

Preparedness toward COVID-19 pandemics and associated factors among health care workers in Dire Dawa Hospitals, Eastern Ethiopia: A facility-based cross-sectional study

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Abstract

Introduction: Health care workers are at the frontline of the response against the COVID-19 outbreak. Poor preparedness and infection prevention practices among health care workers compound the hazard and occurrence of COVID-19 hospital transmission. Thus, the study aimed to assess preparedness toward COVID-19 pandemics and associated factors among health care workers in Hospitals of Eastern Ethiopia.

Methods: Facility-based cross-sectional study was conducted from 20 June to July 10 2020. A simple random sampling technique was used to select 423 health care workers. Data were collected using a structured self-administered questionnaire and analyzed using SPSS Version 23. Bivariate and multivariable logistic regression was conducted to identify factors associated with the outcome variable, and statistical significance was declared at a *p*-value less than 0.05.

Results: This study revealed that the proportion of health care workers' preparedness toward the COVID-19 pandemic was 40.9% (95% CI: 36.2–45.9). Working in a public hospital (AOR = 2.7, 95% CI: 1.6–4.3), being unafraid of transmitting COVID-19 to patients (Adjusted odds ratio/AOR = 4.6, 95% CI: 2.2–10.0), feeling safe at the workplace (AOR = 3.3, 95% CI: 1.7–6.4), satisfied with the infection control policy (AOR = 6.0, 95% CI: 2.3–15.0), and not feeling anxious about the likelihood of COVID-19 spread (AOR = 2.1, 95% CI: 1.3–3.4) were significantly associated with COVID-19 preparedness.

Conclusion: The majority of the health care workers were not prepared for COVID-19 pandemics. Feeling safe at the workplace scared of transmitting COVID-19 to patients, satisfied with the infection control policy, and feeling anxious concerning the likelihood of COVID-19 were factors associated with health care workers' preparedness to COVID-19. The current awareness creation training, including motivational and psychological preparation for all health care workers, is mandatory, regardless of their profession or working place.

Keywords

Preparedness, health care works, COVID-19, Dire Dawa, Ethiopia

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Introduction

COVID-19 has first emerged as a group of mysterious cases of pneumonia in Wuhan, China^{1,2} and it was declared as a pandemic disease by World Health Organization (WHO) on 11 March 2020 after it was declared first as a public health emergency disease back in the start of March 2020.³

COVID-19, which has never been detected previously in humans, is capable of transmitting both from human-to-human and animal-to-human.¹⁻⁵ Even though the major route of transmission of the COVID-19 is through the respiratory route (sneezing and coughing), it can also be transmitted by touching already infected objects and surfaces, which indicates that the virus can live in many places.^{3,5,6}

The clinical features of COVID-19 range from asymptomatic to symptomatic by showing severe respiratory impairments.⁷⁻⁹ However, the most common symptom of the virus is mainly respiratory, including shortness of breath, cough, and fever,^{4,6-8,10} and the rare ones include the inability to smell and taste, diarrhea, muscle pain, headache, sore throat, and hemoptysis.⁹⁻¹¹

The COVID-19 pandemic has amplified the already existed problem of the world about the economic predicament, morbidity, and mortality.^{2,12,13} Globally, the last updated, from 3 October 2020, confirmed cases of COVID-19: 34,838,209, deaths: 1,033,356, and recovered: 25,898,926 were reported.^{2,12}

In Ethiopia, the first reported case of COVID-19 was from Addis Ababa on 31 March 2020 and currently there are 289,962 confirmed cases and 4489 deaths from COVID-19 pandemic.^{14,15} With the predominant upsetting problem of COVID-19, different kinds of measures were taken by countries around the globe to prevent its continuous worldwide spread, including complete lockdown, quarantine service for suspected persons, avoidance of crowding, and closing of transport and education services.^{16,17}

According to the Amnesty analysis, worldwide there were more than 17,000 health care workers (HCWs) have died because of this pandemic. According to Amnesty, as of figures compiled by Friday, at least 3507 HCWs died from COVID-19 in the United States, with the number of 3371 in Mexico, 1143 in Brazil, 1131 in Russia, and 931 in the United Kingdom. Unsafe working conditions and a lack of personal protective equipment (PPE) have been some of the main issues faced by health workers worldwide throughout the pandemic, especially in the early phases.¹⁸

In Ethiopia, the total deaths due to nosocomial infections (NIs) are estimated to account for 691,000 individuals (30%).¹² This study aimed to fill the current information gap by assessing preparedness toward the COVID-19 pandemic and its factors affecting HCWs in Dire Dawa health facilities, Eastern Ethiopia. The questions that we have tried to answer to this study were as follows: To what extent do HCWs have prepared toward COVID-19 pandemics? And which predictors have a significant (major) effect on preparedness among frontline HCWs?

The findings from this study will be expected to provide manifold benefits to HCWs through awareness creation stressing on the consistent use of PPEs, how to protect them from other factors that contribute to a risk of getting a disease (nCoV-19). As this study is the first in Dire Dawa Administration, eastern part of Ethiopia that tried to identify the associated factors toward COVID-19 preparedness, by revealing major threats felt out by HCWs and availing such pertinent data, will be used by the government in its effort by designing cope up mechanisms to be delivered as means of encouragement for HCWs prevention and control of COVID-19 in the study area.

This study will have paramount importance to Dire Dawa Regional Health Bureau for better management of frontline HCWs, now and for the future. It will be used as a baseline to further research areas untouched.

Methods and materials

Study area and period

The study was conducted in Dire Dawa administration hospitals from 20 June 2020 to 10 July 2020. Dire Dawa is found 515 km east of Addis Ababa, the capital city of Ethiopia. According to 2020, population projection, Dire Dawa has a total population of 466,000 of which females account for 51.6%. There are 9 urban and 38 rural kebeles. There are 2 public hospitals, 15 health centers (HCs), 16 private clinics, and 4 private hospitals. As of October 2020, the Dire Dawa Regional Laboratory has performed the COVID-19 test for a total of 22,110 suspected cases, of these 2133 were confirmed cases, 70 active cases were found, 28 death recorded, and 2063 were recovered including HCWs.

Study design and populations

A facility-based cross-sectional study was employed among HCWs working in Dire Dawa Hospitals. All health professionals working at public and private health institutions in Dire Dawa city during the data collection period were included in the study while part-time health professional workers were excluded.

Sample size determination and sampling procedure

The sample size was determined using a single population proportion formula $(Z\alpha/2)^2 pq/d^2$ based on the following assumptions: 95% confidence level, P (50%) proportion of preparedness as there is no previous study conducted, 5% of margin of error; and adding 10% for non-response rate gives the final sample size of 423.

The two public and four private hospitals were selected purposively. The study participants were then allocated to the six hospitals proportionally according to their number of

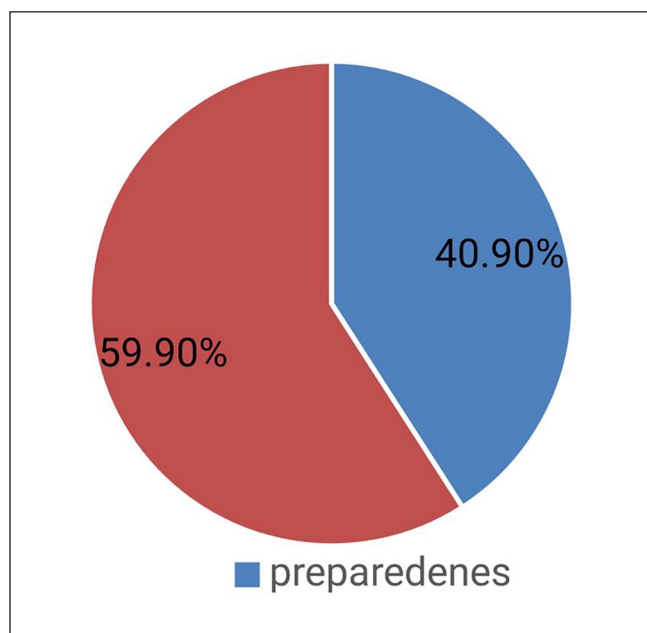


Figure 1. Magnitude of preparedness toward COVID-19 among frontline HCWs working in public and private hospitals of Dire Dawa, Eastern Ethiopia, 2020 ($n=423$).

health care professionals (Figure 1). The study subjects were selected using a simple random sampling technique.

Variables

Dependent variable: Preparedness of HCWs toward COVID-19

Independent variables:

- **Socio-demography:** professions/ job category, age, education level, sex, place of work, monthly income, and service year/work experience.
- **Behavioral and safety practices:** COVID-19 transmission awareness, job satisfaction, consistent PPE use, adherence to safety guidelines, and precaution.
- **Organizational environment:** training, working hours/week, the presence of safety and work guidelines, and presence and accessibility of PPE, working department.

Operational definitions

Preparedness: The state of being prepared or state of being ready for something to do happen.

Prepared: Those participants who gave a correct answer for all preparedness measuring questions.

Unprepared: Those participants who missed at least one preparedness measuring question.

Data collection tools and procedures

Data were collected using a structured and pre-tested self-administered questionnaire which was adopted from WHO.¹⁹ This questionnaire provides detailed information on socio-demographic, behavioral, and organizational variables useful for this study. Five data collectors and supervisors were assigned as interviewer and supervision, respectively. Background information and exposure status useful for the study were asked and collected in a form of a questionnaire.

Data quality control

To ensure the quality of the data, intensive training was given to all supervisors and data collectors. The data collection process was undertaken with frequent monitoring and supervision. The completeness and consistency of the data were monitored daily. Before the actual data collection period, 5% of the questionnaire was pre-tested and modified accordingly. Finally, double data entry was done to check the consistency of the data and minimize the entry errors.

Statistical analysis

First, data were entered into Epi Data Version 3.1 and exported to SPSS Version 23 for analysis. Descriptive statistics, binary, and multivariable logistic regression analysis were conducted to identify the association between the outcome and independent variables. All variables with a p -value less than or equal to 0.25 were taken into the multivariable model to control for all possible confounders. Those variables which were candidates for multivariable regression model were satisfied with the infection control policy (ICP): those are feel anxious, working department, current workplace, feel safe, and afraid of transmission, and also these variables were significant in the final model. Hosmer–Lemeshow and Omnibus tests were done for model fitness. Multicollinearity was checked to see the linear correlation among the independent variables using variance inflation factor and standard error. Variables with variance inflation factor > 10 and standard error of > 2 were dropped from the multivariable analysis. The adjusted odds ratio (AOR) with the corresponding 95% confidence interval (CI) was calculated to see the strength of the association, and a p -value of less than 0.05 was declared to be statistically significant.

Results

Socio-demographic characteristics

All 423 HCW were enrolled in the study giving a response rate of 100%. The respondents' mean age was 35.9 (± 7.9 SD) years with a majority (53.4%) of the respondents were females while 234 (55.3%) of them were working in private hospitals. Regarding the working department, 94 (22.2%) of them were working in a medical unit (Table 1).

Table 1. Socio-demographic characteristics of HCWs in public and private hospitals of Dire Dawa, Eastern Ethiopia, 2020 (n=423).

Variables	Frequency (n)	%
Age (years)		
<20	2	0.5
20–34	197	46.6
35–49	190	44.9
>50	34	8.0
Sex		
Male	197	46.6
Female	226	53.4
Profession		
Medical doctor	66	15.6
Health officer	85	20.1
Nurse	108	25.5
Pharmacist	67	15.8
Laboratory personnel	54	12.8
Midwives	43	10.2
Current workplace		
Public hospital	189	44.7
Private hospital	234	55.3
Working department/unit		
Emergency	57	13.5
Medical unit	94	22.2
Intensive care unit	87	20.6
Laboratory	67	15.8
Pharmacy	65	15.4
Other, specify	53	12.5

Knowledge about the virus, adherence to safety measures, and institutional protocol

When we see a safe source of information about COVID-19, 225 (53.2%) of the participants have got the information from social media. Regarding HCWs awareness on the route of COVID-19 transmission majority, 239 (56.5%) of them responded airborne while 86 (20.3%) of them responded through contact. Concerning the potential methods for prevention of transmission COVID-19, 210 (49.6%) of the participants responded by hand hygiene while 61 (14.4%) of the participants by avoiding the crowded area. Among all the respondents, 240 (56.7%) of the respondents always wear all PPE during the provision of health care to a COVID-19 patient, while the majority 365 (86.3%) of the respondents said PPE is always available at their institution (Table 2).

Psychological interaction

From the total of 423 participants, the majority, 278 (65.7%) of the respondents were feeling safe at their workplace with the existing safety precautions, whereas 293 (69.3%) of the respondents were afraid as they feel they could transmit the

COVID-19 to their families, and the majority 286 (67.6%) of the respondents do not feel that infection prevention practice that exists at their hospital/clinic will decrease the risk of contracting COVID-19 for themselves and their colleagues (Table 3).

Activities are done by HCW for patients with COVID-19

From the total participants, majority, 292 (69%) of them gave direct patient care and 407 (96.2%) of them had face-to-face contact (in the range of 1 m) with patients with COVID-19. Besides, 233 (55.1%) of the respondents had no incidental contact with respiratory/body fluid secretions while giving care to COVID-19 patients (Table 4).

Preparedness of HCW toward COVID-19 pandemic

This study revealed that only 173 (40.9%) participants had prepared for COVID-19, but the majority of 250 (59.1%) HCWs responded unprepared to COVID-19 pandemic (Figure 1).

Factors affecting preparedness of HCW toward COVID-19

The binary and multivariable logistic regression analyses showed that hospital type, feeling safe at the workplace with the existing safety measures, being afraid of transmitting the COVID-19 to patients, satisfied with the ICP at their institution, and feeling anxious concerning the likelihood of COVID-19 spread were found to be significantly associated with the preparedness of frontline HCW.

Those HCW working in public hospitals were almost three times more likely to be prepared for COVID-19 than those working in private hospitals (AOR=2.7, 95% CI: 1.6–4.3).

Those HCWs, who were feeling safe at their workplace with the existing safety measures, were 3.3 times more likely to be prepared to COVID-19 than those who were not (AOR=3.3, 95% CI: 1.7–6.4). Whereas, those HCWs, who were not scared of transmitting COVID-19 to patients, were 4.6 times more prepared than their counterparts (AOR=4.6, 95% CI: 2.2–10.0).

HCWs, who were satisfied with the ICP at their institution, were six times more likely to be prepared for COVID-19 than their counterparts (AOR=6.0, 95% CI: 2.3–15.0). In addition, those HCWs, who were not feeling anxious concerning the likelihood of COVID-19 spread, were two times more likely to be prepared to COVID-19 than those who were anxious (AOR=2.1, 95% CI: 1.3–3.4) (Table 5).

Table 2. Knowledge about the virus, adherence to safety measure, and institutional protocol of frontline HCWs in public and private hospitals in Dire Dawa, Eastern Ethiopia, 2020 (n=423).

Variables	Frequency (n)	%
Route of COVID-19 transmission		
Airborne	239	56.5
Droplets	98	23.2
Contact	86	20.3
Potential approaches thought to help prevent transmission of COVID-19		
Hand hygiene	210	49.6
Covering nose and mouth while coughing	61	14.4
Avoiding sick contacts	91	21.5
Avoiding crowded places	61	14.4
Considerations after dealing with suspected patient		
Remove all your PPE	134	31.7
Get rid of disposable equipment	47	11.1
Clean other equipment with clean wipes	166	39.2
Rubbish should be double-bagged	76	18.0
PPE for approaching a patient with suspected COVID-19 infection		
N95 mask	127	30
Double gloves	164	38.8
Gowns	79	18.7
Visor (goggles)	53	12.5
Wear all PPE		
Always, as recommended	240	56.7
Most of the time	110	26.0
Occasionally	0	0
Rarely	73	17.3
Remove and replace your PPE according to the protocol		
Always, as recommended	246	58.2
Most of the time	132	31.2
Occasionally	45	10.6
Rarely	0	0
Perform hand hygiene before and after touching the COVID-19 patient		
Always, as recommended	246	58.2
Most of the time	112	26.5
Occasionally	0	0
Rarely	65	15.4
Perform hand hygiene before and after any clean or aseptic procedure was performed		
Always, as recommended	245	57.9
Most of the time	111	26.2
Occasionally	22	5.2
Rarely	45	10.6
Perform hand hygiene after exposure to body fluid		
Always, as recommended	246	58.2
Most of the time	132	31.2
Occasionally	45	10.6
Rarely	0	0
High touch surfaces decontaminated frequently (at least three times daily)		
Always, as recommended	130	30.7
Most of the time	78	18.4
Occasionally	159	37.6
Rarely	56	13.2
Performing aerosol-generating procedures		
Yes	83	19.6
No	340	80.4
PPE is always available at their institution		
Yes	365	86.3
No	58	13.7
Previously took care of a positive or suspected COVID-19 patient		
Yes	386	91.3
No	37	8.7

PPE: personal protective equipment.

Table 3. Psychological preparedness frontline HCW at public and private hospitals of Dire Dawa, Eastern Ethiopia ($n=423$).

Variables	Category	Frequency (n)	%
Feel safe at work with the current safety precautions	Yes	278	65.7
	No	145	34.3
Satisfied with the ICP at their institution	Yes	137	32.4
	No	286	67.6
Afraid of the transmission of COVID-19 to their families	Yes	293	69.3
	No	130	30.7
Feel anxious regarding the possibility of the spread of COVID-19	Yes	243	57.4
	No	180	42.6
Feel that current infection control practice at their institution	Yes	83	19.6
	No	340	80.4
Afraid of the transmission of COVID-19 to their patients	Yes	252	59.6
	No	171	40.4
Feel safe about their colleagues with the current safety precautions	Yes	34	8.0
	No	389	92.0

HCW: Health care worker.

Table 4. HCW activities performed on COVID-19 patients in public and private hospitals of Dire Dawa, Eastern Ethiopia, 2020 ($n=423$).

Variables	Frequency (n)	%
Direct care to a confirmed COVID-19 patient		
Yes	292	69
No	131	31
Face-to-face contact with a confirmed COVID-19 patient in a health care facility		
Yes	407	96.2
No	16	3.8
Direct contact with the environment where the confirmed COVID-19 patient has been cared		
Yes	253	59.8
No	170	40.2
Accident with body fluid/respiratory secretions		
Yes	190	44.9
No	233	55.1

HCW: Health care worker.

Discussion

In this study, we tried to assess the level of HCWs' preparedness and its associated factors toward COVID-19 pandemics in Eastern Ethiopia. Accordingly, it was found that only 40.9% (95% CI: 36.2–45.9) of HCWs have prepared for the COVID-19 pandemic. This study was almost similar with study conducted in North West of Ethiopia (41.3%).²⁰

In this study, we tried to look compared HCWs' preparedness between public and private health facilities and it was found that HCWs in the public hospital were 2.7 times prepared for COVID-19 than those who were working in private hospitals. This is contradict with the study conducted in Palestine where governmental hospitals were

significantly less likely to have all appropriate PPE than non-governmental institutions ($p=0.001$). The difference might be due to the lack of accesses of PPE equipment in Ethiopia to distribute for private health facilities. In addition, this could be because of the availability and accessibility of PPE and hygiene materials within public hospitals/HCs, as support from governmental and non-governmental organizations prioritize to private health facilities.²¹

This study also identified a significant association between HCW's preparedness and satisfaction with the infection prevention strategy at their hospital. Accordingly, those satisfied HCWs were 6.0 times more likely to be prepared to COVID-19 than those who were not. This finding is congruent with a similar study conducted in Ethiopia.²² This could satisfy health professionals to have a good psychological and physical readiness to combat COVID-19 infection.

A previous study that was done in Jordan, 2020²¹ showed a significant association between HCW's preparedness and is not anxiety about the likelihood of COVID-19 spread and the shooting up of cases, and this was in line with the current study finding where HCWs, who were unanxious about the spread of COVID-19 and surge of positive cases, were 2.1 times more likely to be prepared to COVID-19 (95% CI: 1.3–3.4) when compared to their counterpart.

In this study, those HCWs, who were unafraid of transmitting COVID-19 to patients, were 4.6 times more likely to be prepared to COVID-19 than those who were scared. This finding could indirectly suggest a difference in self-assurance developed in advance among HCWs which has to do with confidence while doing their routines, either learned or gained knowledge and experiences; this means that unprepared HCWs are scared to transmit their patients. This finding was inconsistent with the studies done in African countries.²³ The difference might be personal belief/thinking that means scared to transmit disease.

Table 5. Factors associated with preparedness toward COVID-19 among frontline HCWs working in public and private hospitals of Dire Dawa, Eastern Ethiopia, 2020 (n = 423).

Variables	Preparedness for COVID-19		COR (95% CI)	AOR (95% CI)	p-value
	Yes, no (%)	No, no (%)			
Current workplace					
Public hospital	101 (23.8)	88 (20.8)	2.5 (1.7–3.8)	2.7 (1.6–4.3)	<0.001*
Private hospital	72 (17)	162 (38.3)	1	1	
Feel safe at work with the current safety precautions					
Yes	131 (30.9)	147 (34.8)	2.1 (1.4–3.3)	3.3 (1.7–6.4)	<0.001*
No	42 (10)	103 (24.3)	1	1	
Afraid of the transmission of COVID-19 to their patients					
Yes	123 (29)	129 (30.5)	1	1	
No	50 (11.8)	121 (28.7)	2.3 (1.5–3.4)	4.6 (2.2–10.0)	<0.001*
Satisfied with the ICP at their institution					
Yes	49 (11.5)	88 (20.8)	0.7 (0.47–1.1)	6 (2.3–15)	<0.001*
No	124 (29.2)	162 (38.4)	1	1	
Feel anxious regarding the possibility of the spread of COVID-19					
Yes	117 (27.6)	126 (29.8)			
No	56 (13.2)	124 (29.3)	2.0 (1.3–3.0)	2.1 (1.3–3.4)	0.001*
Working department					
Emergency	30 (7.0)	27 (6.4)	1	1	
Medical unit	53 (12.6)	41 (6.7)	0.86 (0.44–1.6)	1.1 (0.5–2.4)	0.72
Intensive care unit	34 (8.0)	53 (12.6)	1.7 (0.88–3.4)	2.0 (0.9–4.2)	0.07
Laboratory	16 (3.8)	51 (12.0)	3.5 (1.6–7.6)	3.6 (1.5–8.4)	0.003*
Pharmacy	15 (3.6)	50 (11.8)	3.7 (1.7–8.0)	4.5 (1.9–10.7)	<0.001*
Others	25 (5.8)	28 (6.6)	1.2 (0.5–2.6)	1.6 (0.7–3.8)	0.2

HCW: health care worker; ICP: infection control policy; AOR: adjusted odds ratio; COR: crude odds ratio. The interpretation of each factor was explained by keeping the others constant.

*Significant association at $p < 0.05$.

In the current study, a sense of safety or security/ feeling safe at their workplace with the existing safety measures showed significant association with preparedness toward COVID-19. Accordingly, HCWs having a sense of safety or feeling of security were 3.3 times more likely to prepare than those who do not feel safe. The possible reason for the observed association could be the positive impression of HCWs possesses on their work environment, intellectual perception, or conscious awareness. In action to this, those HCWs, who feel safe at the workplace, could have enough confidence about their preparedness compared to their counterparts. This finding is supported by the study conducted in India.¹³

Although feeling safe about their colleagues with the existing safety measures, concerned about dealing with COVID-19 patients and age was previously reported to have a significant effect on preparedness to COVID-19,^{24,25} none of them showed such effect in our study.^{24,25}

Since the study was cross-sectional, it did not establish a possible temporal relationship. Also, the scarcity of similar studies makes it difficult to compare our findings with other findings. Finally, our search strategy found limited studies, especially no studies from our country.

Conclusion

Only two-fifths of HCWs were prepared for COVID-19 pandemic. Working in public hospitals, having a sense of safety or security/ at the workplace with the existing safety measures, being unafraid transmitting the COVID-19 to patients, satisfaction with the ICP at their institution, and being unafraid about the likelihood of COVID-19 spread were found to be positively associated with the preparedness of frontline HCWs. Therefore, intensive training focused on the emotional and psychological preparation of HCWs should be given regardless of their profession or working place. Moreover, stakeholders should work hard to increase HCWs' preparedness in both private and public health facilities through regular inspection, supervision, and provision of PPE. We strongly recommend that intensive work should be done to create a safe and conducive work environment in emergency units for both private and public health facilities.

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Author Contributions

T.M., A.F.A., and Y.M. conceived the review topic and objectives; T.M., Y.S., R.M., M.K., and B.Y. participated in the study selection, data extraction, and analysis; T.M., Y.S., A.S., and Y.M. reviewed the article critically for its scientific content; all authors reviewed and approved the article.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics approval and consent to participate

Ethical clearance was obtained from the Research and Technology Interchange (RTI) of Dire Dawa University with Ref No: DDU/RTI/1912/2020. Following approval, a written official letter of cooperation was distributed to each health facilities. Informed written consent was obtained from all subjects before the study. Confidentiality was assured throughout the process. The names and addresses of the participants were not recorded in the questionnaire. Furthermore, all the basic principles of human research ethics (respect of persons, beneficence, voluntary participation, confidentiality, and justice) were respected.

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Informed consent

Informed written consent was obtained from all subjects before the study. Confidentiality was assured throughout the process.

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Data availability

All related data have been presented within the article. The dataset supporting the conclusions of this article is available from the corresponding author upon reasonable request.

Supplemental material

Supplemental material for this article is available online.

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