

Evaluation of knowledge of the healthcare personnel working in Giresun province regarding Crimean-Congo hemorrhagic fever before and after educational training

Safiye Koculu¹, Ahsen Oncul², Ozgur Onal³, Zuhal Yesilbag⁴ & Nuray Uzun²

¹Department of Infectious Diseases and Clinical Microbiology, Sisli Florence Nightingale Hospital, Istanbul; ²Department of Infectious Diseases and Clinical Microbiology, Sisli Hamidiye Etfal Education and Research Hospital, Istanbul; ³Burdur Public Health Center, Burdur;

⁴Department of Infectious Diseases and Clinical Microbiology, Medical Faculty, Maltepe University, Istanbul, Turkey

ABSTRACT

Backgrounds & objectives: Crimean-Congo hemorrhagic fever (CCHF) is a highly fatal and contagious tick-borne viral disease. Healthcare workers (HCWs) should know how and with which symptoms can CCHF patients attend to hospitals, and be aware of nosocomial transmission capability. The aim of this study was to investigate the knowledge of HCWs working in Giresun province regarding CCHF.

Methods: This research was carried out during an educational programme arranged for healthcare personnel working in district state hospitals in June 2012. In total, 428 workers completed a self-administered questionnaire including personal demographic characteristics, general knowledge of CCHF disease, knowledge of nosocomial transmission and infection control during hospitalization.

Results: Almost all participants (95.3%) knew that the workers in livestock and agriculture were at risk. About 93.5% of participants knew that tick bite is the cause of CCHF transmission. In contrast to this high ratio, only 73 and 77% workers knew that CCHF can be transmitted by direct contact with animal's or patient's blood and body fluids, but after imparting relevant information in the form of one hour lecture given by a doctor expertised in infectious diseases, 92% gave correct answers. Nearly, all healthcare workers were aware that ticks should be removed by using fine-tipped tweezers without crushing (90.7%). Doctors were the most and the laboratory personnel the least well-informed groups. The knowledge degree significantly increased from 67.48 ± 13.89 to 80.92 ± 10.80 points after providing the CCHF related information ($p<0.05$).

Interpretation & conclusion: It was observed that the healthcare personnel working in district state hospitals of the province were moderately aware of CCHF disease. There is possibility of achieving improvement in their knowledge by educating them regarding CCHF and such educational programmes should be conducted from time-to-time.

Key words Crimean-Congo hemorrhagic fever; healthcare workers; knowledge

INTRODUCTION

Crimean-Congo hemorrhagic fever (CCHF) is a highly fatal and contagious viral infection reported from nearly 30 countries and has the most extensive geographic distribution among the medically important tick-borne viral diseases¹. CCHF is caused by a *Nairovirus* of the Bunyaviridae family¹⁻⁴. During the last decade, there have been an increasing number of publications on CCHF including large outbreaks in the community and the nosocomial setting³⁻⁵. The number of diagnosed CCHF cases has been increasing every year since its first observation in Turkey in 2003 from persons who became sick during 2002 CCHF outbreak⁶⁻⁸. Approximately, 30 patients per year are diagnosed with CCHF in Giresun province since 2010, where the current study was undertaken.

The high risk of nosocomial outbreaks of CCHF was first recognized in 1976, when a laparotomy was performed on a CCHF patient in Pakistan resulting in 11 secondary cases in hospital staff with three deaths⁹. Transmission to humans mainly occurs through tick bite or crushing infected ticks with unprotected hands, or direct contact with blood or tissues of viremic hosts^{1-3, 8}. In endemic areas, high risk groups consists of persons having occupational contact with livestock and other animals, including farmers, livestock owners, abattoir workers, and veterinarians^{1-3, 10-11}. Recreational activities such as hiking and camping in endemic areas also represent risk factors for tick bite.

Healthcare workers (HCWs) should know how and with which symptoms can CCHF patients attend to hospitals and be aware about the potential of importation of

CCHF from endemic areas, human-to-human transmission, and nosocomial infections. Prompt suspicion and diagnosis is necessary in order to take immediate strict isolation precautions for the prevention of transmission in the community and the hospital^{1-3, 10}. All HCWs that may be involved in the management of a case should be adequately educated about the disease.

The aim of this study was to investigate the knowledge of the healthcare personnel working in Giresun province regarding Crimean-Congo hemorrhagic fever, before and after providing necessary information by a doctor on infectious diseases accompanied by provincial health directorate.

MATERIAL & METHODS

This study was carried out during an educational programme arranged by provincial health directorate for healthcare personnel working in district state hospitals in June 2012. In total, 428 workers participated in this research. As per the inclusion criteria only those working in Giresun district state hospitals, attending the education program and acting as volunteer were included. Self-administered questionnaires were completed by voluntary healthcare personnel before and after providing necessary information in the form of one hour lecture on infectious diseases given by a doctor. The questionnaire included personal demographic characteristics, general knowledge of CCHF disease (consisting of 39 questions) and knowledge of nosocomial transmission and infection control during hospitalization (consisting of 10 questions). The questions were rated according to their importance levels and overall knowledge was evaluated in the form of 0 to 100 points (first part of the questionnaire carried 56 points, and the second part including nosocomial transmission questions, 44 points).

McNemar's test was used to compare the results before and after providing education and $p<0.05$ was considered to be statistically significant.

RESULTS

Of 428 participants, 70.1% were females and 72.2% were university graduates. Table 1 shows general characteristics of the participants. Nearly, half of them were 30–39 yr-old, and the majority (57.7%) were nurses followed by doctors (23.6%). The educational level of participants was high; 27.8% were high school, and 72.2% university graduated. Approximately, 95% were < 50 yr-old.

General knowledge about disease, including risky occupations, incubation period, transmission mode, re-

Table 1. Demographic characteristics of the participants ($n=428$)

Characteristics	Number (%)
<i>Gender</i>	
Male	128 (29.9)
Female	300 (70.1)
<i>Educational level</i>	
High School	119 (27.8)
University graduate	309 (72.2)
<i>Age groups</i>	
19–29	96 (22.4)
30–39	213 (49.8)
40–49	97 (22.7)
≥ 50	22 (5.1)
<i>Occupation</i>	
Doctor	101 (23.6)
Nurse	247 (57.7)
Medical Assistant	48 (11.2)
Emergency Medical Technician	24 (5.6)
Laboratory personnel	6 (1.4)
<i>Other</i>	2 (0.5)
Total	428 (100)

moval method and contagious tick type are summarized in Table 2. Almost, all participants (95.3%) knew that the workers in livestock and agriculture were at risk. The least known risky occupation was slaughterhouse working with awareness ratio 50.4%, which significantly increased to 68% after educating the participants about CCHF. Tick bite was a well-known transmission mode by 93.5% of participants before education. In contrast to this high ratio, only 73 and 77% workers knew that CCHF can be transmitted by direct contact with animal's or patient's blood and body fluids, however, after educating them on CCHF 92% gave correct answers. When the results were evaluated, it was seen that knowledge about incubation period rose from 68.7 to 87.6% ($p<0.05$), and nearly all healthcare workers were aware that ticks should be removed by using fine-tipped tweezers without crushing (90.7%). Only 53.3% of participants knew that all tick types can be contagious, but this ratio increased to 90.7% after providing information on CCHF.

The knowledge of major signs and symptoms of the disease are mentioned in Table 3. Fever was the most well-known symptom. Table 4 summarizes the knowledge of laboratory findings of CCHF before and after providing education regarding CCHF.

The knowledge level of different occupational groups can be seen in Fig. 1. Doctors were the most and the laboratory personnel the least well-informed groups. It significantly rose from 67.48 ± 13.89 to 80.92 ± 10.80 points ($p<0.05$).

Table 2. General knowledge about Crimean-Congo hemorrhagic fever (*n* = 428)

Question	Correct answer	Before education No. (%)*	After education No. (%)*	<i>p</i> -value
High-risk occupations for CCHF	Workers in livestock and agriculture industry	408 (95.3)	417 (97.4)	>0.05
	Veterinarians	279 (65.2)	322 (75.2)	<0.05*
	Butchers	207 (48.4)	288 (67.3)	<0.05*
	Slaughterhouse workers	218 (50.9)	291 (68)	<0.05*
	Healthcare workers	307 (71.7)	381 (89)	<0.05*
	People who make camp and picnic	362 (84.6)	393 (91.8)	<0.05*
CCHF incubation period	1–14 days	294 (68.7)	375 (87.6)	<0.05*
CCHF transmission mode	Tick bite	400 (93.5)	416 (97.2)	<0.05*
	Direct contact with animal's blood and body fluids	313 (73.1)	396 (92.5)	<0.05*
	Direct contact with patient's blood and body fluids	330 (77.1)	395 (92.3)	<0.05*
Tick removal method	By using fine tipped tweezers without squeezing	389 (90.9)	401 (93.7)	<0.05*
Contagious tick type	All of them (larva, nymph and adult male or female)	228 (53.3)	388 (90.7)	<0.05*

*The number and percent represents the number of participants replied correctly.

DISCUSSION

CCHF is an acute, tick-borne viral disease, which often leads to severe hemorrhagic manifestations and death. Its ability of human-to-human transmission makes this disease an important issue in infection control policies of hospitals. Since 2003, all healthcare centres in Turkey are known for reporting suspected CCHF cases to the Turkish Ministry of Health (TMoH), and sending patient's serum to the reference laboratory. Since then, official letters including disease information and infection control measures to be taken are sent to hospitals from TMoH. According to the surveillance reports of the TMoH, between 2002 and 2007, 1820 CCHF cases occurred, of which three (0.16%) were nosocomial. This

survey was a part of the education programme that was arranged by provincial health directorate and reveals important findings about knowledge and attitude of health-caregivers in our province.

CCHF is transmitted to humans via the bite of ticks (mainly of the genus *Hyalomma*) or through unprotected contact with blood or tissues (secretions) from infected

Table 4. Knowledge of physical examination and laboratory findings before and after educating participants about CCHF

Signs/Symptoms	Before education No. (%)*	After education No. (%)	<i>p</i> -value
Fever	425 (99.3)	424 (99.1)	>0.05
Headache	297 (69.4)	390 (91.1)	<0.05*
Myalgia	334 (78)	397 (92.8)	<0.05*
Fatigue	369 (86.2)	401 (93.7)	<0.05*
Nausea	324 (75.7)	345 (80.6)	>0.05
Vomiting	231 (54)	276 (64.5)	<0.05*
Diarrhea	210 (49.1)	319 (74.5)	<0.05*
Abdominal pain	232 (54.2)	321 (75)	<0.05*
Petechia and ecchymosis	266 (62.1)	310 (72.4)	<0.05*
Rash	156 (36.4)	318 (74.3)	<0.05*
Bleeding	320 (74.8)	393 (91.8)	<0.05*

Symptoms/Laboratory findings	Before education No. (%)*	After education No. (%)	<i>p</i> -value
Symptoms			
Fever	418 (97.7)	418 (97.7)	>0.05
Mental confusion	208 (48.6)	312 (72.9)	<0.05*
Bleeding from gums	249 (58.2)	359 (83.9)	<0.05*
Hypotension	169 (39.5)	244 (57)	<0.05*
Tachycardia	163 (38.1)	284 (66.4)	<0.05*
Epistaxis	261 (61)	354 (82.7)	<0.05*
Splenomegaly	88 (20.6)	243 (56.8)	<0.05*
Ecchymosis	248 (57.9)	331 (77.3)	<0.05*
Haematuria	173 (40.4)	307 (71.7)	<0.05*
Maculopapular rash	139 (32.5)	281 (65.7)	<0.05*
Vaginal bleeding	159 (37.1)	322 (75.2)	<0.05*
Gastrointestinal bleeding	164 (38.3)	293 (68.5)	<0.05*
Laboratory findings			
Anemia	162 (37.9)	346 (80.8)	<0.05*
AST, ALT elevation	233 (54.4)	408 (95.3)	<0.05*
Pulmonary infiltration	48 (11.2)	201 (47)	<0.05*
Leucopenia	199 (46.5)	373 (87.1)	<0.05*
CK elevation	99 (23.1)	262 (61.2)	<0.05*
Thrombocytopenia	299 (69.9)	381 (89)	<0.05*

*The number and percent represents the number of participants replied correctly.

*The number and percent represents the number of participants replied correctly.

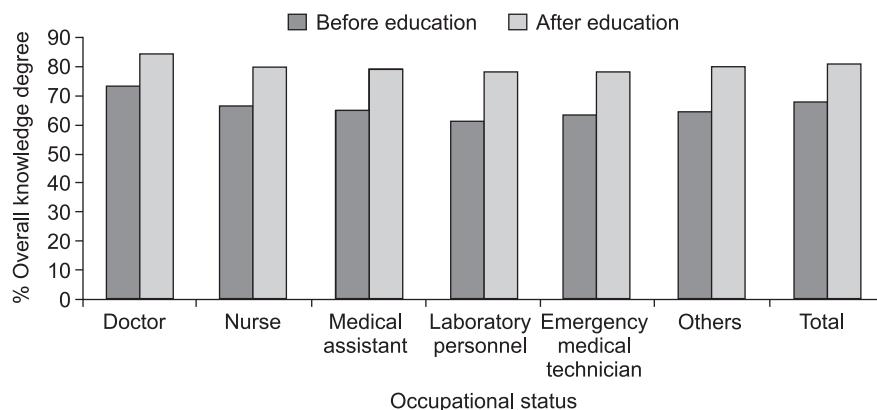


Fig. 1: Comparison of knowledge degree of healthcare workers regarding CCHF before and after educating the participants from specific occupational status.

animals or humans^{1-3, 8}. As it is primarily known as 'tick disease' in Turkey, 93.5% of participants knew that it is transmitted by tick bite. On the other hand nearly 30% were unaware of other transmission ways, such as direct contact with animal or patient's blood and body fluids. Rahnavardi *et al*¹² reported respondent's awareness about patient's blood and body fluids infectivity to be 89% in Iran and Yilmaz *et al*¹³, reported 66% in Turkey. In the present study, knowledge of this type of contagion went up to 92% after providing education regarding CCHF to HCWs. The public knowledge about transmission of the disease with close patient contact and animal body fluids were found to be very low (6.3%, and 13.3% respectively) although that survey was made in Tokat province where CCHF outbreaks are still being reported since 2003 in every spring to early autumn¹⁴. Knowing that patient's body fluids can be contagious, healthcare personnel will more carefully use personal protective equipment including gowns, gloves, surgical masks or face shields, and eye protection, while giving care to the patients or handling their blood and other body fluids.

Knowing when to suspect CCHF is also important especially in the emergency and primary care. The participants in the study were all working at the primary care hospitals. Nearly, all (95.3%) knew that working in livestock and agriculture industry were risky occupations, but only 71% responded that healthcare workers were also at risk. After education, 89% stated that working in healthcare facilities is a risky occupation. Previously reported risky occupations such as butchers and slaughterhouse workers were less known both before and after education (48.4 to 67.3%, and 50.9 to 68% respectively). The incubation period of the disease was known by 68.7% of participants, and the ratio increased to 87.6% with education. Yilmaz *et al*¹³ and Bulut *et al*¹⁵ reported better knowledge regarding CCHF in tertiary care hospitals. Tick

removal method plays a major role in prevention of CCHF transmission and it was known to nearly all workers, as reported in other studies in the country^{13, 15-16}.

Nearly, all HCWs knew that fever was a sign and symptom of CCHF. Other frequent symptoms, such as fatigue, myalgia and nausea were not so well-known (86, 78 and 75.5% respectively) and the least known symptom was rash (36.4%). Hidiroglu *et al*¹⁶, found similar results. We could achieve a significantly better knowledge of approximately all signs and symptoms with education. About 74% of participants stated that bleeding was a symptom, but gastrointestinal bleeding was known as a sign by only 38.3%, and this ratio nearly increased two fold with education. This was an important improvement, as taking isolation precautions for a patient admitting to the emergency clinic with gastrointestinal bleeding and fever can be life saving for the HCWs.

A recent epidemiological study by Bodur *et al*¹⁷, showed that approximately 90% of CCHF infections can be predicted to be subclinical. In such conditions and when making a diagnosis, laboratory findings gain importance. In this study, the least known laboratory finding that can be detected during the disease was pulmonary infiltration on the X-ray, and creatine kinase (CK) elevation in the sera of patients. On the other hand, the most well known finding was thrombocytopenia before providing education, whereas it was aspartate aminotransferase-alanine aminotransferase (AST-ALT) elevation after education. Yilmaz *et al*¹³ and Bulut *et al*¹⁵, have reported higher knowledge about these well-known laboratory findings.

When the overall knowledge level was evaluated according to occupation, doctors were found to be the most well informed group and the laboratory personnel the least, both before and after educating them regarding CCHF. This was compatible with studies from our coun-

try and Iran^{12, 15-16}. The level of knowledge of all participants increased from 67.48 (± 13.89) to 80.92 (± 10.80) points with a statistically significant elevation.

With evaluation of the questionnaires it's understood that the healthcare personnel working in district state hospitals of the province were moderately aware about CCHF disease transmission, symptoms and laboratory findings. We could achieve good improvement with education, but it should be maintained by conducting such programmes from time-to-time.

REFERENCES

- Ergonul O. Crimean-Congo hemorrhagic fever. *Lancet Infect Dis* 2006; 6(4): 203-14.
- Voroua R, Pierrotsakos IN, Maltezou HC. Crimean-Congo hemorrhagic fever. *Curr Opin Infect Dis* 2007; 20: 495-500.
- Ergonul O, Celikbas A, Dokuzoguz B, Erens, Baykam N, Esener H, et al. Characteristics of patients with Crimean-Congo hemorrhagic fever in a recent outbreak in Turkey and impact of oral ribavirin therapy. *Clin Infect Dis* 2004; 39: 284-7.
- Van Eeden PJ, Joubert JR, Van de Wal BW, King JB, de Kock A, Groenewald JH, et al. A nosocomial outbreak of Crimean-Congo haemorrhagic fever at Tygerberg Hospital. Pt I. Clinical features. *S Afr Med J* 1985; 68: 711-7.
- Fisher-Hoch SP. Lessons from nosocomial viral haemorrhagic fever outbreaks. *Br Med Bull* 2005; 73-74 (1): 123-37.
- Gozalan A, Akin L, Rolain JM, Tapar FS, Oncul O, Yoshikura H, et al. Epidemiological evaluation of a possible outbreak in and nearby Tokat province. *Mikrobiyol Bull* 2004; 38: 33-44.
- Bakir M, Ugurlu M, Dokuzoguz B, Bodur H, Tasyaran MA, Vahaboglu H. Turkish CCHF study group. Crimean-Congo haemorrhagic fever outbreak in middle Anatolia: A multicentre study of clinical features and outcome measures. *J Med Microbiol* 2005; 54: 385-9.
- Yilmaz GR, Buzgan T, Irmak H, Safran A, Uzun R, Cevik MA, et al. The epidemiology of Crimean-Congo hemorrhagic fever in Turkey, 2002-2007. *Int J Infect Dis* 2009; 13: 380-6.
- Burney MI, Ghafoor A, Saleen M, et al. Nosocomial outbreak of viral hemorrhagic fever caused by Crimean hemorrhagic fever-Congo virus in Pakistan, January 1976. *Am J Trop Med Hyg* 1980; 29: 941-7.
- Whitehouse CA. Crimean-Congo hemorrhagic fever. *Antiviral Res* 2004; 64: 145-60.
- Ozkurt Z, Kiki I, Erol S, et al. Crimean-Congo hemorrhagic fever in east Turkey: Clinical features, risk factors and efficacy of ribavirin therapy. *J Infect* 2006; 52: 207-15.
- Rahnavardi M, Rajaeinejad M, Pourmalek F, Mardani M, Holakouie-Naieni K, Dowlatshahi S. Knowledge and attitude toward Crimean-Congo haemorrhagic fever in occupationally at-risk Iranian healthcare workers. *J Hosp Infect* 2008; 69: 77-85.
- Yilmaz GR, Buzgan T, Çevik MA, Safran A, Torunoğlu MA, Kulaç E. The evaluation of knowledge of the healthcare personnel regarding Crimean-Congo haemorrhagic fever. *Flora* 2009; 14(1): 27-35.
- Yilmaz R, Ozcetin M, Erkorkmaz U, Ozer S, Ekici F. Public knowledge and attitude toward Crimean-Congo hemorrhagic Fever in Tokat, Turkey. *Iranian J Arthropod Borne Dis* 2009; 3(2): 12-7.
- Bulut C, Yetkin MA, Ataman-Hatipoglu C, Yilmaz S, Yazkan, Demiröz AP. Evaluation of knowledge of the healthcare workers regarding Crimean-Congo haemorrhagic fever. *Klinik Dergisi* 2009; 22(1): 14-7.
- Hidiroglu S, Onsuz MF, Topuzoglu A, Karavus M. Knowledge and attitudes of healthcare workers in Umraniye, Turkey regarding Crimean-Congo haemorrhagic fever. *Erciyes Med J* 2012; 34(2): 73-8.
- Bodur H, Akinci E, Ascioglu S, Ongor P, Uyar Y. Subclinical infections with Crimean-Congo hemorrhagic fever virus, Turkey. *Emerg Infect Dis* 2012; 18(4): 640-2.

Correspondence to: Dr Ahsen Oncul, Sisli Hamidiye Etfal Egitim ve Arastirma Hastanesi-34377, Sisli, Istanbul.
E-mail: onculahsen@gmail.com

Received: 19 October 2014

Accepted in revised form: 15 January 2015