah B, et al. Knowledge, attitude, and practice towards dengue fever among patients in hospital Taiping. Malaysian J Public Health Med 2017;17:66-75.

37. Al-Dubai S, Ganasegeran K, Mohanad Rahman A, Alshagga MA, Saif-Ali R. Factors affecting dengue fever knowledge, attitudes and practices among selected urban, semi-urban and rural communities in Malaysia. Southeast Asian J Trop Med Public Health 2013;44:37-49.

38. Van Rozita W, Yap B, Veronica S, Mohammad A, Lim K. Knowledge, attitude and practice (KAP) survey on dengue fever in an urban Malay residential area in Kuala Lumpur. Malaysian J Public Health Med 2006;6:62-7.

39. Nguyen NM, Whitehorn JS, Luong Thi Hue T, Nguyen Thanh T, Mai Xuan T, Vo Xuan H, et al. Physicians, primary caregivers and topical repellent: All under-utilised resources in stopping dengue virus transmission in affected households. PLoS Negl Trop Dis 2016;10:e0004667.

40. Van Benthem BH, Khantikul N, Panart K, Kessels PJ, Soomboon P, Oskaam L. Knowledge and use of prevention measures related to dengue in northern Thailand. Trop Med Int Health 2002;7:993–1000.

41. Acharya A, Goswami K, Srinath S, Goswami A. Awareness about dengue syndrome and related preventive practices amongst residents of an urban resettlement colony of south Delhi. J Vector Borne Dis 2005;42:122-7.

42. Uma Deavi A, Gan Chong Y, Ooi Guat S. A knowledge attitude and practice (KAP) study on dengue/dengue haemorrhagic fever and the Aedes mosquitoes. Med J Malaysia 1986;41:108–15.

43. Gupta P, Kumar P, Aggarwal OP. Knowledge, attitude and practices related to dengue in rural and slum areas of Delhi after the dengue epidemic of 1996. J Commun Dis 1998;30:107–12.

44. Mayxay M, Cui W, Themamvong S, Khansakhok K, Vongsavanh V, Inthasoum L, et al. Dengue in peri-urban Pak-Ngum district, Vientiane capital of Laos: A community survey on knowledge, attitudes and practices. BMC Public Health 2013;13:434.

45. Leong TK. Knowledge, attitude and practice on dengue among rural communities in Rembau and Bukit Pelanduk, Negeri Sembilan, Malaysia. Int J Trop Dis Health 2014;6:179-84.

46. Talarico L, Pujol C, Zibetti R, Faría PC, Noseda MD, Duarte ME, et al. Determinants of practices for dengue diagnosis among healthcare professionals working in public hospitals of Abidjan, Cote d’Ivoire. Journal of Public Health and Epidemiology 2017;9:212-8.

47. Abdullah MN, Azib W, Harun MF, Burhanuddin MA. Determinants of practices for dengue diagnosis among healthcare professionals working in public hospitals of Abidjan, Cote d’Ivoire. Journal of Public Health and Epidemiology 2017;9:212-8.