



Research

Healthcare workers' perceptions of COVID-19 in four regions of Tanzania: A quantitative cross-sectional survey in healthcare facilities

^{1,2}Magwe EA, ²Varisanga MD, ³Ng'weshemi SK.

¹Department of Pharmaceutical Sciences, Institute of Health and Allied Sciences, Ruaha Catholic University, P.O. Box 774 Iringa, Tanzania.

²Department of Biological and Food Sciences, Faculty of Science, Technology and Environmental Studies, The Open University of Tanzania, P.O. Box 23409 Dar es Salaam, Tanzania.

³Department of Community Medicine, School of Medicine and Dentistry, University of Dodoma, P.O. Box 854 Dodoma, Tanzania.

Corresponding author: Edward Augustine Magwe, Department of Pharmaceutical Sciences, Institute of Health and Allied Sciences, Ruaha Catholic University, P.O. Box 774 Iringa, Tanzania; edwardam87@gmail.com; +255765836904

Article history: Received 01 May 2023, Reviewed 22 June 2023, Accepted for publication 27 June 2023

This is an open access journal and articles are distributed under the terms of the Creative Commons Attribution License (Attribution, Non-Commercial, No Derivatives" 4.0) - (CC BY-NC-ND 4.0) that allows others to share the work with an acknowledgement of the work's authorship and initial publication in this journal.

How to cite this article:

Magwe EA, Varisanga MD, Ng'weshemi SK. Healthcare workers' perceptions of COVID-19 in four regions of Tanzania: A quantitative cross-sectional survey in healthcare facilities. The Nigerian Health Journal 2023; 23(2):666-677

Abstract

Background: On 16 March 2020, the first COVID-19 case was reported from Mount Meru Hospital in Arusha region, a public hospital in northern Tanzania. Tanzanian Government ordered the closure of all schools and universities the next day, as well as the prohibition of all public gatherings except churches and mosques. This study was conducted to assess level of COVID-19 perception among healthcare workers in selected regions of Tanzania in order to strengthen healthcare system.

Methods: A quantitative analytical cross-sectional survey design was conducted from 24th of August to 3rd October involving 596 healthcare workers from Dar es Salaam, Mwanza, Arusha and Dodoma regions. Statistical Package for the Social Sciences (SPSS) 26 version was used to analyze collected data giving frequencies and percentages for categorical variables. Association between categorical variables were analyzed by using Chi-square and significant relationship observed at P-value < 0.05.

Results: Healthcare workers in the study areas had an average of 79.9% of positive perception which is moderate. About 63%, 30%, and 7% of healthcare workers holding good, moderate, and low levels of perception respectively. Four predictors (sex, field profession, level of education and region) had significant relationship with level of perception, all had P-value (P < 0.05).

Conclusion: Most of participants showed positive perception on believing that it is necessary to have regular training related to epidemics even when they do not exist and that, society can facilitate the eradication of COVID-19.

Keywords: Perception, Healthcare facilities, Healthcare workers, COVID-19, Tanzania

Introduction

Along with a good recent progress of development and implementation of vaccine for Coronavirus Disease 2019 (COVID-19), Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the virus that causes COVID-19 still remains a major threat worldwide in

healthcare system.^{1,2} By March 16, 2021, the virus had spread worldwide, about 120,164,106 million confirmed cases were recorded and 2,660,422 deaths.³ Hospital staff including doctors, nurses, laboratory personnel, pharmaceutical personnel and administrative staff became the frontline in the diagnosis, screening and



treatment of COVID-19 patients which facilitated high risk exposure to the virus among healthcare workers. Such kind of exposure is an outcome of working in close contact with patients, for a long time and more frequently compared to their normal schedule before the pandemic.⁴⁻⁶

Previous studies reported that, healthcare workers perceived high risk of exposure to COVID-19.^{7,8} Furthermore, they perceived that they are at higher risk to COVID-19 exposure compared to their family members. That is to say that healthcare workers are more afraid of their families than themselves. In addition, healthcare workers revealed that the spread of COVID-19 has a significant relationship with their everyday workload.⁶ High risk perception among healthcare workers to Corona virus can significantly associated with pandemic response strategies and provision of resources to protect them among their countries.⁹ In adherence to the recommended preventive measures, individual risk perception should be one of the major factors to be in place for consideration.^{10,11,12} The effectiveness of controlling disease outbreak will mainly depend on community response and adherence of the recommended preventive measures.^{9,13} Lack of adequate understanding and perception of the disease among healthcare workers may cause a delay in identifying, handling the disease and its treatment, then accelerate rapid increase of the infection. Tanzania's COVID-19 response was disturbing, in the early months of the pandemic, between February and April 2020, the Tanzanian Government quickly implemented various measures recommended by World Health Organization (WHO), and by February 27, 2021, about 15 guidelines were in place from the Tanzanian Ministry of Health.^{14,15} On 16 March 2020, the first COVID-19 case was reported from Mount Meru Hospital in Arusha, a public hospital in northern Tanzania. Tanzanian Government ordered the closure of all schools and universities the next day, as well as the prohibition of all public gatherings except churches and mosques. On the other hand, Tanzania stopped publishing COVID-19 data by April 2020. About 509 positive cases, 21 deaths, and 183 recoveries were already reported.¹⁴

Dar-es-salaam region was leading in number of infected cases, followed by Mwanza, Arusha, and Dodoma regions.¹⁶ Keeping in view the severity of the outbreak and the importance of healthcare professionals working with scarce resources to combat COVID-19, it was pertinent to evaluate their perception. Therefore, researching in this area in regions of Dar es Salaam, Dodoma, Mwanza and Arusha where COVID-19

transmission grew higher compared to other regions in the country, will add value to the existing level of perception, strengthen healthcare policy and good utilization of available but limited resources. According to this current cross-sectional study which conducted from August 24, 2022 to October 3, 2022 a significant number of healthcare workers had good and moderate perceptions of COVID-19, all holding an average of moderate perception.

Methods

Study area

This study was conducted in Dar es Salaam, Arusha, Dodoma, and Mwanza regions which are respectively located in Eastern, Northern, Central and Lake zone in Tanzania. Ilala, Arusha urban, Nyamangana and Dodoma urban districts were respectively selected to represent Dar es Salaam, Arusha, Mwanza, and Dodoma regions due to their potential and high prevalence of COVID-19.¹⁶ This study involved 40 healthcare facilities, each region involved 10 healthcare facilities including 2 hospitals, 4 health centers and 4 dispensaries except Nyamagana district which represented Mwanza region had only 3 health centers (limited number), therefore 1 health center was replaced by 1 dispensary and making number of dispensaries to be 5, 3 health center, and 2 hospitals.

Study design and population

A quantitative analytical cross-sectional survey design was conducted from 24th of August to 3rd October, 2022. This study involved healthcare workers including nurses, clinician (doctors), pharmaceutical personnel, laboratory personnel and other health support staff from selected public hospitals, health centers and dispensaries. Only government owned health facilities were involved, private owned health facilities and student healthcare workers who were in short term field practices during data collection were not involved.

Sample size

According to Munga and Maestad¹⁷ in average, there are 1.4 healthcare workers per 1000 people in Tanzania. So, the ratio of 1.4 healthcare workers per 1000 people was used to estimate number of healthcare workers according to the number of populations in a particular area. Estimated population was calculated based on 35% growth rate from 2012 Tanzania's population and housing national census to 2022 as reported by Macrotrends¹⁸, except in Dodoma region which estimated 39.2% of growth rate caused by Governmental activities shifted from Dar es Salaam.¹⁹



Therefore, estimated population involved in Dar es Salaam, Arusha, Mwanza, and Dodoma regions are 1,647,825; 562,197; 490,660 and 572,050 people respectively by the year 2022. Estimated number of healthcare workers based on Munga and Maestad¹⁷ are 2,307 in Dar es salaam, 787 in Arusha, 686 in Mwanza and 777 in Dodoma regions. Then, Krejcie and Morgan's (1970) formula was used to calculate sample size based on number of healthcare workers in each region with 5% margin of error, 95% confidence level and response distribution of 86%.²⁰ Hence, a total of 596 healthcare workers were involved in this study from four regions of Tanzania, in which 172 estimated from Dar es Salaam, 138 from Arusha, 134 from Mwanza, and 152 from Dodoma regions.

Sampling procedure

Participants dedicated to care for only COVID-19 patients during the disease outbreaks and participants who were not dedicated to care for COVID-19 patients were all participated in this study. Therefore, the participants from the COVID-19 team were separated and among them the number of required participants were randomly selected, the participants who were not part of the COVID-19 team were also separated and randomly selected.

Data management

Self-administered questionnaires were used to collect primary data from healthcare workers. About 25 healthcare workers from two healthcare facilities in Dodoma city were involved in pilot study, Cronbach's alpha coefficient was used to measure reliability of data. Items testing >0.7 were regarded as reliable and those <0.7 were either modified or removed from the questionnaire. Statistical Package for the Social Sciences (SPSS) 26 version was used to analyze collected data from participants. Frequencies and percentages were analyzed for categorical variables. Association between categorical variables were analyzed by using Chi-square and significant relationship among variables observed at P -value <0.05 . Factors influencing level of perception among healthcare workers were analyzed by multinomial logistic regression with predictor variables, adjusted odds ratio (AOR), 95% Confidence Interval (CI) and P -values were computed, also significant relationship observed at $P < 0.05$.

Scoring and definitions of perception assessment

Bloom's cut-off point was modified and used to classify the overall level of perception among healthcare workers as follows, good perception ($\geq 80\%$ to 100%), moderate perception (60% to $<80\%$) and $<60\%$ classified as poor perception.²¹ All positive perception responses were used to grade level of COVID-19 perception among healthcare workers.

Ethical approval

The research clearance letter with reference number PG202001923 was approved by the Open University of Tanzania. Then permission to conduct research in healthcare facilities was given by the regional and district medical officers of the respective areas. Then, in the facility participants were asked to fill out a consent form to ensure their confidentiality, only participants who agreed to fill out the consent form participated in this study.

Results

Socio-demographic characteristics of participants

This study involved a total of 596 healthcare workers with demographic characteristics of sex, age in years, field profession, highest level of education achieved by participants, whether a participant was dedicated in the COVID-19 team to care for infected patients in healthcare facilities and service experience (years) in healthcare system. As described in **(Table 1)**, distribution of sex involved 329 (55.2%) female who contributed more compared to males 267 (44.8%); participants aged between 30-39 years were higher 212 (35.6%) than other age groups. Concerning field professional nurses were higher 184 (30.9%) than the rest categories. Regarding education level participants holding diploma level were highly involved about 256 (43.0%). Demographic characteristics related to healthcare facilities involved 307 (51.5%) participants from hospital, 185 (31.0%) from health center and 104 (17.4%) from dispensaries. Healthcare facilities that served outpatients and inpatients involved more participants 433 (72.7%) than that served only outpatients 163 (27.3%). Based on the situation of caring patients at healthcare facilities during the first wave of COVID-19, the majority of participants 341 (57.2%) were involved from healthcare facilities that served all patients and participants from Dar es salaam region were higher 172 (28.9%) compared to other regions.



Table 1. Socio-demographic characteristics of participants (N=596)

Predictor variables	Valid response	Number (%)
Sex	Male	267 (44.8)
	Female	329 (55.2)
Age in years	18 – 29	209 (35.1)
	30 – 39	212 (35.6)
	40 – 49	111 (18.6)
	50 and above	64 (10.7)
Field profession	Clinician (doctor)	157 (26.3)
	Nurse	184 (30.9)
	Pharmaceutical personnel	90 (15.1)
	Laboratory personnel	87 (14.6)
Highest level of education	Supportive staff	78 (13.1)
	Primary school	21 (3.5)
	Secondary school	42 (7.0)
	Certificate	109 (18.3)
	Diploma	256 (43.0)
Dedicated in COVID-19 team to care COVID-19 patients	Bachelor's degree	155 (26.0)
	Master's degree	13 (2.2)
	Yes	222 (37.2)
Service experience in years	No	357 (59.9)
	No dedicated team	17 (2.9)
	Less than 1	86 (14.4)
	1 – 5	203 (34.1)
	6 – 10	120 (20.1)
Region	11 – 15	73 (12.2)
	16 – 20	44 (7.4)
	Above 20	70 (11.7)
	Dar es salaam	172 (28.9)
	Mwanza	134 (22.5)
	Arusha	138 (23.2)
Category of healthcare facility	Dodoma	152 (25.5)
	Hospital	307 (51.5)
	Health center	185 (31.0)
Type of patients served at healthcare facility	Dispensary	104 (17.4)
	Outpatients only	163 (27.3)
Situation of caring COVID-19 patients in healthcare facilities	Outpatients and inpatients	433 (72.7)
	Cared COVID-19 patients only	93 (15.6)
	It served all patients	341 (57.2)
	It referred patients with COVID-19	162 (27.2)

Descriptive analysis of healthcare workers' perception level in combating COVID-19

This study found that 63%, 30%, and 7% of healthcare workers holding good, moderate, and low levels of perception respectively as shown in (Figure).

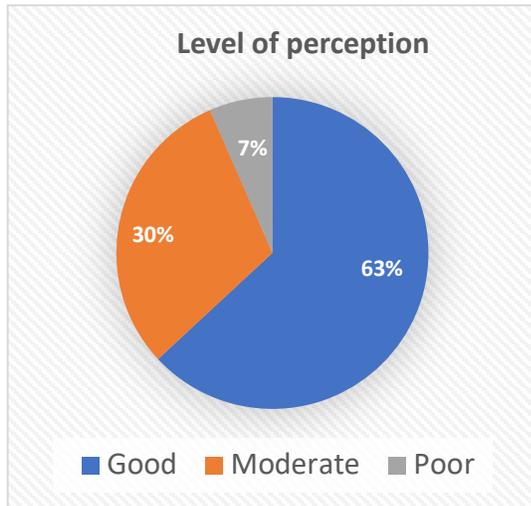


Figure. Overall level of perception among healthcare workers

A total of 561 (94.1%) participants showed positive perception on the question asked that is not necessary to have regular training related to epidemics when do not exist about 338 (56.7%) strongly disagree and 223 (37.4%) disagree. Similarly, 558 (93.6%) of participants showed positive perception on the question asked that the society has nothing to do to facilitate eradication of COVID-19, 340 (57.0%) strongly disagree and 218 (36.6%) disagree. Concerning the question asked that public health education has no help in fighting against COVID-19 about 548 (91.9%) of participants showed positive perception, 381 (63.9%) strongly disagree and 167 (28.0%) disagree. A total of 544 (91.2%) of participants showed positive perception on the question asked that it was not necessary to continue taking precautions after the reduction of COVID-19 phase one infection, 365 (61.2%) strongly disagree and 179 (30.0%) disagree. Also, 543 (91.1%) of participants showed positive perception on the question asked that adherence to guidelines provided by a health institution like WHO and Ministry of Health (MoH) contributed to reduction of COVID-19, 291 (48.8%) strongly agree and 252 (42.3%) agree (Table 2).

Poor perception reported in the question asked that adherence to traditional medicines contributed to

reduction of COVID-19 in which only 210 (35.2%) participants showed positive perception, 104 (17.4%) strongly disagree and 106 (17.8%) disagree. Another poor perception reported in the question asked that adherence to religious belief contributed to reduction of COVID-19, about 248 (41.6%) showed positive perception, 120 (20.1%) strongly disagree and 128 (21.5%) disagree. Also, 362 (60.7%) of participants showed positive perception on the question asked that COVID-19 can be treated at home, 180 (30.2%) strongly disagree and 182 (30.5%) disagree (Table 2).

Association of predictor variables and healthcare workers' perception level in COVID-19

In this study, significant relationship between predictor variables and level of perception among healthcare workers was computed by bivariate analysis. Four predictor independent variables (sex, field profession, level of education and region) had significant relationship with level of perception, all with P-value < 0.05 while the other six predictors (age in years, dedication to COVID-19 team, service experience in years, category of healthcare facilities, patient's category served at facility and situation of caring COVID-19 patients in healthcare facilities) had no significant relationship with level of perception, all with P-value > 0.05 as shown in (Table 3).

Factors influencing level of perception on COVID-19 among healthcare workers

Multinomial logistic regression was conducted to examine the combined influence of level of perception in which socio-demographic characteristics used as predictor variables against level of perception. The moderate and poor categories of perception were contrasted against good perception as the reference category. Logistic regression results shown in (Table 4) indicates that when the moderate category was contrasted against the good category as a reference field profession, healthcare workers dedicated in COVID-19 team and regions of participants significantly predicted relationship in the moderate perception category.

In clinician (doctor) field profession odds decreased by a factor of 0.39 (AOR =0.39, 95% CI: 0.189-0.802, P =0.011), odds decreased by a factor of 0.42 (AOR =0.419, 95% CI: 0.213-0.825, P =0.012) among nurses and odds decreased by a factor of 0.44 (AOR =0.435, 95% CI: 0.2-0.947, P =0.036) among pharmaceutical personnel. The results show that, dedicated healthcare workers to care COVID-19 patients significantly decreased by a factor of 0.16 (AOR= 0.161, 95% CI:



Table 2: Descriptive analysis of questions pertaining to the perceptions of healthcare workers in combating COVID-19

Statement	Response				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
‡ I think it was not necessary to continue taking precautions after the reduction of COVID-19 phase one infection	365 (61.2)	179 (30.0)	12 (2.0)	20 (3.4)	20 (3.4)
† I think pandemics can recur after disappearing	33 (5.5)	12 (2.0)	45 (7.6)	298 (50.0)	208 (34.9)
† I think it is important for the health facility to take precautions related to outbreak of epidemics that can emerge in the community	35 (5.9)	11 (1.8)	13 (2.2)	213 (35.7)	324 (54.4)
‡ The government is only responsible to facilitate eradication of COVID-19	308 (51.7)	230 (38.6)	16 (2.7)	21 (3.5)	21 (3.5)
‡ Only healthcare workers can stop the spread of COVID-19 because it relates to their professions	321 (53.9)	213 (35.7)	13 (2.2)	30 (5.0)	19 (3.2)
‡ Public health education has no help in fighting against COVID-19	381 (63.9)	167 (28.0)	16 (2.7)	10 (1.7)	22 (3.7)
‡ The society has nothing to do to facilitate eradication of COVID-19	340 (57.0)	218 (36.6)	20 (3.4)	8 (1.3)	10 (1.7)
† Adherence to guidelines provided by a health institution like WHO and MoH contributed to reduction of COVID-19	16 (2.7)	16 (2.7)	21 (3.5)	252 (42.3)	291 (48.8)
‡ Adherence to religious belief contributed to reduction of COVID-19	120 (20.1)	128 (21.5)	134 (22.5)	162 (27.2)	52 (8.7)
‡ Adherence to traditional medicines contributed to reduction of COVID-19	104 (17.4)	106 (17.8)	155 (26.0)	194 (32.6)	37 (6.2)
‡ COVID-19 can be treated at home	180 (30.2)	182 (30.5)	93 (15.6)	124 (20.8)	17 (2.9)
† Closure of schools and workplaces during COVID-19 helped to prevent the pandemics	63 (10.6)	55 (9.2)	59 (9.9)	296 (49.7)	123 (20.6)
‡ Handling COVID-19 patient does not threaten healthcare workers	219 (36.7)	227 (38.1)	34 (5.7)	88 (14.8)	28 (4.7)
‡ I think it is not necessary for healthcare workers to prepare for the disease that is not in Tanzania, but it is reported outside of Tanzania	306 (51.3)	218 (36.6)	27 (4.5)	27 (4.5)	18 (3.0)
‡ I think it is not necessary to have regular training related to epidemics even if they do not exist	338 (56.7)	223 (37.4)	13 (2.2)	13 (2.2)	9 (1.5)
‡ I think it was wise to escape attending patients when COVID-19 was in the peak	320 (53.7)	206 (34.6)	25 (4.2)	26 (4.4)	19 (3.2)
Descriptive statistics on level of perception	Mean =79.9, standard deviation =13.8, Range =100 (100-0)				

† = Positive worded statement in which agree and strongly agree represents positive perception

‡ = Negative worded statements in which disagree and strongly disagree represented positive perception

Table 3. Bivariate analysis of the predictor variables and level of perception among healthcare workers

Predictor variables	Valid response	Overall level of perception			Chi square	P value
		Good	Moderate	Poor		
Sex	Male	169 (28.4)	88 (14.8)	10 (1.7)	6.86	0.032*
	Female	207 (34.7)	93 (15.6)	29 (4.9)		
Age in years	18 – 29	131 (22.0)	68 (11.4)	10 (1.7)	8.713	0.190
	30 – 39	141 (23.7)	58 (9.7)	13 (2.2)		
	40 – 49	71 (11.9)	29 (4.9)	11 (1.8)		
	50 and above	33 (5.5)	26 (4.4)	5 (0.8)		
Field profession	Clinician (doctor)	111 (18.6)	45 (7.6)	1 (0.2)	28.028	<0.001*
	Nurse	117 (19.6)	48 (8.1)	19 (3.2)		



Predictor variables	Valid response	Overall level of perception			Chi square	P value
		Good	Moderate	Poor		
Highest level of education	Pharmaceutical personnel	55 (9.2)	25 (4.2)	10 (1.7)	30.01	0.001*
	Laboratory personnel	55 (9.2)	30 (5.0)	2 (0.3)		
	Other health support staff	38 (6.4)	33 (5.5)	7 (1.2)		
	Primary school	11 (1.8)	5 (0.8)	5 (0.8)		
	Secondary school	22 (3.7)	17 (2.9)	3 (0.5)		
	Certificate	63 (10.6)	31 (5.2)	15 (2.5)		
	Diploma	171 (28.7)	73 (12.2)	12 (2.0)		
	Bachelor's degree	102 (17.1)	49 (8.2)	4 (0.7)		
Dedicated to care COVID-19 patients	Master's degree	7 (1.2)	6 (1.0)	0 (0.0)	7.781	0.100
	Yes	137 (23.0)	69 (11.6)	16 (2.7)		
	No	232 (38.9)	102 (17.1)	23 (3.9)		
Service experience in years	No dedicated team	7 (1.2)	10 (1.7)	0 (0)	16.704	0.081
	Less than 1	53 (8.9)	32 (5.4)	1 (0.2)		
	1 – 5	123 (20.6)	65 (10.9)	15 (2.5)		
	6 – 10	84 (14.1)	29 (4.9)	7 (1.2)		
	11 – 15	52 (8.7)	17 (2.9)	4 (0.7)		
	16 – 20	28 (4.7)	11 (1.8)	5 (0.8)		
Region	Above 20	36 (6.0)	27 (4.5)	7 (1.20%)	24.11	<0.001*
	Dar es salaam	122 (20.5)	41 (6.9)	9 (1.5)		
	Mwanza	88 (14.8)	36 (6.0)	10 (1.7)		
	Arusha	64 (10.7)	60 (10.1)	14 (2.3)		
	Dodoma	102 (17.1)	44 (7.4)	6 (1.0)		
Category of healthcare facility	Hospital	183 (30.7)	107 (18.0)	17 (2.9)	6.576	0.160
	Health center	122 (20.5)	49 (8.2)	14 (2.3)		
	Dispensary	71 (11.9)	25 (4.2)	8 (1.3)		
Type of patients cared at healthcare facility	Outpatients only	110 (18.5)	41 (6.9)	12 (2.0)	2.927	0.231
	Outpatients and inpatients	266 (44.6)	140 (23.5)	27 (4.5)		
Situation of caring COVID-19 patients in healthcare facility	It served only COVID-19 patients	62 (10.4)	24 (4.0)	7 (1.2)	5.787	0.216
	It served all patients	202 (33.9)	115 (19.3)	24 (4.0)		
	It referred patients with COVID-19 symptoms	112 (18.8)	42 (7.0)	8 (1.3)		

* P<0.05 is statistically significant

0.053-0.49, P=0.001) when the moderate category was contrasted against the good category of perception. Also, healthcare workers who were not dedicated to care COVID-19 patients decreases odds by a factor of 0.14 (AOR =0.14, 95% CI: 0.045-0.429, P =0.001). Arusha region significantly increased odds by a factor of 2.31

(AOR =2.311, 95% CI: 1.33-4.013, P =0.003). Similarly, when the poor category was contrasted against the good category of perception, clinician (doctor) field profession decreased odds by a factor of 0.09 (AOR =0.094, 95% CI: 0.009-0.938, P =0.044) while Arusha region significantly increased odds by a factor of 4.17 (AOR =4.166, 95% CI: 1.357-12.792, P =0.013).

Table 4. Multinomial logistic regression odds ratio for factors influencing level of perception among healthcare workers

Predictor variables	Good perception (Reference) vs Moderate perception				Good perception (Reference) vs Poor perception			
	AOR	95% C.I. for EXP(B)		P-value	AOR	95% C.I. for EXP(B)		P-value
		Lower	Upper			Lower	Upper	
Sex								
Male	1.214	0.794	1.856	0.371	0.852	0.356	2.037	0.718



Female	Reference							
Age in years								
18 – 29	0.29	0.083	1.019	0.053	0.995	0.119	8.309	0.997
30 – 39	0.368	0.117	1.158	0.088	1.093	0.166	7.2	0.926
40 – 49	0.544	0.222	1.336	0.184	2.008	0.414	9.74	0.387
50 and above	Reference							
Field profession								
Clinician (doctor)	0.39	0.189	0.802	0.011*	0.094	0.009	0.938	0.044*
Nurse	0.419	0.213	0.825	0.012*	0.951	0.287	3.153	0.935
Pharmaceutical personnel	0.435	0.2	0.947	0.036*	2.108	0.538	8.254	0.284
Laboratory personnel	0.499	0.23	1.084	0.079	0.259	0.042	1.609	0.147
Other health support staff	Reference							
Level of education								
Primary school	0.218	0.04	1.198	0.08	b	b	b	b
Secondary school	0.909	0.218	3.79	0.896	-	-	-	-
Certificate	0.666	0.18	2.468	0.543	-	-	-	-
Diploma	0.691	0.199	2.397	0.561	-	-	-	-
Bachelor degree	0.627	0.181	2.174	0.462	-	-	-	-
Master's degree	Reference							
Dedicated in COVID-19 team								
Yes	0.161	0.053	0.49	0.001*	-	-	-	-
No	0.14	0.045	0.429	0.001*	-	-	-	-
Dedication was not done	Reference							
Service experience in years								
Less than 1	1.731	0.471	6.362	0.409	0.149	0.009	2.428	0.181
1 – 5	1.301	0.403	4.203	0.66	0.923	0.146	5.833	0.932
6 – 10	0.755	0.245	2.331	0.626	0.562	0.098	3.216	0.517
11 – 15	0.678	0.247	1.857	0.45	0.499	0.093	2.686	0.418
16 – 20	0.688	0.259	1.829	0.453	0.557	0.113	2.755	0.473
Above 20	Reference							
Region								
Dar es salaam	0.772	0.436	1.367	0.375	1.858	0.556	6.203	0.314
Mwanza	0.872	0.488	1.559	0.645	2.751	0.839	9.022	0.095
Arusha	2.311	1.33	4.013	0.003*	4.166	1.357	12.792	0.013*
Dodoma	Reference							
Category of your healthcare facility								
Hospital	2.294	0.98	5.365	0.056	0.705	0.148	3.359	0.66
Health center	1.482	0.653	3.364	0.347	0.93	0.226	3.836	0.92
Dispensary	Reference							
Type of patients receiving healthcare at your facility								
Outpatients only	0.998	0.498	1.999	0.995	0.886	0.254	3.092	0.849
Outpatients and inpatients	Reference							
Situation of caring Covid-19 patients at your facility during the first wave of Covid-19								
It served only Covid-19 patients	0.797	0.402	1.58	0.515	2.007	0.583	6.905	0.269
It served all patients	1.089	0.653	1.817	0.743	1.711	0.636	4.602	0.287
It referred patients with Covid-19 symptoms	Reference							

* $P < 0.05$ is statistically significant, degree of freedom (df) = 1, CI=Confidence Interval, AOR=Adjusted Odds Ratio, ^bN/A results were not considered due to maximum variation caused by zero odds in reference categorical variable.



Discussion

This study found that, healthcare workers in the study area had an average of 79.9% of positive perception which is moderate. About 63%, 30%, and 7% of healthcare workers holding good, moderate, and low levels of perception respectively. The number of healthcare workers who scored good perception in this study is not enough to bring positive impact in fighting against COVID-19 in Tanzania whenever it emerges because good perception and good practice are closely related. The results of the study were not far from the results of the study conducted in Saudi Arabia which found negative perception and overall moderate level of perception among healthcare workers.²² Although, it was interesting that about 85% of healthcare workers agreed that the closure of schools and shopping markets reduced the spread of SARS which is a good result compared to this study which agreed at 70.3% that the closure of schools reduced the transmission of COVID-19.²³

The study in Vietnam¹ revealed a high level of risk perception to COVID-19 among healthcare workers which was consistent with another study²⁴ which reported that healthcare workers in Vietnam had a higher level of risk perception than mid-point level of exposure. Other studies also showed that healthcare workers perceived a relatively higher risk of being infected.^{7,11,25,26} The results show how healthcare workers are very afraid during the outbreak of diseases, these results are not surprising for healthcare workers to have high risk perception due to their working environment and maximum interaction with patients, a situation that requires immediate attention every time diseases emerge by providing access to proper Personal Protective Equipment (PPE) among them and safe patients' handling procedures.

In this study poor perception reported in the question asked that adherence to traditional medicines contributed to reduction of COVID-19 in which only 210 (35.2%) participants showed positive perception. Even though a large number of healthcare workers who participated in this study believed that traditional medicine helped to fight the outbreak of COVID-19, many traditional medicines in Tanzania were used in a way that was not scientifically sound, safety, efficacy and efficiency were all questionable and no one knew the effects caused by the arbitrary use of traditional medicine. Along with the current challenges on the use of traditional medicine, a total of 634 records were found

and discussed on the use of traditional medicine.²⁷ Among them, 48.90% of the data were contributed by institutes in China, following 13.56% of United States of America (USA), 6.15% of India, 5.99% of United Kingdom (UK) and 3.15% of Australia. Other countries with the data contribution higher than 2% were Iran, South Korea, Germany, and Italy.²⁴

Traditional medicine as an important part in health services in Asian countries was inevitable in fighting the outbreak of COVID-19. Contrary to the general reviews of western countries that warned about the use of traditional medicines in treating COVID-19. One document from the French Agency for Food, Environmental and Occupational Health and Safety warns patients from utilizing traditional medicines for the fact that, the supplements from herbal medicines with an activity on the immune system could amplify the inflammation response and consequently worsen COVID-19.²⁸ The variation in culture, medication and regulation among different countries make the use and control of traditional medicines currently to be difficult. In order to make maximum advantages on the uses of traditional medicines some efforts can still be considered. Traditional medicines that have been proven to produce significantly therapeutic effects in the clinic, rational clinical trials designed with strict and scientific standards should be performed before giving a conclusive claim.²⁷

Another poor perception reported in the question asked that adherence to religious belief contributed to reduction of COVID-19 in which only 248 (41.6%) showed positive perception. In addition to the fact that, in Tanzania religious practices did not follow the guidelines to control COVID-19 to a large extent but many healthcare workers declared that adherence to religious helped to combat COVID-19. Although one study²⁹ reported the consequences of religious practice in spreading SARS-CoV-2 in different areas as follows; in South Korea during the end the first week of March 2020, almost two-thirds of coronavirus infections (approximately 5,000 cases) were traced back to "Patient 31," an individual who worshipped at Shincheonji Church of Jesus in Daegu. The church insisted on abandoning the use of health masks, continuing with gatherings involving many people and worshipping by touching each other and later the church was blamed for contributing to the spread of the disease outbreak. Another report in South Korea revealed that, thousands of cases of COVID-19 originated from the practices of Shincheonji Church of Jesus.³⁰



Earlier in the year 2020 public notes were brought involving religious practices in the spread of COVID-19 when a number of cases erupted amongst those who visited Iran's Shia Muslim holy sites of Qom and Mashhad in February of the same year, and who subsequently travelled within the Middle East.^{31,32} In Southeast Asia, about 14,000 strong delegation of Islamic Tablighi-Jamaat in Kuala Lumpur was widely considered to be the cause of the second wave of the pandemic in Malaysia, with attendees from the event travelling to Brunei, Cambodia and Indonesia and later testing positive.³³ In this context, religious activities should be controlled when we are fighting against COVID-19 and other diseases of the same nature, healthcare workers should be frontline in this awareness.

Only about 362 (60.7%) of participants showed positive perception on the question asked that COVID-19 can be treated at home. Even though a large number of healthcare workers perceived that COVID-19 patients can be treated at home, the practice is difficult especially for developing countries like Tanzania. Treating at home a patient infected by COVID-19 generates healthcare waste which are infectious in nature and probably mixed or discarded as domestic waste and cause public health risk among individuals and the environment depending on the ways of transport and disposal. Basically, the spread of coronavirus can be caused by poor waste management, poor handling conditions associated with inappropriate use of personal protective equipment and other unfavorable conditions presented mainly in developing countries.³⁴ Although an expert opinion from Italy provides indications for treating a COVID-19 patients at home based on the evidence from the literature and on current guidelines. Decisions related to isolating provide treatment to a COVID-19 patient at home depends on clinical evaluation of the COVID-19 patient and should be made on a case-by-case basis.³⁵ When a COVID-19 case is suspected, immediate action should be taken to protect the family and caregivers from being contaminated with biological waste. Furthermore, the healthcare provider should instruct the household to follow all procedures to protect themselves from infection from the patient receiving treatment at home.³⁵ But this situation was limited as per Italian situation of severity and handling COVID-19, developing countries like Tanzania with a poor management of infectious waste it is not recommended as it may lead to serious public health consequences.

Along with reported overall moderate perception and poor perception in some of questions, also good perception reported in some questions as follows; a total of 561 (94.1%) participants showed positive perception on the importance of having regular training related to epidemics even when they do not exist. Similarly, 558 (93.6%) of participants showed positive perception on the role of community to facilitate the eradication of COVID-19. Concerning the importance of public health education in fighting against COVID-19 about 548 (91.9%) of participants showed positive perception. A total of 544 (91.2%) of participants showed positive perception on continuing to take precautions after the reduction of COVID-19 phase one infection. Also, 543 (91.1%) of participants showed positive perception on adherence to guidelines provided by health institutions like World Health Organization (WHO) and Ministry of Health (MoH) in reduction of COVID-19.

Four predictor independent variables (sex, field profession, level of education and region) had significant relationship with level of perception, all with P-value ($P < 0.05$). where women had significantly higher perception compared to men, in terms of field profession nurses had significantly higher perception compared to other professions. This is similar with another study¹ in Vietnam which reported that, nurses reported a lower daily risk of exposure than doctors and that, nurses were more likely to report their exposures to COVID-19 than doctors. These findings may be due to the nature of the work in which doctors often perform procedures in closer contact with the patient than nurses, even though nurses interact with patients more frequently. In education level, diploma had significantly good perception compared to other groups, also Dar es Salaam region had a significantly high perception compared to other regions. So, the groups with a low level of perception should be built to improve their perception which can directly influence the practice of fighting against COVID-19 in its generality.

Conclusion

This study found overall moderate perception among healthcare workers at 79.9%. Also, 63%, 30% and 7% of healthcare workers possessed good, moderate, and poor perception respectively. This study reported poor perception among most of healthcare workers on believing that adherence traditional medicines contributed to reduction of COVID-19 and that adherence to religious belief contributed to reduction of COVID-19. Most of participants showed positive



perception on believing that it is necessary to have regular training related to epidemics even when they do not exist, and that society can facilitate the eradication of COVID-19. Also, multinomial logistic regression reported significant relationship of field of profession, staff dedicated in COVID-19 team and region of study with overall level of perception.

Recommendation

The Ministry of Health of Tanzania and other developing countries should facilitate and ensure that healthcare facilities conduct capacity building training among healthcare workers which will increase their awareness on COVID-19 in order to improve their perception in handling the disease.

Declarations

Conflict of Interest: There was no conflict of interest in this study.

Funding: There was no funding support in this study.

References

1. Le XT, Nguyen QT, Onyango B, Nguyen QN, Pham QT, Ta NT, et al. Perception toward exposure risk of COVID-19 among health workers in Vietnam: Status and correlated factors. *Front Public Health*. 2021; 9:589317
2. Mofijur M, Fattah IM, Alam MA, Saiful ABM, Ong HC, Ashrafur SM, et al. Impact of COVID-19 on the social, economic, environmental and energy domains: lessons learnt from a global pandemic. *Sustain Prod Consum*. (2021); 26:343–59. doi: 10.1016/j.spc.2020.10.016
3. World Health Organization. WHO Coronavirus (COVID-19) Dashboard. 2021. Available online at: <https://covid19.who.int/> (Accessed 27 February 2023).
4. Lua W, Hang Wang H, Yuxing Lin Y, Li L. Psychological status of medical workforce during the COVID-19 pandemic: a cross-sectional study. *Psychiatry Res*. 2020; 288:112936. <https://doi.org/10.1016/j.psychres.2020.112936>.
5. Jordan RE, Adab P, Cheng K. Covid-19: risk factors for severe disease and death. *Bmj*. 2020;368.
6. Gorini S, Fiabane E, Sommaruga M, Barbieri S, Sottotetti F, La Rovere MT, et al. Mental health and risk perception among Italian healthcare workers during the second month of the Covid-19 pandemic. *Arch Psychiatr Nurs*. (2020) 34:537–44. doi: 10.1016/j.apnu.2020.10.007
7. Ran L, Chen X, Wang Y, Wu W, Zhang L, Tan X. Risk factors of healthcare workers with coronavirus disease 2019: a retrospective cohort study in a designated hospital of wuhan in China. *Clin Infect Dis*. 2020;71(16):2218–2221.
8. Vimercati L, De Maria L, Quarato M, Caputi A, Stefanizzi P, Gesualdo L, et al. COVID-19 hospital outbreaks: Protecting healthcare workers to protect frail patients. An Italian observational cohort study. *International Journal of Infectious Diseases*. 2021; 102:532-7.
9. Bashirian S, Jenabi E, Khazaei S, Barati M, Karimi-Shahanjari A, Zareian S, et al. Factors associated with preventive behaviours of COVID-19 among hospital staff in Iran in 2020: an application of the Protection Motivation Theory. *J Hosp Infect*. 2020;105(3):430-3.
10. World Health Organization (WHO). Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response. 2020. Available from; <https://www.who.int/docs/default-source/coronaviruse/covid19-rcce-guidance-final-brand.pdf>. (Accessed 27 February 2023).
11. Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W, et al. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. *The Lancet Public Health*. 2020; 5(9): e475-83
12. Verbeek JH, Rajamaki B, Ijaz S, Sauni R, Toomey E, Blackwood B, et al. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. *Cochrane database of systematic reviews*. 2020(4).
13. Girma S, Agenagnew L, Beressa G, Tesfaye Y, Alenko A. Risk perception and precautionary health behavior toward COVID-19 among health professionals working in selected public university hospitals in Ethiopia. *Plos one*. 2020; 15(10): e0241101.
14. Makoni, M. Tanzania refuses COVID-19 vaccines. *The Lancet*. 2021. Available from; [https://www.thelancet.com/journals/lancet/article/PIIS0140_6736\(21\)00362-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140_6736(21)00362-7/fulltext); (Accessed 26 February 2023).
15. Mtani FA, Ngohengo J. Africa at the Crossroads: An Overview of the Covid-19 Pandemic and its Drama in Tanzania. *African Journal of History and Geography*. 2023; 2(1):1-6.
16. Rugarabamu S, Ibrahim M, Byanaku A. Knowledge, attitudes, and practices (KAP) towards COVID-19:



- A quick online cross-sectional survey among Tanzanian residents. medRxiv. 2020; doi: <https://doi.org/10.1101/2020.04.26.20080820>
17. Munga MA, Mæstad O. Measuring inequalities in the distribution of health workers: the case of Tanzania. *Hum Resour Health*. 2009;7(1):1-12.
 18. Macrotrends Tanzania population growth rate 1950-2022. Available from: <https://www.macrotrends.net/countries/TZA/tanzania/population-growth-rate> . (Accessed 20 May 2022).
 19. World population review. Available from: <https://worldpopulationreview.com/world-cities/dodoma-population> . (Accessed 20 May 2022).
 20. Krejcie RV, Morgan DW. Determining sample size for research activities. *Educ Psychol Meas*. 1970;30(3):607-10.
 21. Feleke BT, Wale MZ, Yirsaw MT. Knowledge, attitude and preventive practice towards COVID-19 and associated factors among outpatient service visitors at Debre Markos compressive specialized hospital, north-west Ethiopia. *Plos one*. 2021; 16(7): e0251708.
 22. Abolfotouh MA, Almutairi AF, BaniMustafa AA, Hussein MA. Perception and attitude of healthcare workers in Saudi Arabia with regard to Covid-19 pandemic and potential associated predictors. *BMC Infect Dis*. 2020; 20:1-0.
 23. Abolfotouh MA, AlQarni AA, Al-Ghamdi SM, Salam M, Al-Assiri MH, Balkhy HH. An assessment of the level of concern among hospital-based health-care workers regarding MERS outbreaks in Saudi Arabia. *BMC Infect Dis*. 2017; 17:4. <https://doi.org/10.1186/s12879-016-2096-8>.
 24. Huynh TL. The COVID-19 risk perception: a survey on socioeconomics and media attention. *Econ Bull*. (2020) 40:758–64.
 25. Gómez-Ochoa SA, Franco OH, Rojas LZ, Raguindin PF, Roa-Díaz ZM, Wyssmann BM, et al. COVID-19 in health-care workers: a living systematic review and meta-analysis of prevalence, risk factors, clinical characteristics, and outcomes. *Am J Epidemiol*. 2021; 190(1):161-75.
 26. Simione L, Gnagnarella C. Differences between health workers and general population in risk perception, behaviors, and psychological distress related to COVID-19 spread in Italy. *Front Psychol*. 2020; 11:2166.
 27. Xiong Y, Gao M, van Duijn B, Choi H, van Horsen F, Wang M. International policies and challenges on the legalization of traditional medicine/herbal medicines in the fight against COVID-19. *Pharmacol. Res*. 2021; 166:105472.
 28. French Agency for Food, Environmental and Occupational Health & Safety. ANSES Warns Against Taking Food Supplements That Could Lower the Body's Immune Response, 2020. <https://www.anses.fr/fr/system/files/NUT2020-SA0045.pdf>. (Accessed 26 February 2023).
 29. Wildman WJ, Bulbulia J, Sosis R, Schjoedt U. Religion and the COVID-19 pandemic. *Religion Brain Behav*. 2020;10(2):115-7
 30. Channel News Asia (CNA). Church at centre of South Korea COVID-19 sits silent as infections surge [Internet]. Channel News Asia, 2020. Available from: <https://www.channelnewsasia.com/news/asia/coronavirus-covid19-church-south-korea-empty12458786>; [Accessed 25 February 2023].
 31. Al-Rousan N, Al-Najjar H. Is visiting Qom spread CoVID-19 epidemic in the Middle East? *Eur Rev Med Pharmacol Sci*. 2020; 24: 5813–5818.
 32. Barmania S, Reiss MJ. Health promotion perspectives on the COVID-19 pandemic: The importance of religion. *Glob Health Promot*. 2021; 28(1):15-22.
 33. Che Mat NF, Edinur HA, Abdul Razab MK, Safuan S. A single mass gathering resulted in massive transmission of COVID-19 infections in Malaysia with further international spread. *J Travel Med*. 2020; 27(3): taaa059.
 34. Mol MP, Caldas S. Can the human coronavirus epidemic also spread through solid waste? *Waste Manag Res*. 2020; 38(5):485-6.
 35. Donno DR, Grattagliano I, Rossi A, Lora Aprile P, Medea G, Lagolio E, et al. How to treat COVID-19 patients at home in the Italian context: an expert opinion. *Infect Dis Rep*. 2021;13(1):251-8.