RESEARCH ARTICLE

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Evaluation of Turkish Validity and Reliability of Knowledge, Attitude, Practice and Perceived Barriers in Infection Control Questionnaire among Emergency Healthcare Professionals regarding COVID-19

ABSTRACT

Objective: Determination of deficiencies in knowledge, attitude, practice (KAP) and perceived barriers in infection control among healthcare professionals (HCP) is important for fighting against epidemics. This study aims to conduct Turkish validity and reliability of the "KAP and Perceived Barriers in Infection Control" among HCP and to evaluate the study group.

Methods: This is a methodological, cross-sectional study conducted among emergency HCP during the 12-24th week of the pandemic. The questionnaire was applied online and consisted of sociodemographic characteristics, COVID-19 KAP and perceived barriers in infection control questionnaire. In first stage of the study, to evaluate the Turkish reliability-validity of the questionnaire, this study was conducted among 177 HCP. In the second stage, it was aimed to reach the whole group which was consisted of 307 (73.1%) HCP.

Results: The Cronbach's alpha values of the sub-dimensions were calculated as 0.68-0.90 and factor loads as 0.38-0.88. Knowledge level of those with associate and higher degree was found to be superior. Those who had university or higher education degree, paramedics indicated more positive attitude. It was observed that female compared to male, emergency medical technicians compared to other occupational groups had better practice level. Moreover, those who had an associate or higher degree; those who had 6-10 years working experience; those who did not experience COVID-19 symptoms had better practice level ($p<0.05$).

Conclusions: The questionnaire is a valid-reliable measurement tool. In Turkey, it was observed that HCP had better knowledge and practice than average however deficiencies were found in all sub-dimensions.

Keywords: COVID-19, Knowledge, Attitude, Practice, Healthcare Professionals.

Acil Sağlık Çalışanlarında COVID-19 Hakkında Bilgi, Tutum, Beceri ve Enfeksiyon Kontrolünde Algılanan Engeller Düzeyinin Belirlenmesi

ÖZET

Amaç: Sağlık çalışanlarında bilgi, tutum, beceri ve enfeksiyon kontrolünde algılanan engeller konusunda eksikliklerin belirlenmesi salgınlarla mücadelede önem taşımaktadır. Çalışmada acil sağlık çalışanlarında "COVID-19 Hakkında Bilgi, Tutum ve Beceri ve Enfeksiyon kontrolünde algılanan engel" anketinin Türkçe geçerlik-güvenirlik çalışmasının yapılması ve çalışma grubunun ankete göre değerlendirilmesi amaçlandı.

Gereç ve Yöntem: Çalışma, COVID-19 pandemisinin 12-24.haftasında acil sağlık çalışanlarında gerçekleştirilen metadolojik ve kesitsel tipte bir araştırmadır. Anket form, kişilerin sosyodemografik özellikleri, COVID-19 bilgi, tutum, beceri ve enfeksiyon kontrolünde algılanan engeller anketinden oluşmakta olup online uygulandı. Çalışmanın ilk aşaması, anket formun Türkçe geçerlik-güvenirliğini değerlendirmek için anket madde sayısı dikkate alınarak 177 sağlık çalışanında gerçekleştirildi. İkinci aşamada ise çalışma grubunun tümüne ulaşılması hedeflenmiş olup 307(%73.1) sağlık çalışanına ulaşıldı.

Bulgular: Anketin güvenirlik geçerlilik analizleri sonuçlarına göre alt boyutların Cronbach alfa değerleri 0.68-0.90 ve faktör yükleri 0.38-0.88 olarak hesaplandı. COVID-19 bilgi düzeyi yüksekokul ve üzeri öğrenime sahip olanlarda daha yüksekti. Üniversite ve üzeri öğrenim derecesine sahip olanlar ve paramedikler daha olumlu bir tutum sergiledi. Kadınlar erkeklere göre, acil tıp teknisyenleri diğer meslek gruplarına göre daha iyi uygulama düzeyine sahipti. Ayrıca, yüksek okul ve üzeri öğrenime sahip olanlar; 6-10 yıl iş tecrübesi olanlar; COVID-19 semptomlarını yaşamayanlar daha iyi beceri düzeyine sahipti ($p<0.05$).

Sonuç: Sonuç olarak anket geçerli ve güvenilir bir ölçme aracıdır. Türkiye'de sağlık çalışanları ortalamaya göre iyi bilgi ve beceri düzeyine sahip olmakla birlikte bilgi, tutum ve beceri ve enfeksiyon kontrolünde algılanan engeller açısından eksiklikler bulundu.

Anahtar Kelimeler: COVID-19, Bilgi, Tutum, Beceri, Sağlık Çalışanları.

INTRODUCTION

Similar to previous epidemics in the world, it had been observed that healthcare professionals (HCP) were in serious danger during COVID-19 pandemic (1). It was reported that COVID-19 positivity among HCP during the pandemic had varied between 3.5-38% (2-5). In Turkey in December 2020; out of 1,9 million COVID-19 cases 120.000 of them were HCP and 375 of them lost their lives (6,7). One of the most important problems faced by HCP during the pandemic was the risk of getting infection and causing the infection to spread unconsciously (8). The risk of infection in HCP increased due to reasons such as the need to stay together with infected patients for a long time and provide care, lack of knowledge about infection prevention and control, long working hours and excessive fatigue.

Emergency HCP had a higher risk of outbreaks compared to other HCP (9). The emergency HCP are responsible for providing emergency care from the notification of the emergency to the delivery of the definitive treatment. Delivery of emergency health services requires intervention in the patient's environment, and then patient transfer by ambulance if necessary. The risk of emergency HCP increases in terms of COVID-19 since they need to conduct rapid intervention to the patient in their own location and to stay in ambulance which is a closed and narrow environment. During COVID-19 and similar epidemics, in order to ensure continuous emergency reception and care; knowledge level, attitude and practice of emergency HCP at the front line should also be high (10). At this point, HCP who had the first contact with the patient should have sufficient knowledge and practices about disease characteristics, mode of transmission and risks, protective measures, compliance with guidelines, and risk controls (11, 12).

Examining the knowledge, attitude and practice of HCP and perceived barriers to infection control help to reveal the situation; to understand the deficiencies and possible risk factors and determine the effective interventions in the fight against future epidemic (13). Although, there are questionnaire form development studies in determining the knowledge, attitude and practice of HCP about the pandemic, there is no accepted questionnaire form yet. It was aimed to adapt the questionnaire named "Knowledge, attitude, practice and perceived barriers among healthcare professionals regarding COVID-19", which was first published in the international literature on April 17, 2020,to Turkish; then to conduct a reliability and validity study and to evaluate the group in terms of these characteristics.

MATERIAL AND METHODS

This study is a methodological and cross-sectional research conducted among pre-hospital emergency HCP during the 12-24th week of the COVID-19 pandemic (when the first wave started to decline), in Eskişehir which is a city of middle Anatolia region.

Working Group and Design: Eskişehir 112 Provincial Ambulance Service consisted of total of 36 Emergency Health Services Stations; 21 of which were in the city center and 15 of them were in peripheral districts. In addition, it comprised of a Command Control Center and 420 health personnel. The study was executed in two stages. In the first stage of the study, considering item number in the questionnaire, it was aimed to reach 177 people in order to evaluate the Turkish reliability and validity of the questionnaire (14). In the second stage, it was objected to reach the whole study group and 307 (73.1%) HCP were reached in order to determine the knowledge, attitude, practice and perceived barriers in infection control among emergency healthcare professionals regarding COVID-19. There was no difference between the two groups in terms of age and gender distribution.

Permissions: Permission was obtained from the author to translate the questionnaire into Turkish. Necessary permissions and ethical committee approval were obtained from official institutions in order to conduct the study.

Data Collection Tools: In the study, a questionnaire form was prepared by benefiting from the literature in order to collect data. The questionnaire consisted of socio-demographic characteristics (age, gender, marital status, etc.) and COVID-19 related factors, COVID-19 knowledge, attitudes, practices and perceived barriers in infection control. The questionnaire named "Knowledge, attitude, practice and perceived barriers among healthcare professionals regarding COVID-19" had four subdimensions as 'Knowledge of HCP regarding COVID -19', Attitude of HCP regarding COVID-19" and "Practice among HCP regarding COVID-19"and "Barriers in infection control practice perceived by healthcare professionals regarding COVID-19". In the original form of the questionnaire consisted of 14 questions of knowledge, 7 questions of attitude, 6 questions of practice, and 8 questions of perceived barriers in infection control and the Cronbach alpha value was reported as 0.77 (14). Due to the pandemic, data in the study group were collected online. The questionnaire was sent to the working group three times and was encouraged by verbal warnings.

Turkish Validity and Reliability of Knowledge, Attitude and Practice and Perceived Barriers Questionnaire among healthcare professionals regarding COVID-19: The

questionnaire was translated into Turkish by two independent foreign language experts in accordance with the translation-back translation method due to the adaptation of the questionnaire from different languages and cultures, and it was translated back into English by another linguist. The Turkish form, which was created by comparing all forms, was evaluated with expert opinion for content validity. The content validity rate of the questionnaire, which was evaluated by eight experts to determine its suitability and comprehensibility, ranged from 0.8 to 1.0, and the content validity index was found to be 0.95. Exploratory factor analysis (EFA) was used to determine the construct validity. Kaiser Meyer Olkin and Barlett test values were determined accordingly. Internal consistency (Cronbach alpha) and Interclass Correlation (ICC) analyzes were used to evaluate the reliability of the questionnaire. Items with a factor load greater than 0.30 and total item correlations greater than 0.20 were accepted as reliable (15). Cronbach alpha coefficient above 0.60 was considered reliable (16).

Knowledge questions consisted of 8 items and each question was answered as "Yes, No and I don't know". One question (Eighth question) was reverse coded. Correct answer was scored as "2", I don't know as "1", wrong answer as "0". The score that could be obtained from the knowledge sub-dimension varied between 0 and 16. The higher the score, the higher the knowledge level was accepted.

Attitude questions consisted of 7 items and the answer of each item was scored in a 5-point Likert format ranging from “1 point” to “I strongly agree” and “5 points to absolutely disagree”. The total score ranged from 7-35, with an overall lower score indicating a positive attitude towards COVID-19.

Practice Questions of Healthcare Professionals on COVID-19 consisted of 5 items and each item would be answered as yes "2 points", sometimes "1 point" and no "0 points". The total score ranged from 0 to 10, the higher the score was, the better the practice level was considered.

The perceived barriers sub-dimension in the infection control application consisted of 8 questions and the answer of each item was scored in a 5-point Likert format ranging from "strongly agree" "5 points" to "strongly disagree" "1 point". For the sub-dimension of perceived barriers in infection control, it ranged between 8 and 40 points, indicating that the perceived barriers increased as the score increased.

Data Analyzes: The data obtained were transferred to the computer environment and evaluated in the SPSS (Version 15.0) statistical package program, and $p<0.05$ was accepted as the statistical significance value. Number, percentage, mean and standard deviation values were used in the evaluation of descriptive data. The compliance of the data to normal distribution was evaluated with the Kolmogrov-Smirnov and Shapiro-Wilk tests. Mann-Whitney U and Kruskal Wallis tests were used in the evaluation of knowledge, attitude and practices, since the data did not indicate a normal distribution.

RESULTS

62.5% (n=199) of the 307 HCP reached in the cross-sectional phase of the study were women and the mean age±SD (min-max) was 32.1±6.9 (20-60) years. 54.4% of the individuals in the study group were emergency medical technicians, 33.2% were paramedic, 12.4% were in the other profession groups. (midwife, medical secretary…).

Evaluation of Turkish Validity and Reliability of Knowledge, Attitude, Practice and Perceived Barriers in Infection Control Questionnaire: It was determined that the item to which the participants in the study group gave the most correct answer in the knowledge sub-dimension was "Coronavirus infection could be fatal" with 99.3% correct answers. It was determined that the attitude question that the people in study group most participated was ‘COVID-19 patients should be kept in isolation" with 80.8%". It was observed that the question ‘Do you use soap or hand sanitizer to wash your hands continuously’ was the question which was most answered ‘Yes’ with 99.7% by the participants in the study group. It was monitored that ‘Overcrowding in the emergency department is an obstacle in infection control practice." was the perceived barriers in infection control subdimension question to which the participant individuals in the study group agreed more with 59.3%. Explatory factor analysis results and percentage of participation for items of "COVID-19 KAP and perceived barriers in infection control questionnaire" was indicated in Table 1.

The scores the participants obtained from the knowledge sub-dimension ranged from 5 to 16, with an average of 14.7 ± 1.8, and a median of 16.0. Their scores from the attitude sub-dimension ranged from 7 to 33, with a mean of 11.9 ± 3.6, and a median of 12. The scores they got from the practice sub-dimension ranged from 1 to 10, with an average of 9.5 ± 1.1 and a median of 10. The scores obtained from the subscale of perceived barriers in infection control practices in HCP ranged from 8 to 40, with an average of 34.8 ± 5.2 and a median value of 36.

The median score obtained from the COVID-19 knowledge level sub-dimension was higher in those with associate or higher education than those with high school level ($p = 0.001$). Those with university and higher education level indicated more positive attitude than those with high school and college education ($p=0.009$). In addition, paramedics showed more positive attitude than EMT and other professions ($p=0.019$). Female compared to male ($p=0.013$), those with college and higher education compared with high school graduates ($p=0.001$); EMT compared with people

Table 1. Explatory factor analysis results and percentage of participation for items of "COVID-19 KAP and perceived barriers in infection control questionnaire"

Knowledge among Healthcare Professionals About COVID-19	**Factor load**	**Item total correlation value**	**Cronbach alfa if deleted item**	**Percentage of correct answers (%)**
1.COVID-19 is a viral infection. COVID-19 viral bir enfeksiyondur.	0.562	0.348	0.652	92.1
2.Coronavirus infection could be fatal. Koronavirüs enfeksiyonu ölümcül seyredebilir.	0.378	0.259	0.682	99.3
3.Incubation period for virüs is 2-14 days. İnkübasyon periyodu 2-14 gündür.	0.501	0.323	0.659	95.8
4.Polymerase chin reaction (PCR) can be used to diagnose COVID-19. Polimeraz zincir reaksiyonu (PCR) COVID-19 tespiti için kullanılabilir.	0.584	0.443	0.632	82.4
5.People with comorbidity like diabetes and hypertension are more likely to be infected. Diyabet ve hipertansiyon gibi komorbiditesi olan kişiler için daha risklidir.	0.517	0.369	0.651	95.8
6.COVID-19 spreads through close contact like caring and/or living with infected people. COVID-19, enfekte kişilere bakım verme ve/veya onlarla yakın temasta bulunma yoluyla yayılır.	0.706	0.514	0.609	82.1
7.COVID-19 patients develop severe acute respiratory illness. COVID-19 hastalarında ciddi akut solunum yolu hastalığı gelişir.	0.568	0.391	0.640	88.6
8. Influenza vaccine also gives protection from COVID-19. İnfluenza aşısı COVID-19 için de koruyucudur.	0.660	0.456	0.622	70.7
				Cronbach alpha value: 0.68 **Total variance explained: 32.2%**
Attitude among Healthcare Professionals About COVID-19	**Factor load**	**Item total correlation value**	**Cronbach alfa if deleted item**	**Percentage of "Strongly agree" answers (%)**
1. Gowns, gloves, mask and goggles must be used when dealing with COVID-19 patients? COVID-19 hastalarıyla uğraşırken önlük, eldiven, maske ve gözlük kullanılmalıdır.	0.684	0.516	0.791	80.1
2. COVID-19 patients should be kept in isolation? COVID-19 hastaları izolasyonda tutulmalıdır.	0.823	0.669	0.766	80.8
3. Intensive and Emergency treatment should be given to diagnosed patients. Tanı konulan hastalara yoğun ve acil tedavi uygulanmalıdır.	0.588	0.461	0.805	40.1
4. Prevalence of COVID-19 can be reduced by active participation of healthcare workers in the hospital infection control program? COVID-19 sıklığı, sağlık çalışanlarının enfeksiyon hastalıklarından korunma ve kontrol programına aktif katılımı ile azaltılabilir.	0.508	0.401	0.820	21.2
5. Any related information about COVID-19 should be disseminated among healthcare workers? COVID-19 ile ilgili her türlü bilgi sağlık çalışanları arasında yaygınlaştırılmalıdır.	0.802	0.675	0.766	50.8
6. Transmission of COVID-19 infection can be prevented by using universal precautions given by WHO, CDC? COVID-19 enfeksiyonunun bulaşması, Dünya Sağlık Örgütü (WHO), Hastalık Önleme ve Kontrol Merkezi (CDC) tarafından verilen evrensel önlemler kullanılarak önlenebilir.	0.637	0.523	0.789	28.3
7. Healthcare workers must acknowledge themselves with all the information about COVID-19? Sağlık çalışanları COVID-19 hakkındaki tüm bilgileri edindiklerinden emin olmalıdır.	0.859	0.727	0.758	50.8
				Cronbach alpha value: 0.81 **Total variance explained: 50.5%**

Practice of healthcare professionals toward COVID-19	Factor load	Item total correlation value	Cronbach alfa if deleted item	Percentage of "Yes" answers (%)
1. Do you use soap or hand sanitizer to wash your hands continuously? Ellerinizi sürekli yıkamak için sabun veya el dezenfektanı kullanıyor musunuz?	0.586	0.384	0.752	99.7
2. Do you cover your nose and mouth with a tissue during sneezing or coughing? Hapşırma veya öksürme sırasında burnunuzu ve ağzınızı bir mendille kapatıyor musunuz?	0.623	0.466	0.717	87.9
3. Do you throw the used tissue in the trash? Kullanılmış peçeteleri çöp kutusuna atıyor musunuz?	0.850	0.649	0.645	96.4
4. Do you avoid touching your eyes, nose or mouth as far as you can? Gözlerinize, burnunuza veya ağzınıza dokunmaktan olabildiğince kaçınır mısınız?	0.660	0.489	0.822	81.1
5. Do you use face mask in crowds? Kalabalık içinde yüz maskesi kullanıyor musunuz?	0.877	0.704	0.624	96.1
				Cronbach alpha value: 0.74 **Total variance explained: 53.2%**
Perceived barriers to infection control practice	**Factor load**	**Item total correlation value**	**Cronbach alfa if deleted item**	**Percentage of "Strongly agree" answers**
1. Lack of knowledge about the mode of transmission of the disease COVID19? COVID-19 bulaşma şekli hakkında bilgi eksikliğimin olması enfeksiyon kontrolünde engeldir.	0.608	0.525	0.901	38.8
2. Not wearing mask while examine or contact with the patient? Hastayı muayene ederken veya hastayla temas halindeyken maske takmamak enfeksiyon kontrolünde engeldir.	0.681	0.617	0.896	57.7
3. Limitation of infection control material? Enfeksiyon kontrol materyallerinin sınırlı olması enfeksiyon kontrolünde engeldir.	0.859	0.776	0.876	52.1
4. No hand washing after examine or contact with the patient? Muayene veya hastayla temas ettikten sonra el yıkamama enfeksiyon kontrolünde engeldir.	0.768	0.691	0.884	57.3
5. Lack of policy and Procedures of infection control Practice? Enfeksiyon kontrol uygulamasında politika ve prosedür eksikliği enfeksiyon kontrolünde engeldir.	0.865	0.797	0.874	47.9
6. Insufficient training in infection control measurements? Enfeksiyon kontrol önlemlerinde yetersiz eğitim enfeksiyon kontrolünde engeldir.	0.839	0.752	0.879	51.8
7. Less commitment of health care workers to the policies and procedures? Sağlık çalışanlarının politika ve prosedürlere daha az bağlılığı enfeksiyon kontrolünde engeldir.	0.782	0.699	0.883	45.6
8. Overcrowding in Emergency room is also a barrier in infection control practice? Acil serviste aşırı kalabalıklaşmanın enfeksiyon kontrol uygulamasında bir engeldir.	0.841	0.752	0.882	59.3
				Cronbach alpha value: 0.90 **Total variance explained: 61.6%**

Table 2. The distribution of the points that healthcare professionals obtained from knowledge, attitude, practice and perceived barriers in infection control questionnaire about COVID-19

Sociodemographic characteristics and related factors	Knowledge		Attitude		Practice		Perceived barriers in infection control	
	Median (Min-Max)	Test Degree (p)	Median (Min-Max)	Test Degree (p)	Median (Min-Max)	Test Degree (p)	Median (Min-Max)	Test Degree (p)
Age group								
20-24	15(8-16)	0.455	12(7-16)	0.663	10(1-10)	0.696	37(26-40)	0.281
25-44	16(5-16)		12(7-33)		10(2-10)		36(8-40)	
45-60	16(6-16)		11(7-17)		10(7-10)		36(19-40)	
Gender								
Female	16(7-16)	0.313	12(7-33)	0.995	10(3-10)	**0.013**	35(8-40)	0.287
Male	16(5-16)		12(7-16)		10(1-10)		37(10-40)	
Education level								
Highschool	14(5-16)	**0.001**	13(7-33)	**0.009**	9(1-10)	**0.001**	32(10-40)	**0.002**
Associate degree	16(11-16)		12(7-33)		10(6-10)		34(8-40)	
University and above	16(10-16)		11(7-19)		10(6-10)		38(19-40)	
Occupation								
Paramedic	15(10-16)	0.334	11(7-33)	**0.019**	10(6-10)	**0.027**	36(20-40)	0.138
Emergency Medical Technician	15(5-16)		12(7-33)		10(1-10)		34(8-40)	
Others	16(6-16)		12(7-17)		10.0(7.0-10.0)		38(19-40)	
Working time (year)								
0-5	15(6-16)	0.428	12(7-19)	0.623	10(1-10)	**0.019**	38(19-40)	0.101
6-10	16(7-16)		12(7-31)		10(3-10)		38(19-40)	
11 and above	16(5-16)		12(7-33)		10(2-10)		36(8-40)	
Experiencing symptoms of COVID-19								
No	15(5-16)	0.255	12(7-33)	0.187	10(1-10)	**0.015**	36(8-40)	0.814
Yes	16(5-16)		14(7-17)		9(7-10)		38(28-40)	
Have COVID-19 test								
No	15(6-16)	0.796	12(7-33)	0.720	10(2-10)	0.520	34(10-40)	0.596
Yes	16(5-16)		12(7-33)		10(1-10)		36(8-40)	
If a relative has been diagnosed with COVID-19								
No	15(5-16)	0.135	12(7-17)	0.656	10(1-10)	0.336	35(7-40)	0.099
Yes	15(5-16)		12(7-33)		10(7-10)		39(29-40)	
Total	16(5-16)		12(7-33)		10(1-10)		36(8-40)	

from other professions (p=0.027), those with 6-10 years working experience compared with people with 11 and higher experience (p=0.019), people who did not live COVID-19 symptoms compared with people who lived (p=0.015) were observed to have better practice level. The distribution of the points that HCP obtained from the knowledge, attitude and practice and perceived barriers in infection control questionnaire about COVID-19 were indicated in Table 2. The most preferred source of information was the Ministry of Health (84.6%), followed by expert and colleague opinions (61.8%) and radio and television (58.3%) in the third place. The distribution of information sources preferred by the individuals in the study group was demonstrated in Figure 1.

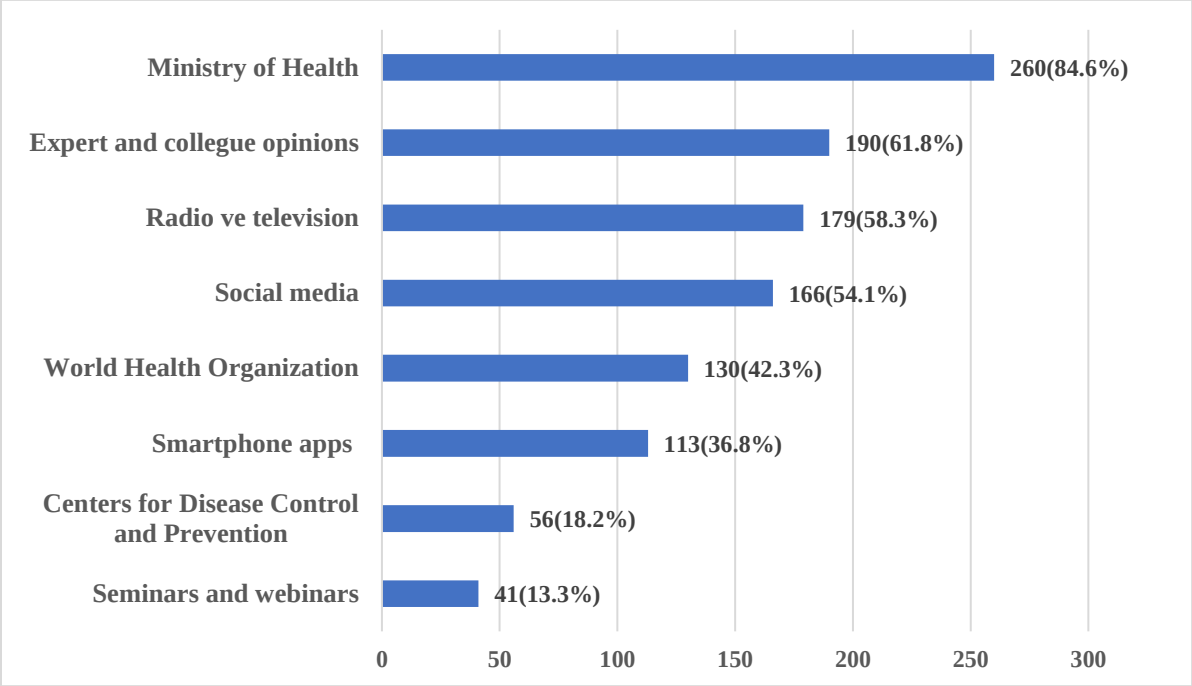

Figure 1. The distribution of information sources preferred by the individuals in the study group(* Percentages are based on the number of people.)

DISCUSSION

In the study knowledge, attitude, practice, and perceived barriers to infection control regarding COVID-19 for HCP Turkey was conducted in a comprehensive way to evaluate the reliability and validity of an internationally recognized questionnaire. Improving the level of knowledge, attitudes and practices about COVID-19 in the working processes of the COVID-19 pandemic among HCP is imperative to protect both their own health and the health of patients. Moreover, in the ongoing pandemic and possible future pandemic situations, HCP should carefully follow the infection control measures and follow up-to-date information in implementing the diagnosis and treatment processes and put this information into practice. Healthcare professionals, whose awareness has increased, will significantly affect the society and contribute to the protection and development of health (15).

In the study, the Cronbach's alpha coefficient was determined as 0.68 for knowledge, 0.81 for attitude, 0.73 for practice, and 0.91 for perceived barriers in infection control, and it was sufficient (16). The Cronbach alpha value of the original questionnaire was reported as 0.77. The total Cronbach alpha value in the study was determined as 0.70. Relative differences may have been observed due to the difference in sample size and the extracted items. The fact that the total correlation values of the items in the questionnaire form were greater than 0.20 indicated that the items were reliable (16).

In the validity analysis, a structure consisting of four different dimensions including knowledge, attitude, practice and perceived barriers in infection control was revealed in EFA. The total variance was 32.2% for knowledge, 50.5% for attitude, 53.2% for skills, and 61.6% for perceived barriers in infection control. In the studies conducted, it was known that the total variance over 30% was an adequate criterion (17). In questionnaire adaptation studies, if the factor loadings were not below 0.30 after EFA was performed, it indicated that the questionnaire form had sufficient factor load (18).

As a result of the factor analysis, six items were removed from the knowledge sub-dimension and one item from the practice sub-dimension. As a result, knowledge was composed of 8 items, attitude 7, skill 5, and perceived barriers in infection control 8 items and were evaluated as sufficient. In the extraction of the items, it was

effective to bring new information about COVID-19 related to the original questionnaire developed in April to the literature. "Vaccination of coronavirus disease is available", "Special caution must be taken if a person presents with symptoms of COVID-19 travelled from infected area?" the accuracy of the items had changed during the course of the pandemic. This may have played a role in the removal of these items.

Approximately 70% of the participants in the study group obtained points above average from the knowledge sub-dimension of the questionnaire. In the original study, it was reported that 93.2% of the HCP had a good level of knowledge (19). In a study conducted by Nemati et al. in Iran it was reported that 89,5% of HCP had sufficient level of knowledge. In addition, the study executed by Giao et al. and Zhang et al. in China indicated this ratio as 89,0% (20-22). In a study conducted in Indonesia, it was reported that 51.7% of HCP had good knowledge about COVID-19 (23). In a study realized by Kadoya et al. in Japan, it was reported that especially non-physician HCP had insufficient knowledge (24). Another study conducted in Uganda; it was reported that 69% of the HCP had sufficient knowledge level (25). In a study executed with HCP in Nepal, it was reported that good knowledge level was found with a frequency of 82.2% (26, 27). The study conducted by Ayinde et al. among HCP in Nigeria the frequency of good knowledge was reported as 78.6% (28). As expected in the study, the median score obtained from the COVID-19 knowledge level sub-dimension was found to be higher in those with associate degree and university degrees than those with high school education.

In this study, it was determined that 58.6% of the HCP indicated a more positive attitude than the average. The average score of the individuals in the study group (11.9) was higher than the original study (8.43) (19). Olum et al. reported that 21% of HCP had a positive attitude towards COVID-19 (25). Moreover, Nepal et al. reported that 90.9% of HCP had a positive attitude (27). The frequency of positive attitudes among HCP in Nigeria had been reported as 64% (26). In this study, those with university and higher education level demonstrated more positive attitude than those with high school and associate education level. In addition, paramedics indicated more positive attitude than EMT and other professions. Differences in attitude among HCP might have been affected by many different variables such as their sociodemographic characteristics, professions, personal experiences, the unit they work in, and the responsibilities of the administrative unit.

It was found that 73% of the HCP had a better practice level than the average. In the original study, 88.7% of the HCP were reported to have a good practice level (19). In Uganda, it had been reported that 74.0% of HCP had good practice level (25). In the study conducted by Nepal et al., the frequency of good practice was reported as 83.6% (27). Gender, education level, occupation, duration of work and COVID-19 symptoms are considered as the factors that affected the practice level. Guidelines and algorithms prepared by the Ministry of Health could have positive impact in applying practices.

53.1% of the HCP had a higher perception of barrier in infection control practices compared to the average. Similar to the original study, crowding in the emergency room, not washing hands after examination and contact with the patient, and inadequate education were identified as the most perceived obstacles in infection control (19). Similarly, studies reported that crowding in the emergency room was perceived as a barrier in infection control (19, 29).

Although the most frequently used information source by HCP is the Ministry of Health, the least preferred information source was declared as seminars and webinars. In a study conducted with university students, it was reported that the most preferred information source was the internet and social media, and the least preferred information source was scientific websites and articles (30). Many studies reported that the most frequently used information source for HCP was social media and the website of the Ministry of Health (19-21). Since The Ministry of Health was actively tracking the process and publishing guides, it became the information source firstly preferred. It is crucial for HCP to follow the scientific information published by the Ministry of Health in order to prevent malicious and false information epidemic.

Limitations

By virtue of being an online study involved in pre-hospital emergency healthcare professionals in a city, it cannot be generalized. Further research is needed.

CONCLUSION

In the light of the analysis, it was found that the Knowledge, Attitudes and Practice and Perceived Barriers in Infection Control About COVID-19 in Healthcare Professionals questionnaire was a valid and reliable measurement tool. According to the average, HCP in Turkey had good knowledge and practice levels. However, deficiencies were found in terms of knowledge, attitude, practices and perceived barriers in infection control. In this context, it should be ensured that all preventive and control practices related to COVID-19 are promoted by raising awareness about the importance of HCP. Well-structured, up-to-date training programs for each HCP should be planned and implemented completely in order to effectively control the spread of the infection and to increase existing knowledge, to gain positive attitudes and practices, and to improve perceived barriers in infection control.

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