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COVID-19 Perception, Knowledge, and Preventive Practice: Comparison between South Korea, Ethiopia, and Democratic Republic of Congo

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Abstract

In Africa, the first confirmed case of COVID-19 was reported in Egypt on February 14, 2020. Since then, the number of cases has continued to increase with Ethiopia, the Democratic Republic of Congo (DRC), Nigeria, Sudan, Angola, Tanzania, Ghana, and Kenya identified as vulnerable countries. The present study aimed to: 1) identify differences in trust level of COVID-19 diagnosis, recent healthcare utilization experiences, and COVID-19-related knowledge, information, and prevention practices in South Korea, Ethiopia, and DRC; and 2) identify factors influencing trust level in healthcare facilities regarding COVID-19 diagnosis. The present study was cross-sectional. The questionnaire survey was conducted between May 1–14, 2020 using Google forms, and 748 respondents were included in the final analysis. The data collected were analyzed using ANOVA, post-hoc test, and binary logistic regression analysis. South Korea showed higher rate of practice for COVID-19 prevention such as hand washing, mask wearing, and etc. than Ethiopia and DRC. The results showed significant differences with the trust level being 3.129 times higher in respondents from DRC than those from Ethiopia (aOR=3.129, 95% CI: [1.884-5.196], p<.000) and 29.137 times higher in respondents from South Korean than those from Ethiopia (aOR=29.137, 95% CI: [13.869-61.210], p<.000). Gender, age, number of family members, healthcare utilization experience, information, and practice were significant variables. Health education expansion for information and practice about COVID-19 in Ethiopia and DRC is necessary. *(Afr J Reprod Health 2020 (Special Edition); 24[2]:66-77).*

Keywords: COVID-19, Pandemic, Ethiopia, DRC, South Korea, Online Survey

Résumé

En Afrique, le premier cas confirmé de COVID-19 a été signalé en Égypte le 14 février 2020. Depuis, le nombre de cas n'a cessé d'augmenter avec l'Éthiopie, la République démocratique du Congo (RDC), le Nigéria, le Soudan, l'Angola, La Tanzanie, le Ghana et le Kenya ont été identifiés comme pays vulnérables. La présente étude visait à: 1) identifier les différences de niveau de confiance dans le diagnostic du COVID-19, les expériences récentes d'utilisation des soins de santé et les connaissances, informations et pratiques de prévention liées au COVID-19 en Corée du Sud, en Éthiopie et en RDC; et 2) identifier les facteurs influençant le niveau de confiance dans les établissements de santé concernant le diagnostic du COVID-19. La présente étude était transversale. L'enquête par questionnaire a été menée du 1er au 14 mai 2020 à l'aide de formulaires Google, et 748 répondants ont été inclus dans l'analyse finale. Les données collectées ont été analysées en utilisant une analyse ANOVA, un test post-hoc et une analyse de régression logistique binaire. La Corée du Sud a montré un taux de pratique plus élevé pour la prévention du COVID-19, comme le lavage des mains, le port d'un masque, etc. que l'Éthiopie et la RDC. Les résultats ont montré des différences significatives, le niveau de confiance étant 3,129 fois plus élevé chez les répondants de RDC que chez ceux d'Éthiopie (aOR = 3,129, IC à 95%: [1,884-5,196], p <.000) et 29,137 fois plus élevé chez les répondants sud-coréens que ceux d'Éthiopie (aOR = 29,137, IC à 95%: [13,869-61,210], p <.000). Le sexe, l'âge, le nombre de membres de la famille, l'expérience d'utilisation des soins de santé, l'information et la pratique étaient des variables importantes. L'élargissement de l'éducation sanitaire pour l'information et la pratique du COVID-19 en Éthiopie et en RDC est nécessaire. *(Afr J Reprod Health 2020 (Special Edition); 24[2]: 66-77).*

Mots-clés: COVID-19, Pandémie, Éthiopie, RDC, Corée du Sud, Enquête en ligne

Introduction

In December 2019, the first confirmed case of COVID-19 was reported in Wuhan, China. Subsequently, COVID-19 was declared a pandemic by the World Health Organization (WHO) on March 10, 2020—the third pandemic since the establishment of the WHO, following the Hong Kong flu in 1968 and H1N1 flu in 2009[1]. As of May 1, 2020, there were 4,013,728 confirmed cases of COVID-19 and 278,993 COVID-19-related deaths in the world. The number of confirmed cases by continent was 1,731,606 in Europe, 1,702,451 in the America, 271,361 in the Eastern Mediterranean region, 160,910 in Western Pacific region, 102,155 in the South-East Asia region, and 44,553 in Africa[2].

By May 2020, the COVID-19 outbreak had started to taper off in South Korea but was still in the beginning stage in Africa. Experts have opined that factors that contributed to the successful management of COVID-19 in South Korea should be identified and analyzed to determine factors that could be incorporated in European and African countries[3]. The high level of health care trust relation in the South Korean and the active cooperation of its citizens have been factors that have influenced the tapering COVID-19 trend in South Korea[4,5].

In Africa, the first confirmed case of COVID-19 was reported in Egypt on February 14, 2020, and since then, the number of cases has continued to increase. The WHO warned that if COVID-19 were to spread throughout Africa, the outbreak could have a more fatal impact since many countries in Africa have weak healthcare systems, inadequate monitoring systems, a scarcity of healthcare facilities and public health personnel, and limited financial means[6]. Gilbert analyzed the preparedness of African countries against COVID-19 through a modelling study. As a result, Ethiopia, the Democratic Republic of Congo (DRC), Nigeria, Sudan, Angola, Tanzania, Ghana, and Kenya were defined as vulnerable countries[7].

Ethiopia is one of Africa's air-traffic hubs with many airlines coming in from Central and South America, North America, Europe, and Asia, including China[7]. Accordingly, the United Nations (UN) identified Ethiopia as a major country for supplying COVID-19 medical supplies throughout Africa and emphasized the importance of COVID-19 management in the Ethiopian region[8,9].

DRC experienced Ebola outbreaks in 2014 and 2019-2020 and has been criticized for its inability to minimize the outbreaks due to the dissemination of false information by the government and a lack of response by the citizens[10]. Consequently, the WHO added Ethiopia and DRC to the list of 13 top-priority quarantine countries in Africa and decided to apply intensive management to prevent the spread of COVID-19, including measures for quarantine and monitoring systems, case management, and contacts management[11].

With respect to cases involving infectious diseases in Africa, more cases of healthcare-acquired infections (HAIs) have been reported in Africa than any other continent[12]. Therefore, many Africans have the misconception that they may become infected with a disease if they visit a healthcare facility, and often take preventive and care measures on their own due to a lack of trust in the care provided by healthcare facilities[13]. Studies have shown that if a patient develops mistrust in healthcare facilities, it takes longer for them to visit the hospital for diagnosis and treatment. In cases involving infectious diseases, there is an increased risk of secondary infection[14]. According to a health behavior model, knowledge, information, and practice have been identified as important factors for increasing hospital visits among patients with low levels of trust[15].

Accordingly, the objectives of the present study were to: 1) identify differences in levels of trust in COVID-19 diagnosis, recent healthcare utilization experience, and COVID-19-related knowledge, information, and prevention practices in South Korea, Ethiopia, and DRC, and 2) to identify the factors that influence the level of trust in healthcare facilities regarding COVID-19 diagnosis.

Methods

Study design

The present study was designed as a cross-sectional study to analyze levels of trust in

healthcare facilities regarding COVID-19 diagnosis and COVID-19-related experiences, information, knowledge, and practice of healthcare facilities. The countries studied consisted of South Korea, Ethiopia and DRC. The target age group for respondents was adults aged ≥20 years.

Sampling

Subject selection and data collection methods were carried out in the following order.

First, the sample size needed for the study was calculated using the G*Power 3.17 program. When calculated based on parameters of the two-sided test, odds ratio (OR) of 1.5, α probability = .05, and power = 0.95 for ANOVA and multivariate logistic regression analysis, the minimum total sample size was estimated to be 417 overall.

Second, non-probability sampling was used to investigate the subjects based on the geographic distance between Ethiopia, DRC, and South Korea and the characteristics of the COVID-19 pandemic. The questionnaire surveys used convenience and snowball sampling techniques, and the respondents consisted of undergraduate and graduate students and faculty members from four colleges in South Korea, two colleges in Ethiopia, and one college in DRC.

Third, the questionnaire survey was conducted from May 1–14, 2020, as an online survey using Google forms. The average time required to complete the survey was five minutes. The first page of the online questionnaire contained the objectives of the study, research institution, and information privacy. Subjects who read the material and completed the informed consent form were allowed to participate in the survey. A total of 773 respondents participated in the survey: 200 from Ethiopia, 203 from DRC, and 370 from South Korea. After excluding 25 respondents for incomplete responses in Ethiopia, data from 748 respondents were used in the final analysis.

Study instrument

The Online tool used in the present study was a questionnaire developed by public health experts at Yonsei Global Health Center in South Korea. This questionnaire was based on reflex, act, action, and practice among the health behavior concepts of Rummel (1976)[16] and previous studies that used the Health Belief Model (1950) and the Theory of Reasoned Action & Theory of Planned Behavior Model (1980)[17]. The questionnaire contained nine items on *personal demographic characteristics*, nine items on *COVID-19-related healthcare utilization (within 14 days) characteristics*, two items on the *history of contact with a confirmed COVID-19 patient*, three items on *COVID-19 infection knowledge* characteristics, four items on *COVID-19-related information acquisition characteristics*, seven items on trust in the diagnosis of *COVID-19 and infection concerns*, and 11 items on *COVID-19 prevention practice*. The reliability of the instrument (Cronbach's α) was .875. The questions regarding the COVID-19 situation in this instrument were preliminarily constructed in Korean by four researchers and were used in a pilot study on 15 participants. Subsequently, the instrument was translated into English and French and the content validity of the instrument was tested by researchers from Ethiopia and DRC to finalize the questionnaire. The questionnaire survey was then conducted in English, French, and Korean for Ethiopia, DRC, and South Korea, respectively.

Variables

The present study used the question "*How much trust do you have in your own hospital to diagnose or recognize COVID-19?"* to determine the level of trust in healthcare facilities (hospitals). Responses of "highly trust" and "somewhat trust" were codified as 1 and "difficult to trust" and "no trust at all" were codified as 0.

Personal demographic characteristics included sex (male/female), marital status (married/not married), number of household members (1/2/3-5/≥6), chronic disease (yes/no), and insurance status (no/yes).

The variables regarding healthcare utilization experience (within the past 14 days) consisted of diagnosis by a physician (no/yes), hospitalization (no/yes), COVID-19 testing (no/yes), and self-isolation (no/yes).

Knowledge of the COVID-19 infection route was analyzed based on three questions

regarding infection by droplets (impossible/possible), contaminated objects (impossible/possible), and airborne transmission (impossible/possible). If the respondent answered all three questions correctly, *knowledge of COVID-19 infection route* was codified as 1 and analyzed as an independent variable in the logistic regression analysis. The variables regarding awareness of COVID-19 patient information consisted of the number of confirmed COVID-19 patients (aware/unaware), the number of deaths (aware/unaware), and the number of recovered patients (aware/unaware). If the respondent was aware of all three, *COVID-19 information acquisition* was codified as 1 and analyzed as an independent variable in logistic regression analysis.

Practice of COVID-19 prevention measures was developed by referencing the preventive measures recommended by the WHO and Centers for Disease Control and Prevention (CDC)[18,19]. Among the COVID-19 prevention measures recommended by the WHO and CDC, the present study included the following nine items: cover coughs and sneezes (do not/do), avoid public transportation (do not/do), wash your hands with soap and water (do not/do), wash your hands after sneezing (do not/do), mandatory mask wearing (do not/do), wash your hands after touching a contaminated object (do not/do), avoid using elevators (do not/do), sit in a row (do not/do), and avoid gatherings of 10 or more people (do not/do). If the respondent practiced at least three out of nine prevention measures, *practice of COVID-19 prevention measures* was codified as 1 and analyzed as an independent variable in logistic regression analysis.

Statistical analysis

The data collected in the present study were used to perform an analysis of variance (ANOVA) to analyze the differences in levels of trust in healthcare facilities regarding COVID-19 diagnosis, healthcare utilization experience (within the past 14 days), knowledge about the COVID-19 infection route, awareness of COVID-19 patient information, and rate of practicing COVID-19 prevention measures in South Korea, Ethiopia, and DRC. First, differences between the three countries were analyzed and a post-hoc test was performed using Tukey's HSD method to differentiate groups. Based on the Tukey's HDS results, countries were differentiated as groups.

Second, a binary logistic regression analysis was performed to identify the influence of recent healthcare utilization experiences, knowledge about the COVID-19 infection route, awareness of COVID-19 patient information, and the rate of practicing COVID-19 prevention measures on the level of trust in healthcare facilities. The goodness of fit of binary logistic regression analysis was tested by Nagelkerke and Cox & Snell R^2.

Results

Characteristics of participants

The total number of respondents in the present study was 748, with 370 from South Korea, 175 from Ethiopia, and 203 from DRC. Sex, marital status, number of cohabiting family members, chronic disease, insurance status, and age were analyzed as respondent characteristics. When the differences in respondent characteristics by country were analyzed by ANOVA, the results confirmed differences in sex ($p<.000$), marital status ($p<.000$), number of cohabiting family members ($p<.000$), and age ($p<.000$). In addition, Tukey's HSD post-hoc test results showed that Ethiopia and DRC had similar characteristics with respect to sex, marital status, insurance status, and age, whereas South Korea had different characteristics than Ethiopia and DRC. South Korea and Ethiopia belonged to the same group with respect to number of cohabiting family members, whereas DRC did not.

Trust in hospital COVID-19 diagnosis and test, information, knowledge, and practice of COVID-19

ANOVA was performed on level of trust in healthcare facilities regarding COVID-19 diagnosis, healthcare utilization experience (within the past 14 days), and COVID-19-related knowledge, information, and practice in Ethiopia, DRC, and South Korea. A post-hoc test was performed for an analysis between the groups (Table 2).

Table 1: Characteristics of participants by country (n, %)

	South Korea[a] (n=370)	Ethiopia[b] (n=175)	DRC[c] (n=203)	F (*P*-value)	Post-hoc test (Tukey's HSD[1)])
Sex					
Male	155(41.9%)	115(65.7%)	93.0(47.4%)	27.2 (<.000***)	b<a=c
Female	215(58.1%)	60(34.3%)	103(52.6%)		
Marital status					
Married	358(96.8%)	147(84.0%)	162(82.7%)	37.6 (<.000***)	a>b=c
Not married	12(3.2%)	28(16.0%)	34(17.3%)		
Number of household members					
1	40(10.8%)	35(20.0%)	11(5.6%)	143.7 (<.000***)	a=b<c
2	21(5.7%)	27(15.4%)	30(15.3%)		
3-5	297(80.3%)	74(42.3%)	94(48.0%)		
≥ 6	12(3.2%)	39(22.3%)	61(31.1%)		
Chronic disease					
No	336(90.8%)	157(78.5%)	173(88.3%)	0.9 (p=.631)	a=b=c
Yes	34(9.2%)	18(10.3%)	23(11.7%)		
Insurance status					
No	0(0.0%)	157(89.7%)	173(88.3%)	227.0 (p<.000***)	a>b=c
Yes	370(100.0%)	18(10.3%)	23(11.7%)		
Age (M±SD)	22.9±4.7	26.0±5.7	26.1±4.2	44.2 (p<.000***)	a>b=c

* p<.05, **p<.01, *** p<.001

The level of trust in healthcare facilities regarding COVID-19 diagnosis in South Korea was 94.1%, which was significantly higher than that of DRC (74.2%) and Ethiopia (46.6%) (p<.000). Tukey's post-hoc test results showed South Korea>DR Congo>Ethiopia.

With respect to healthcare utilization experience within the past 14 days, the countries showed significant differences in physician examination experience and hospitalization experience. Physician examination experience was highest in DRC (24.0%), followed by South Korea (11.9%), and Ethiopia (6.9%), while the post-hoc test results showed DRC>South Korea=Ethiopia. Hospitalization experience was as follows: DRC (6.9%), South Korea (2.5%), and Ethiopia (1.0%), while the post-hoc test results showed DRC>South Korea=Ethiopia.

There were significant differences in knowledge about infection by contaminated objects and airborne transmission between the countries. The percentage of respondents with knowledge of transmission by droplets was ≥ 90% in all countries: 98.8% in Ethiopia, 96.8% in South Korea, and 94.9% in DRC. The percentage responses about airborne transmission and post-hoc results together were DRC (63.4%)>South Korea (53.5%) =Ethiopia (48.1%).

For rate of practicing COVID-19 prevention measures, a total of nine questions were asked, and in all items, South Korea showed higher rates of practice than Ethiopia and DRC. The post-hoc results showed South Korea>Ethiopia=DRC for six out of nine items. The other three items were mandatory mask wearing (South Korea>Ethiopia=DRC), avoid gatherings of 10 or more people (South Korea>Ethiopia>DRC.

Binary logistic regression of COVID-19 diagnosis trust in health facility

The level of trust in healthcare facilities regarding COVID-19 diagnosis in respondents from Ethiopia, DRC, and South Korea was analyzed. The results showed significant differences, the level of trust being 3.129 times higher in respondents from DRC than those from Ethiopia (aOR=3.129, 95% CI: [1.884-5.196], *p*<.000) and 29.137 times higher in respondents from South Korean than those from Ethiopia (aOR=29.137, 95% CI: [13.869-61.210], *p*<.000).

With respect to marital status, there were significant differences in the level of trust in healthcare facilities regarding COVID-19 diagnosis, which was 3.091 times higher in respondents who are married than those who are not married (aOR = 3.091, 95% CI: [1.444-6.615],

Table 2: Level of trust in healthcare facilities regarding COVID-19 diagnosis, healthcare utilization experience, and COVID-19-related knowledge, information, and practice by country (n, %)

	South Korea[a] (n=370)	Ethiopia[b] (n=175)	DRC[c] (n=203)	F (*P*-value)	Post-hoc (Tukey's)
Level of trust in healthcare facilities regarding COVID-19					
Trust in diagnosis made by a healthcare facility	94.1%	46.6%	74.2%	89.5 (p<.000***)	a>c>b
Healthcare utilization experience (within 14 days)					
Physician examination	11.9%	6.9%	24.0%	13.8 (p<.000***)	a=b<c
Hospitalization	2.5%	1.0%	6.9%	3.5 (p=.031*)	a=b<c
COVID-19 testing	4.5%	4.1%	9.8%	2.5 (p<.085)	a=b=c
Self-isolation	3.9%	3.2%	6.3%	0.8 (p=.429)	a=b=c
Knowledge about COVID-19 infection route					
Droplets	96.8%	98.8%	94.9%	2.9 (p=.056)	a=b≥c
Contaminated objects	91.3%	98.3%	93.4%	29.3 (p<.000***)	a<b=c
Airborne transmission	53.5%	48.1%	63.4%	16.4 (p<.000***)	a=b<c
Awareness of COVID-19 patient information					
Acquisition of information about the number of confirmed COVID-19 patients	97.3%	97.7%	99.5%	1.6 (p=.204)	a=b=c
Acquisition of information about the number of COVID-19-related deaths	95.7%	95.4%	99.5%	3.380 (p=.035*)	a=b<c
Acquisition of information about the number of patients recovered from COVID-19	88.6%	93.7%	97.4%	7.369 (p=.001**)	a<b=c
Rate of practicing COVID-19 prevention measures					
Cover coughs and sneezes	83.7%	17.9%	10.8%	186.4 (p<.000***)	a>b=c
Avoid public transportation	50.6%	20.5%	17.9%	38.3 (p<.000***)	a>b=c
Wash your hands with soap and water	92.1%	6.4%	2.1%	471.4(p<.000***)	a>b=c
Wash your hands after sneezing	74.7%	29.9%	29.8%	73.5 (p<.000***)	a>b=c
Mandatory mask wearing	85.1%	44.2%	21.7%	52.6 (p<.000***)	a>b>c
Wash your hands after touching a contaminated object	86.3%	19.4%	10.6%	201.9 (p<.000***)	a>b=c
Avoid using elevators	28.3%	17.1%	8.1%	15.5 (p<.000***)	a>b=c
Sit in a row	24.7%	36.1%	16.2%	7.7 (p<.000***)	b>a=c
Avoid gatherings of 10 or more people	64.2%	19.3%	6.8%	96.5 (p<.000***)	a>b>c

* p<.05, **p<.01, *** p<.001

p=.004). Moreover, an increase in age by one year showed a significant increase (1.066 times) in the level of trust in healthcare facilities regarding COVID-19 diagnosis (aOR= 1.005-1.130, 95% CI: [1.005-1.130], *p*=.034).

As compared to the respondents with just one household family member, the level of trust in healthcare facilities regarding COVID-19 diagnosis was significantly lower by .359 in those with two household family members (aOR=.359, 95% CI: [.145-.891, *p*=.027]) and by .392 times in those with ≥ 6 household family members (aOR=.395, 95% CI: [.165-.928], *p*=.033).

The level of trust in healthcare facilities regarding COVID-19 diagnosis was significantly higher by 2.872 times in respondents who had healthcare utilization experience within the past 14 days than those who had not (aOR=2.872, 95% CI: [1.256-6.569], *p*=.012). Moreover, the level of trust in healthcare facilities regarding COVID-19 diagnosis was significantly higher by 1.831 times in respondents who had proper knowledge of the COVID-19 infection route, specifically, knowledge of all route of droplets, contaminated

Table 3: Logistic analysis on level of trust in healthcare facilities (hospitals) regarding COVID-19 diagnosis

Variable	Model 1 Crude OR (95% CI)	*p*-value	Model 2 Adjust OR (95% CI)	*p*-value
Country				
Ethiopia	1		1	
DR Congo	3.302 [2.113-5.161]	<.001***	3.129 [1.884-5.196]	<.001***
South Korea	18.232 [10.543-31.530]	<.001***	29.137 [13.869-61.210]	<.001***
Gender				
Male	1		1	
Female	1.264 [.884-1.807]	.200	.932 [.585-1.483]	.765
Marital status				
Not married	1		1	
Married	3.474 [2.093-5.764]	<.001***	3.091 [1.444-6.615]	.004**
Age	.957 [.925-.990]	.011*	1.066 [1.005-1.130]	.034*
Number of household family members				
1	1		1	
2	.299 [.138-.648]	.002**	.359 [.145-.891]	.027*
3-5	.793 [.409-1.537]	.793	.481 [.219-1.061]	.070
≥ 6	.348 [.167-.727]	.005**	.392 [.165-.928]	.033*
Chronic disease				
No	1		1	
Yes	.857 [.487-1.510]	.593	.833 [.413-1.681]	.610
Insurance status				
No	1		1	
Yes	3.061 [2.003-4.679]	<.001***	1.357 [.745-2.473]	.319
Healthcare utilization experience (within 14 days)				
No	1		1	
Yes	3.675 [1.741-7.756]	.001**	2.872 [1.256-6.569]	.012*
Knowledge about COVID-19 infection (number of items)				
< 3	1		1	
= 3 (all correct)	1.512 [1.034-2.212]	.033*	1.831 [1.157-2.898]	.010*
COVID-19-related information acquisition (number of items)				
Not all confirmed	1		1	
Confirmed patients, deaths, and recovered patients all confirmed	1.130 [.588-2.170]	.715	1.527 [.676-3.446]	.308
Practice of COVID-19 prevention measures				
Practice ≥3 measures	1		1	
Practice <3 measures	1.248 [.801-1.945]	.327	1.891 [1.083-3.303]	.025*
Constant term			.012	
Nagelkerke			.367	
Cox & Snell R2			.240	

* p<.05, **<p<.01, ***<0<.001

objects, and airborne transmission, than those who did not (aOR=1.831, 95% CI: [1.157-2.898], *p*=.010).

When the respondents were asked nine questions pertaining to preventive measures recommended by the WHO and CDC for COVID-19 prevention, the results showed that the level of trust in healthcare facilities regarding COVID-19 diagnosis was significantly higher by 1.891 times in respondents who practiced <3 such measures than those who practiced ≥3 (aOR=1.891, 95% CI: [1.083-3.303], *p*=.025).

Discussion

The characteristics of the respondents from Ethiopia, DRC, and South Korea were analyzed by ANOVA and Tukey's HSD post-hoc test. The results showed that Ethiopia and DRC belonged to the same group for all respondent characteristics, except sex, whereas South Korea was found to be an independent group. It is believed that such differences in personal characteristics are due to differences between continental characteristics in Africa and Asia[20].

With respect to sex, the percentage of females in South Korea and DRC was 58.1% and 52.6%, respectively. On the other hand, Ethiopia had a higher percentage of males (65.7%) than females. With respect to marital status, the percentage of respondents who are not married was higher in South Korea (96.8%) than Ethiopia (84.0%) and DRC (82.7%). The mean age of the South Korean population is 31.3 years, which is higher than that of Ethiopia (17.1 years) and DRC (18.7 years). However, the mean age of respondents from South Korea in the present study was 22.9 years, which was lower than that of Ethiopia (26.0 years) and DRC (26.1 years). This may have been the reason why the percentage of unmarried respondents was higher[21-23]. Moreover, the younger age of the respondents from South Korea compared with Ethiopia and DRC may be reflected by the age of smartphone users. The percentage of smartphone users among people aged ≥ 20 years in South Korea is 95%, among the highest in the world, while the percentage for Ethiopia (34%) and DRC (20%) is lower[24].

The level of trust in healthcare facilities regarding COVID-19 diagnosis was: South Korea (94.1%), DRC (74.2%), and Ethiopia (46.6%) Tukey's post-hoc test results confirmed that all three countries were statistically independent. Previous studies also confirmed that level of trust in healthcare facilities was high in South Korea[25-27]; therefore, South Korean patients suspected of COVID-19 were more likely to visit hospitals for screening in a timely manner[5]. On the other hand, the level of trust in healthcare facilities in DRC (74.2%) and Ethiopia (46.6%) was lower. Such findings were similar to 62.4% for DRC and 34.4% for Ethiopia reported in a previous study[28]. The logistic regression analysis results in the present study showed that the level of trust was significant higher, by 29.137 times, in South Korea than Ethiopia (aOR=29.137, 95% CI: [13.869-61.210], p<.000) and by 3.129 times in DRC than Ethiopia (aOR=3.129, 95% CI: [1.884-5.196], p<.000).

With respect to healthcare utilization experience (within the past 14 days), physician examination, hospitalization, COVID-19 testing, and self-isolation were all higher in DRC than South Korea and Ethiopia. In particular, physician examination and hospitalization experience were significantly higher in DRC than the other two countries. These results could be interpreted as DRC having more people visiting a hospital for COVID-19, but the results may also reflect the personal opinions of the respondents about physicians and inpatient facilities. According to previous studies, the healthcare utilization rate in DRC was higher than in other African countries because health center branches, health centers, private clinics, and traditional clinics were all seen as hospitals and all medical personnel in those facilities were viewed as physicians[29,30].

With respect to knowledge about the COVID-10 infection route, the percentage of respondents who correctly responded that airborne transmission is possible was 63.4% in DRC, which was significantly higher than in South Korea (53.5%) and Ethiopia (48.1%). Currently, DRC is disseminating information about the mode of transmission and prevention methods through mass media campaigns for COVID-19 prevention. DRC has a better information delivery system than other countries for disseminating information about COVID-19 due to its previous experience in responding to the spread of Ebola[31]. On the other hand, South Korea had a higher practice than Ethiopia and DRC in eight of the nine COVID-19 prevention measures. This is attributed to South Korea's good Internet environment, high smartphone user rate, high information accessibility, and COVID-19 notification system that was a result of the cooperation between the government and telecommunication companies[32].

Respondents' adherence to the mandatory masks was significantly different: South Korea (85.1%), Ethiopia (44.2%), and DRC (21.7%). The post-hoc results confirmed that all three countries were significantly independent. According to previous studies, wearing a mask can prevent infection by 60%, and thus, masks are essential preventive equipment for preventing COVID-19[33]. Currently, there is a shortage of masks worldwide, but as Africa lacks the capacity to produce masks, this may signify problems with respect to preventing COVID-19[34-37].

DRC showed higher levels of recent healthcare utilization experience and awareness of COVID-19 patient information than the other two

countries, but it had the lowest rate of practicing COVID-19 prevention measures. The results may have been affected by various factors, including poor Internet and network environment, poor accessibility to information and knowledge, and poor health knowledge. The Internet in DRC is managed by the government, which makes access to objective information very difficult[38], and accessibility to information and knowledge is poor. Previous studies on Ebola cases have shown that DRC is ranked among the countries in Africa with the lowest health knowledge; this may have influenced its practice of prevention measures[39].

Level of trust in healthcare facilities regarding COVID-19 diagnosis was higher by 29.137 times in South Korea than Ethiopia and by 3.129 times in DRC than Ethiopia. The low trust in healthcare facilities in Ethiopia is related to support of donor agencies and the unstable public education system[40]. Ethiopia ranks first in Africa in the size of donor agency funds; international organizations and donor agencies are also pursuing various healthcare interventions, including healthcare facilities and health education. Accordingly, people of Ethiopia have greater trust in facilities and education provided by donor agencies over public healthcare facilities[40].

Respondents who had knowledge of COVID-19 infection had significantly higher levels of trust in physicians—higher by 1.831 times. The WHO emphasizes the dire need for health education in Africa, highlighting the utilization of community health workers due to lack of healthcare personnel. According to a qualitative study on public health education in Ethiopia, inadequate public health training decreased the Ethiopian public's trust in public healthcare facilities[41]. The respondents in the present study who practiced <3 prevention measures showed significantly higher levels of trust in healthcare facilities regarding COVID-19 diagnosis, higher by 1.891 times, than those who practiced ≥3 prevention measures (aOR=1.891, 95% CI: [1.083-3.303], p=.025). These results indicate the need for proper health training and education for practicing prevention measures for COVID-19 in Africa; furthermore, prevention measures are a means of prevention while there is the need to conduct education on the importance of and need to trust healthcare facilities.

Limitations in the present study included the following. First, the present study chose an online questionnaire design to conduct the survey on COVID-19 in a timely manner since the outbreak of COVID-19. As online surveys are based on non-probability sampling method, there are limitations of selecting highly representative respondents. The present study took into consideration geographic differences between the countries, time constraints, and efficiency of response during the COVID-19 pandemic. It would be necessary for future studies to conduct face-to-face interviews with more diverse age groups.

Conclusion

The first objective of the present study was to identify differences in levels of trust in COVID-19 diagnosis, recent healthcare utilization experience, and COVID-19-related knowledge, information, and prevention practice in South Korea, Ethiopia, and DRC. DRC showed more frequent healthcare utilization experiences and COVID-19-related knowledge and information than South Korea and Ethiopia. However, it was lowest in the nine items on practicing COVID-19 prevention measures. In covering coughs and sneezes and avoiding gatherings of 10 or more people, DRC was 10 times lower than South Korea.

The second objective was to identify the factors influencing levels of trust in healthcare facilities regarding COVID-19 diagnosis. Logistic regression analysis results showed that the level of trust in healthcare facilities was 29.137 times higher in South Korea and 3.129 times higher in DRC than Ethiopia. Moreover, respondents who had more information about COVID-19 showed higher a level of trust in healthcare facilities, and respondents who practiced more COVID-19 prevention measures showed a lower level of trust in healthcare facilities. Accordingly, it is necessary to expand health education for proper information about COVID-19 through Health Extension Worker (HEW) in Ethiopia and Relais Communautaire (RECO) in DR Congo.

Ethical Approval

This study was approved by the Yonsei University Wonju Institutional Review Board (no. 1041849-202004-SB-043-01) in Korea. Informed consent was obtained from each respondent before information was collected.

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Contribution of Authors

HC Lee and EW Nam designed the study. HC Lee, SJ Moon, Grace ON and EW Nam developed the online questionnaire. SJ Moon developed the mobile survey on Google forms. All authors participated in the data collection. HC Lee analyzed data and prepared the manuscripts. HC Lee conducted the primary data analysis and prepared the manuscript. EW Nam advised on all the processes of the article's development, from design to submission. All the authors approved the final draft for submission and the revised draft.

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