Original Article

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 Oche[1,2], Musa Yahaya[1], Remi Abiola Oladigbolu[2], Jessica Timane Ango[2], Christina Nneka Okafoagu[2], Zainab Ezenwoko[2], Adamu Ijapa[2], Abdulaziz Muhammad Danmadami[2]

[1]Department of Community Health, Usmanu Danfodiyo University Sokoto, [2]Department 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 atdetermining 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.[1] It is a mosquito-borne viral infection caused by one of the four serotypes of the dengue virus.[2] The disease is prevalent in the tropical and subtropical regions of the world.[2-4] 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

Address for correspondence: Prof. Oche Mansur Oche,
Department of Community Health, Usmanu Danfodiyo University,
Sokoto, Nigeria.
E-mail: ochedr@hotmail.com

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another region with notable cases,[1] and currently, the disease is endemic in 128 countries.[9-11] Yearly, about 390 million new infection cases are estimated to occur,[12] more than estimated by the WHO.[9]

Aedes aegypti and *Aedes aldopicus* 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.[1]

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,[16] 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

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	35.1±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 (70.9)
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)
ªOthers	55 (14.3)
Total	357 (100)

ªOthers-Tiv, Zuru, Kabba, Edo

Table 2: Knowledge of HCWs Regarding Dengue Fever	
Knowledge of causes, spread, and symptoms of dengue fever Variables	Frequency
Ever heard of dengue fever	
Yes	347 (95.1)
No	18 (4.9)
Source of information regarding DF	
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 (2.3)
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...

Table 2: Contd...	
Knowledge of causes, spread, and symptoms of dengue fever Variables	Frequency
Graded knowledge on causes, spread, and symptoms	
Inadequate knowledge (<60%)	36 (10.0)
Adequate knowledge (≥60%)	325 (90.0)

*Multiple responses

and Ethics committee of the Usmanu 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 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)

Contd...

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)

disease who had no warning signs should be hospitalized and that antibacterial 123 (36.5%) and antiviral drugs 148 (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>
<tr><td colspan="2">Table 4: Knowledge of HCWs on the Treatment of Dengue Fever</td></tr>
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Variables	Frequency
Patients with dengue fever without warning signs should be hospitalized	
Yes	116 (34.0)
No	225 (66.0)
Patients with dengue without warning signs but with other existing diseases should be hospitalized	
Yes	306 (89.7)
No	35 (10.3)
Patients with dengue fever with warning signs should be hospitalized	
Yes	328 (95.3)
No	16 (4.7)
Patients with severe dengue should be hospitalized	
Yes	335 (97.7)
No	8 (2.3)
Intravenous fluids hydration should be given to patients suspected to have dengue fever	
Yes	310 (90.9)
No	31 (9.1)
Paracetamol should be given to patients suspected to have dengue fever	
Yes	254 (75.1)
No	84 (24.9)
Antibacterial drugs should be given to patients suspected to have dengue fever	
Yes	123 (36.5)
No	214 (63.5)
Antiviral drugs should be given to patients suspected to have dengue fever	
Yes	148 (44.3)
No	186 (55.7)
Overall graded knowledge of HCWs	
Inadequate knowledge (<60%)	44 (12.2)
Adequate knowledge (≥60%)	318 (87.8)

<table>
<tr><td colspan="4">Table 5: Correlates of Overall Graded Knowledge of HCWs Regarding Dengue Fever</td></tr>
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Variables	Overall graded knowledge		Test statistics, P
	Inadequate (<60%) Frequency (%)	Adequate (≥60%) Frequency (%)	
Age (years)			
<34	23 (54.8)	147 (48.7)	$\chi^2=0.55$
≥34	19 (45.2)	155 (51.3)	$P=0.51$
Gender			
Female	19 (44.2)	123 (38.8)	$\chi^2=0.46$
Male	24 (55.8)	194 (61.2)	$P=0.51$
Religion			
None	0 (0.0)	2 (0.6)	$\chi^2=1.26$
Christian	13 (30.2)	99 (31.6)	$P=0.74$
Islam	28 (65.1)	205 (65.5)	
Others	2 (4.7)	7 (2.2)	
Marital status			
Unmarried	11 (26.8)	89 (29.3)	$\chi^2=0.105$
Married	30 (73.2)	215 (70.7)	$P=0.855$
Years of experience			
<10	28 (77.8)	154 (55.0)	$\chi^2=6.78$
≥10	8 (22.2)	126 (45.0)	$P=0.011*$

*$P<0.05$

Figure 1: Cadre of Health-care Workers

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 ($c^2=5.82, P=0.018$). 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.[12,23] 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 the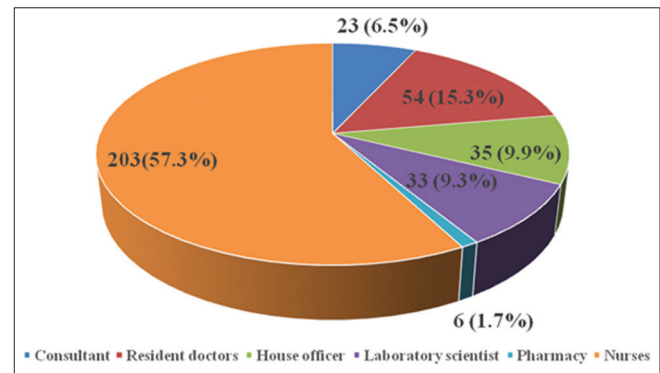refore of paramount importance. Our study investigated the knowledge, attitude, and practice of DF among HCWs in Sokoto. As shown in the data, and similar to another study carried out in Abidjan, Cote de'Ivoire,[24] more than half (54.8%) of the respondents were below 35 years of age, the active period 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.*;[21] however, similar studies conducted in Tanzania and Quebec, Canada, showed female preponderance.[25,26] Our study's male dominance may not be unconnected with the low female school enrollment and our study area's sociocultural milieu.[27] Similar to another study elsewhere,[24] 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.[26,28,29]

Our study's findings showed that less than half (42%) of the study subjects had more than 10 years of working experience as health

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)
Graded attitude of HCWs	
Positive attitude (≥60%)	330 (93.2)
Negative attitude (<60%)	24 (6.8)

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)	$P=0.83$

*$P<0.05$

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] The high level of awareness amongst our study subjects compared with the other studies may not be unconnected with the fact that our study was amongst HCWs while the other studies were in the general population with varying levels of awareness as observed in the findings.

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]

The study revealed that most of the respondents had good knowledge of causes, spread, and DF symptoms with a score of 75% and above. This is not unexpected considering the background of the study subjects and the fact that working in a tertiary health and training institution exposes them to continuing medical education in the form of seminars and clinical meetings. However, lesser knowledge scores were reported among health workers in Tanzania and residents of Westmoreland, Jamaica.[25,33] In contrast to our findings, higher scores were reported from Pakistan and India.[34,35] On the knowledge of the HCWs on prevention and vector characteristics, more than 80% were quite knowledgeable; however, more than half (55.2%) of the respondents knew that the vector bites during the daytime. This is higher than the findings from the study of Kajeguka and his

Table 8: The practice of HCWs Regarding Dengue Fever

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

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

Variables	Overall Graded Practice		Test statistics
	Inappr. (<60%) Frequency (%)	Appr. (≥ 60%) Frequency (%)	P
Age (years)			
<34	41 (51.9)	125 (49.0)	χ^2=0.20
≥34	38 (48.1)	130 (51.0)	P=0.70
Gender			
Female	36 (43.9)	104 (39.0)	χ^2=0.64
Male	46 (56.1)	163 (61.0)	P=0.44
Religion			
None	0 (0.0)	2 (0.8)	χ^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)	χ^2=0.07
Married	53 (69.7)	184 (71.3)	P=0.78
Years of experience			
<10	48 (70.6)	129 (54.2)	χ^2=5.82
≥10	20 (29.4)	109 (45.8)	P=0.018*

*P<0.05

colleagues in Tanzania,[25] where only 26.3% of the participants knew that the mosquitoes that transmit DF are daytime biters. Similarly, other studies observed good knowledge of the transmission by *Aedes* mosquitoes.[36-38]

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.[39]

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[40] and other studies with low knowledge levels from India, Pakistan, Thailand, and Jamaica.[32,33,40-44]

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.[33,40,40,45] 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.[33] 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.[24]

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 10: Knowledge, Attitude, and Practice of HCWs and Their Cadre						
Dependent variables	Consultant	Resident doctor	House officer	Laboratory scientist	Pharmacy	Nurses	*P*
Overall knowledge	80.20±20.13	75.46±13.65	76.74±9.52	62.50±18.06	81.67±9.54	78.91±15.93	0.000**
Attitude	77.86±24.08	82.27±13.37	81.33±12.76	75.20±15.91	71.88±16.09	83.91±14.90	0.025*
Practice	67.19±24.17	69.76±21.28	67.53±19.63	71.21±20.41	69.09±23.71	77.67±21.29	0.016*

**P<0.001; *P<0.05. One-way ANOVA: Analysis of variance

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.

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Conflicts of interest

There are no conflicts of interest.

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