



Knowledge and Attitudes of the Rural Population and Veterinary and Health Personnel Concerning Crimean-Congo Hemorrhagic Fever in Western Iran in 2012

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KNOWLEDGE AND ATTITUDES OF THE RURAL POPULATION AND VETERINARY AND HEALTH PERSONNEL CONCERNING CRIMEAN-CONGO HEMORRHAGIC FEVER IN WESTERN IRAN IN 2012

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ABSTRACT

Crimean-Congo Hemorrhagic Fever (CCHF) is an emerging zoonotic disease in Iran. It became a public health problem in the country after an epidemic during 1999 in western Iran. Subsequent studies showed that the disease is now endemic in 23 out of 31 provinces of Iran. The more people become aware of CCHF, the more this disease will be prevented. Therefore, knowledge assessment studies are essential for planning a structured questionnaire to conduct a program of interviews and in training programs. The present study was conducted in an at risk area in western Iran. During Jun-Jul, 2012, a descriptive cross-sectional study was conducted involving 194 people in Darreh Shahr County, Ilam Province, western Iran. The first interrogation was conducted in 4 villages and the second was focused on the health and veterinary staffs of the County who may have been exposed to the disease or may have come in contact with patients suffering from the disease. An interview was conducted through a structured questionnaire concerning CCHF in all studied populations. Statistical analysis of the collected revealed that 61.7% of those interviewed had some information about the role of ticks in disease transmission, while only 14.8% had correct information about CCHF and its' vector. The education levels and jobs of the respondents correlated significantly with their knowledge about the role of ticks in disease transmission, awareness of CCHF and its' routes of transmission, as well as with the symptoms of the disease ($P = 0.000$). Most health and veterinary staff members had varying levels of knowledge about ticks and tick-borne diseases, while 64.6% recognized CCHF as a tick-borne disease. Their information about ticks was obtained mainly from academic courses (61.1%). A relationship of direct employment in public health or veterinary medicine areas led to improved knowledge of 41.6% of respondents. Education of the interviewed personnel was correlated with their knowledge related to methods of tick control ($P = 0.002$); and the efficacy of various methods of control ($P = 0.02$). Public education related to CCHF and its transmission routes is recommended via TV/radio broadcasts; however health workers can also play an important role in educating and training villagers. Specialized programs are needed to improve the knowledge of relevant health and veterinary staffs.

Key Words: Crimean-Congo hemorrhagic fever, knowledge, Iran

RESUMEN

El Fiebre Hemorrágico del Crimea-Congo (FHCC) es una enfermedad zoonótica emergente en Irán. Se convirtió en un problema de salud pública en el país después de una epidemia en el 1999 en el oeste de Irán. Estudios posteriores demostraron que la enfermedad es endémica en 23 de las 31 provincias de Irán. Lo más sabe las personas sobre el FHCC, lo más se puede prevenirlo. Por lo tanto, es muy recomendable realizar estudios para evaluar el conocimiento del público para la planificación de un cuestionario estructurado para realizar un programa de entrevistas y en los programas de entrenamiento. Se realizó este estudio en

un área de alto riesgo en el oeste de Irán. Se realizó un estudio descriptivo transversal con 194 personas durante junio y julio del 2012 en Darreh Shahr, Provincia de Ilam, en el oeste de Irán. Se realizó el primer estudio en 4 aldeas y el segundo estudio se enfocó en el personal de salud y de veterinario del condado que pueden haber estado expuestos a la enfermedad o en contacto con pacientes que sufren de la enfermedad. Se realizó una entrevista con un cuestionario estructurado sobre FHCC en todas las poblaciones estudiadas. Se realizó el análisis estadístico de los datos con el programa SPSS 16.0. El análisis reveló que el 61.7% de los consultados tenían información sobre el papel que juega las garrapatas en la transmisión de la enfermedad, mientras que sólo el 14.8% tenían la información correcta sobre FHCC y su vector. Se correlacionaron significativamente el nivel de educación y la clase del empleo de las personas encuestadas con sus conocimientos sobre el papel de las garrapatas en la transmisión de la enfermedad y su conciencia de FHCC y sus vías de transmisión, así como con los síntomas de la enfermedad ($p = 0.000$). La mayoría de los miembros del personal de salud y veterinaria tenían distintos niveles de información sobre las garrapatas y las enfermedades transmitidas por garrapatas, mientras que el 64.6% reconoce FHCC como una enfermedad transmitida por garrapatas. Se obtuvo esta información sobre las garrapatas principalmente de los cursos académicos (61.1%). Una relación de empleo directo en la salud pública o la medicina veterinaria resultó en un mejor conocimiento del 41.6% de los encuestados. La educación del personal entrevistados se correlacionó con su conocimiento acerca de los métodos de control de las garrapatas ($P = 0.002$) y con los grados de los distintos métodos de control ($P = 0.02$). La educación pública sobre FHCC y sus vías de transmisión «se recomienda a través de las emisoras de televisión/radio, aunque los trabajadores de salud pública pueden jugar un papel importante en la educación y entrenamiento de la gente en las aldeas. Se necesitan programas especializados para mejorar el conocimiento del personal de sanidad y veterinaria.

Palabras Clave: Fiebre Hemorrágica de Crimea-Congo, Conocimiento, Irán

Crimean-Congo hemorrhagic fever (CCHF) is a tick-borne viral disease that may affect humans, when they have been bitten by hard ticks of the family, Ixodidae, mostly *Hyalomma* spp. In addition some other genera of Ixodidae, such as *Dermacentor* and *Rhipicephalus*, can also support the virus infection; the virus is also detected in *Ornithodoros* and *Argas* ticks as well (Tahmasebi et al. 2010; Telmadarraiy et al. 2010; Salim Abadi et al. 2011). Ticks are able to transmit the virus transstadially and subsequently transovarially. For the viral transmission, ticks need to take blood meals from vertebrates, so when the infected tick bites a human, the viral infection is transmitted (Logan et al. 1989; Shepherd et al. 1991; Gonzalez et al. 1992; Sanchez et al. 2002). The disease can also transmit either via contact with a CCHF-infected patient during the acute phase of the infection or by contact to blood or tissues of viremic livestock. The mortality rates of this disease have been reported to range between 10% and 30% (Hoogstraal 1979; Whitehouse 2004; Flick & Whitehouse 2005; Ergonul 2006). Crimean Congo Hemorrhagic Fever was reported from some countries of Asia, Eastern Europe and Africa, among which, Iran is one of the countries categorized as the most infected (WHO 2008). In Iran, the virus was first detected in 1970, although the human cases of the disease were reported during 1974-1975 for the first time (Chumakov et al. 1970; Asefi 1974; Ardoin & Karimi 1982). An outbreak of CCHF was recognized in 1999 (Chinikar et al. 2010). It was a wake-up call for the government to become equipped against

an important neglected disease and to pay more attention to this danger. As of now 23 out of 31 provinces of the country have been included in the endemic area for CCHF, among them Sistan and Baluchistan, Isfahan, Fars and Khuzestan are the most important with high rates of infection. During 2002-2008, a total of 448 CCHF cases were reported from Iran with mortality amounting to 14.5% (Chinikar et al. 2010). During 2000-2011, a total of 19 out of 117 suspected cases were positive from the neighboring province of Ilam, resulting in 3 deaths. On the other hand, 15.8% mortality among the positive cases in this area has occurred (Pasteur Institute of Iran, unpublished data).

Crimean Congo Hemorrhagic Fever tends to afflict professional personnel, such as animal husbandry workers, livestock workers, butchers, healthcare workers, physicians, and veterinarians which are the groups of people at high risk of the disease in the endemic areas of CCHF (Izadi et al. 2003, 2004; Karimi et al. 2006; Ebadi Azar et al. 2011). Furthermore, travelers and individuals who may come in close contact with livestock in endemic regions, as well as those coming in contact with newly slaughtered lambs may be at risk of the disease as well. Therefore, community awareness concerning the risk of the disease should be evaluated. Such is vital for assessing the level of knowledge of people that may be exposed to the disease; specifically the groups at high risk.

In recent years, numerous cases of CCHF have been reported from the west of the country, from

areas neighboring with Ilam (Majeed et al. 2012). Ilam Province, in western Iran, is a livestock area and therefore is at risk of CCHF. Therefore, the present study was conducted to evaluate knowledge and attitudes of the groups of people at risk of CCHF in an area at risk of CCHF in the area.

MATERIALS AND METHODS

Study Area

Darreh Shahr County covering an area of 1,480 square kilometers is located in southeastern Ilam Province, western Iran at geo-coordinates of N 33° 8' E 47° 22', 650 m asl (Fig. 1). Darreh Shahr city is located in a relatively spacious valley, and has dry and temperate weather. The mean high and low temperatures range from 42 °C and -6 °C, respectively. Since Ilam is one of the provinces with a nomadic population situated at the border with Iraq, livestock production and animal husbandry are the main occupations of people in this region, and, therefore, each year many animals migrate to different areas of the province.

After consultation with the veterinary organization of Darreh Shahr County, 4 out of 24 villages of the county were randomly selected to understand the knowledge level and attitudes of villagers of Gholamabad (North), Farhadabad (South), Markazi (Center) and Kolehjoob (East) (Table 1). People of these 4 selected villages were engaged mostly in animal husbandry and all the selected villages had health centers.

Study Questionnaire

A descriptive cross-sectional investigation was conducted using 2 structured questionnaires, including demographic characteristics, as well as questions to determine knowledge and attitudes of interviewees including veterinary and health personnel, about CCHF. The questionnaire was distributed to all households in the 4 selected villages during Jun-Jul, 2012; the personnel questionnaire was filled out by the interviewing health and veterinary staff of Darreh Shahr County.

Ethical Considerations

Ethical approval was obtained from Tehran University of Medical Sciences Ethics Committee. Sampling Method and Statistical Analysis

Quota sampling methods was applied for selecting survey participants. At total of 194 persons from 81 families (one person per family), and 113 employees of the families, as well, were interviewed. The collected data were analyzed by using SPSS 16.0 Spearman Correlation and the chi-squared test.

RESULTS

Populations of the 4 Selected Villages

Overall, 81 families (1 person per family) were interviewed in 4 villages of Gholamabad (13.6%),

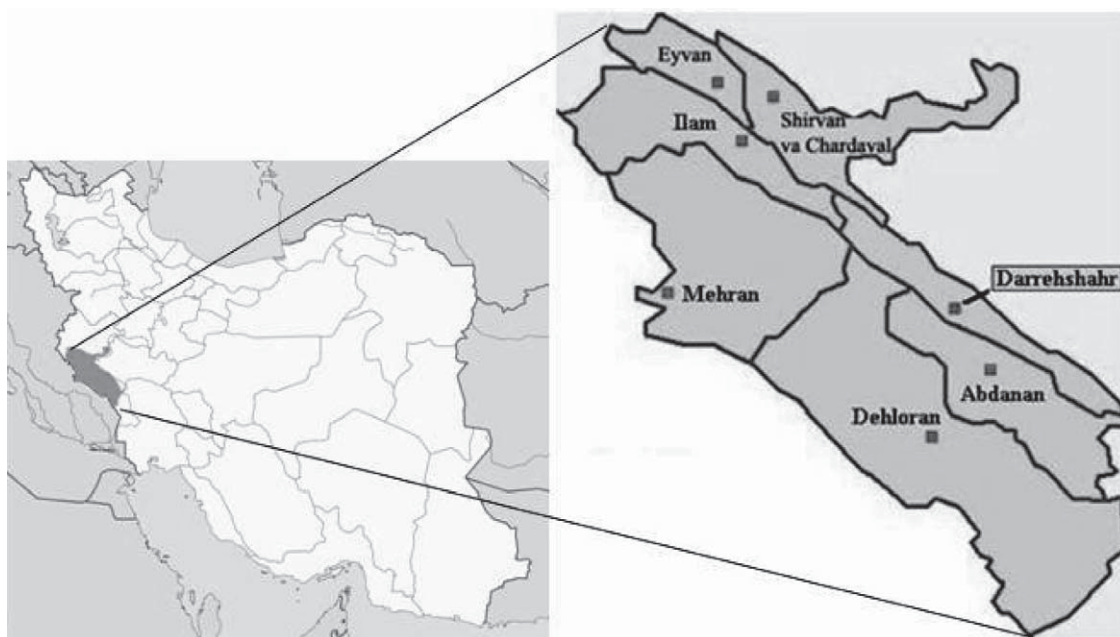


Fig. 1. Location of Darreh Shahr County in Ilam Province in western Iran.

TABLE 1. NUMBER OF RESIDENTS RESPONDING TO CCHF DISEASE-RELATED SURVEY IN THE STUDY AREA AND THE NUMBER OF RANDOMLY SELECTED RESPONDENTS FROM 4 SELECTED VILLAGES IN DARREH SHAHR COUNTY, IRAN.

Village	Total number of residents	Number of selected respondents
Farhadabad	97	26
Kolehjoob	206	56
Gholamabad	34	10
Markazi	31	10
Total	368	102

Farhadabad (33.3%), Markazi (12.3%) and Kolehjoob (40.8%) villages. Educational level of those interviewed was as follows: 33.3% were illiterate; 28.4% had completed primary school education; 14.8% middle school; 9.9% high school; and 13.6% had academic degrees. Most respondents (77.8%) were employed in jobs that were at high risk of acquiring CCHF, such as farmers and butchers. All interviewed villagers had permanent dwellings and none of them were nomads. The results revealed that 93.8% of respondents had animal folds close to their residences. There was no history of the disease infection among the respondents or their family members, although 61.7% had been bitten by ticks.

The assessment of knowledge of the respondents concerning the disease revealed that although most (92.6%) of them were familiar with ixodid ticks, 61.7% had information about the role of ticks in the disease transmission. Among the interviewed villagers, only 14.8% had correct information about CCHF and its vector. When asked about the symptoms of the disease, their response was as follows: fever (9.9%), bleeding (4.9%), while 85.2% had no relevant information. Only 16% of the interviewed personnel believed that the neighborhoods with animal folds were a risk factor for CCHF and other tick-borne diseases. Sources of information of these respondents regarding CCHF was as follows: 11.1%, TV broadcasts; 11.1%, veterinary staff; 2.5%, health workers, while 75.3% had not received any information.

Almost all respondents (98.8%) agreed with the use of insecticides against ticks in animal folds, while in response to another question concerning tick control, 63% agreed with the use of other control/prevention methods.

In practice, 96.3% stated they actually use insecticides against ticks; however, of these only 24.7% indicated that they wear appropriate protective covering while cleaning the animal folds.

The education levels of the respondents was highly significant ($P = 0.000$) in term of with their knowledge about the role of ticks in the disease transmission, awareness of CCHF and its routes of transmission as well as symptoms of the dis-

ease, use of appropriate clothing for prevention of contact with ticks during the cleaning of the animal folds, and agreement with spraying of their animal folds against ticks. Significant correlation ($P = 0.02$) occurred between the various jobs of the interviewed peoples and their knowledge of the role of ticks in disease transmission, their knowledge of CCHF and its transmission, and the benefit of wearing appropriate clothes when they were active in animal folds ($P = 0.000$). Correlation between the respondents' jobs and their agreement on the importance of spraying animal folds with acaricides was not significant ($P = 1.000$).

Personnel of Veterinary and Public Health Sectors

A total of 113 employees participated in this study of which 53.1% were male and 46.9% were female with an age range of 21-60 yr old. All the women participants in this survey had outdoor jobs.

The education level of the respondents was as follows: 5.3% had earned either primary school or middle school diploma, 11.5% had high school diploma and the remainder were university graduates. The jobs assignments of the respondents were as follows: veterinary technician (1.8%), laboratory technician (8%), laboratory officer (9.7%), driver (4.4%), health workers (11.5%), health assistant (20.3%), medical doctor and veterinary doctor (8%) and other job positions (36.2%). Of this study population, 67.3% were employed in public health/ health care services, and the remainder in agricultural and veterinary sectors.

Sources of knowledge about tick control methods in this population were as follows: through training courses (34.5%), through leaflets (15.9%), through TV broadcasts (16.8%), and through personal studies (13.3%). With respect to attitudes within this group concerning tick control, 72.6% preferred chemical control methods and the remainder suggested the use of other non-chemical methods. Various levels of information about ticks and tick-borne diseases were as follows: very low (18.6%), low (14.2%), middle (49.5%) and high (11.5%); while 64.6% considered CCHF to be a tick-borne disease. Their information about ticks was obtained mainly from academic courses (61.1%), workshops (8%), and TV/radio broadcasts and newspapers (16.8%). Direct occupational participation in public health or veterinary medicine led to improved knowledge of 41.6% of respondents.

These respondents believed that the veterinary organization (26.5%) and public health centers (39.8%) were the most important organizations for conducting educational activities about CCHF, while TV/radio programs were also mentioned (10.6%). The opinions of respondent personnel about the levels of success of different organizations in providing information and training are presented in Table 2.

TABLE 2. OPINIONS OF THE SURVEY RESPONDENTS ABOUT THE LEVEL OF SUCCESS OF VARIOUS ORGANIZATIONS CONCERNING CCHF DISEASE-RELATED INFORMATION AND TRAINING, DARREH SHAHR COUNTY, ILAM PROVINCE, WESTERN IRAN, 2012.

Organization	Success level for information and education (%)				
	Very low	Low	In Part	High	Very high
TV/Radio	16.8	15.9	31	24.8	11.5
Press	22.1	31	37.2	8.8	0.9
Veterinary organization	18.7	15	16.8	23	26.5
Health centers	12.4	15	20.4	26.5	25.7

Statistical analysis showed a significant correlation ($P = 0.002$) between education level of interviewed personnel with their knowledge about methods of ticks control and efficacy of different methods of control ($P = 0.02$), although there were no significant differences between the education levels of respondents and; (i) their knowledge about diseases transmitted by ticks ($P = 0.97$); (ii) methods of tick control ($P = 0.85$); and (iii) the efficacies of different methods of chemical control of ticks ($P = 0.47$). Most of the respondents used pesticides including flumethrin, ivermectin, and Mactomil for controlling ticks and some of them removed ticks from their body and squashed them between their finger nails. Only a small number of the respondents used protective clothing.

Reasons given by the respondents for failure to reduce tick populations despite several years of struggle were as follows: lack of government support (14.2%); failure to allocate sufficient funding for implementation of control programs (20.3%); inadequate inter- and intrasectoral arrangements (5.3%); lack of public participation (11.5%); lack of cooperation with other relevant organizations in the implementation of coordinated control programs (13.3%); lack of expertise and high quality work by contractors (17.7%); and all mentioned above cases (17.7%).

DISCUSSION

Regarding the significance of CCHF, the general public, health workers and veterinarians in endemic areas should be aware of the existence of the disease, its transmission routes, risk of nosocomial infection, and finally control and protection measures. To assure such awareness in general, it is first necessary to evaluate the knowledge of at risk groups of the community, to identify weaknesses in their relevant understanding and skills, and finally to make a plan to overcome these deficiencies. There are several published studies pertaining assessment of knowledge about CCHF of different groups of peoples (Rahnavardi et al. 2008; Kartal et al. 2009; Yilmaz et al. 2009; Ozer et al. 2010; Cilingiroglu et al. 2010; Gungormus & Kiyak 2011; Taghdisi et al. 2012).

The results of the present study showed that education level had a significant effect on the knowledge about CCHF of villagers, as also previously reported by Yilmaz et al. (2009), Cilingirolu et al. (2010), and Taghdisi et al. (2012). Although 92.6% of the respondents in the studied villages could detect the ticks, only 14.8% had information about their role in CCHF transmission, and only 16% of them believed the neighborhood with animal folds presented a risk factor for CCHF and other tick-borne diseases. This is in contrast with findings of Cilingiroglu et al. (2010) in Ankara, where 89.8% of their study population understood that ticks are vectors of CCHF. The study of Kartal et al. (2009) in a CCHF endemic area of Turkey showed that although they interviewed people living in an endemic region; the percentages of those who had heard of CCHF (58%) and who were aware of its transmission (33.3%) were low. However, the rate considered as “low knowledge” in Turkey was greater than in the present study (14.8%); therefore, such rating of “low knowledge” can be a “wake-up call” for authorities in Iran to focus on training programs for the people, especially of those who are in close contact with ruminants.

As mentioned above in the results section, significant correlations occurred between the jobs of those interviewed regarding: (i) their knowledge about role of ticks in disease transmission ($P = 0.02$); (ii) their knowledge about CCHF; (iii) their understanding of CCHF transmission and (iv) the importance of wearing appropriate clothing while active in animal folds ($P = 0.000$). Since 77.8% of respondents in the study area worked in high risk jobs from CCHF point of view (farmers and butchers), and because of their weak knowledge concerning the disease, the lack of essential knowledge can be considered as an important factor in disease transmission.

The role of health workers in the health system of Iran is important in training of rural people, because they are in direct contact with the village inhabitants. Yet, the present study revealed that only 2.5% of the village respondents obtained information related to CCHF from the health workers. Since the disease is endemic in Iran, and the study area is at risk of the disease

because of transport of livestock in and out of the area, it is vital to train the health staff and distribute brochures and posters containing information related to CCHF to all health clinics and health centers. People during their daily visits to these centers can be warned about the risk factors of the disease either through discussions while in contact with the health staff or by reading relevant posters and brochures.

The present study on knowledge assessment of veterinary and health staff showed that these professional workers had varying levels of knowledge about the disease, and that merely 11.5% possessed high information level obtained primarily from their academic studies. This percentage of highly knowledgeable professionals is too low either for those in close contact with infected ruminants (veterinarians) or for those who are the focal point of health (health staff). These results are similar to the findings of Ozer et al. (2011) in Turkey, and Taghdisi et al. (2012) in the Hamadan Province of Iran; and this shortcoming can be overcome by conducting regular training courses for both health and veterinary staff.

In conclusion, this study revealed that the knowledge level(s) of both rural villagers and human and animal health personnel concerning CCHF to be insufficient; this disease can cause fatalities if the general community, as well as those in high risk jobs, such as nurses, butchers, veterinarians, and even the people using freshly butchered meat, are not be informed and trained adequately. Different levels of training are suggested based on the risk level for each class of the community; TV/radio broadcasts may be sufficient for the general public, but specialized educational programs and workshops are recommended for health and veterinary staffs.

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REFERENCES CITED

- ARDOIN, A., AND KARIMI, Y. 1982. Spot of thrombocytopenia purpura in Iran in East Azerbaijan (1974 to 1975). *Trop Med.* 42: 319-326.
- ASEFI, V. 1974. Clinical study of 60 patients with infectious and hemorrhagic syndromes in Azerbaijan (Iran). *Iranian J. Public Health* 3(3): 140-146.
- CHINIKAR, S., GHIASI, S. M., HEWSON, R., MORADI, M., AND HAERI, A. 2010. Crimean-Congo hemorrhagic fever in Iran and neighboring countries. *J. Clin. Virol.* 47: 110-114.
- CILINGIROGLU, N., TEMEL, F., AND ALTINTAS, H. 2010. Public's knowledge, opinions and behaviors about Crimean-Congo Hemorrhagic Fever: An example from Turkey. *Kafkas Univ. Vet. Fak. Derg.* 16 (Suppl-A): S17-S22.
- CHUMAKOV, M. P., BELYAEVA, A. P., VOROSHILOVA, M. K., BUTENKO, A. M., SHALUNOVA, N. V., AND SEMASHKO, I. V. ET AL. 1968. Progress in studying the etiology, immunology, and laboratory diagnosis of Crimean hemorrhagic fever in the USSR and Bulgaria, pp. 100-103 *In* Mater 15 Nauchn.Sess. Inst. Polio Virus Entsefalitov vol. 3.
- ERGONUL, O. 2006. Crimean-Congo haemorrhagic fever. *Lancet Infect. Dis.* 6: 203-214.
- FLICK, R., AND WHITEHOUSE, C. A. 2005. Crimean-Congo hemorrhagic fever virus. *Curr. Mol. Med.* 5: 753-760.
- EBADI, F., ESMAEIL, R., AND ZOHOOR, A. 2011. Epidemiological survey of Crimean Congo hemorrhagic fever in Khorasan Razavi. *Medical Sciences J. Islamic Azad Univ., Tehran Medical Branch* 3, vol. 21(1): 61-66.
- GONZALEZ, J. P., CAMICAS, J. L., CORNET, J. P., FAYE, O., AND WILSON, M. L. 1992. Sexual and transovarian transmission of Crimean-Congo hemorrhagic fever virus in *Hyalomma truncatum* ticks. *Res. Virol.* 143: 23-28.
- GUNGORMUS, Z., AND KIYAK, E. 2011. Evaluation of knowledge about protection against Crimean-Congo hemorrhagic fever. *Southeast Asian J. Trop. Med. Public Health* 42(3): 737-743.
- HOOGSTRAAL, H. 1979. The epidemiology of tick-borne Crimean-Congo hemorrhagic fever in Asia, Europe, and Africa. *J. Med. Entomol.* 15: 307-417.
- IZADI, SH., HOLAKOUIE NAIENI, K., MADJIDZADEH, S.R., CHINIKAR, S., NADIM, A., RAKHSHANI, F., AND HOOSHMAND, B. 2003. The prevalence of Crimean-Congo hemorrhagic fever in Sistan and Baluchestan Province, Iran: A serologic study. *Payesh, J. Iranian Inst. Health Sci. Res.* 2(2): 85-93.
- KARTAL, M., AYDIN, B., TULEK, N., ACICBE, O., TANYEL, E., AND FISGIN, N. 2009. The knowledge and attitudes of people at high risk for Crimean-Congo Hemorrhagic Fever: A cross-sectional survey from an endemic region in Turkey. *Turkish J. Family Med. Primary Care (TJFMPC)* 3(2): 8-13.
- KARIMI, I., ROSTAMI JALILIAN, M., CHINIKAR, S., ATAEE, B., KASAEYAN, N., JALALI, N., AND KHOSRAVI, N. 2007. Seroepidemiologic Survey of Crimean-Congo Hemorrhagic Fever among Slaughters and Butchers in Isfahan. *J. Isfahan Medical School* 24(83): 57-62.
- LOGAN, T. M., LINTHICUM, K. J., BAILEY, C. L., WATTS, D. M., AND MOULTON, J. R. 1989. Experimental transmission of Crimean-Congo hemorrhagic fever virus by *Hyalomma truncatum* Koch. *American J. Trop. Med. Hyg.* 40: 207-212.
- MAJEED, B., DICKER, R., NAWAR, A., BADRI, S., NOAH, A., AND MUSLEM, H. 2012. Morbidity and mortality of Crimean-Congo Hemorrhagic Fever in Iran: Cases reported to the National Surveillance System, 1990-2010. *Trans. R. Soc. Trop. Med. Hyg.* 106(8): 480-483.
- OZER, A., MIRALOGLU, M., CETIN EKERBICER, H., CEVIK, F., AND ALOGLU, N. 2010. Knowledge levels about Crimean-Congo Hemorrhagic Fever among midwifery and nursing students in Kahramanmaraş, Turkey. *Southeast Asian J. Trop. Med. Public Health* 41(1): 77-84.
- RAHNAVARDI, M., RAJAEINEJAD, M., POURMALEK, F., MARDANI, M., HOLAKOUIE-NAIENI, K., AND DOWLATSHAHI, S. 2008. Knowledge and attitudes toward

- Crimean-Congo Haemorrhagic Fever in occupationally at-risk Iranian healthcare workers. *J. Hospital Infection* 69: 77-85.
- SANCHEZ, A. J., VINCENT, M. J., AND NICHOL, S. T. 2002. Characterizations of the glycoprotein of Crimean-Congo Hemorrhagic Fever virus. *J. Virol.* 76: 7263-7275.
- SHEPHERD, A. J., SWANEPOEL, R., SHEPHERD, S. P., LEMAN, P. A., AND MATHEE, O. 1991. Viremic transmission of Crimean-Congo Hemorrhagic Fever virus to ticks. *Epidemiol. Infect.* 106: 373-382.
- SALIM ABADI, Y., CHINIKAR, S., TELMADARRAIY, Z., VATANDOOST, H., MORADI, M., OSHAGHI, M. A., AND GHIASI, S. M. 2011. Crimean-Congo Hemorrhagic Fever: a molecular survey on hard ticks (Ixodidae) in Yazd Province, Iran. *Asian Pacific J. Trop. Med.* 4(1): 61-63.
- TAHMASEBI, F., GHIASI, S. M., MOSTAFAVI, E., MORADI, M., PIAZAK, N., MOZAFARI, A., HAERI, A., FOOKS, A. R., AND CHINIKAR, S. 2010. Molecular epidemiology of Crimean-Congo Hemorrhagic Fever virus genome isolated from ticks of Hamadan province of Iran. *J. Vector Borne Dis.* 47: 211-216.
- TELMADARRAIY, Z., GHIASI, S. M., MORADI, M., VATANDOOST, H., FAGEHIHI, F., ZAREI, Z., HAERI, A., AND CHINIKAR, S. 2010. A survey of Crimean-Congo Haemorrhagic Fever in livestock and ticks in Ardabil Province, Iran during 2004-2005. *Scandinavian J. Infectious Dis.* 42: 137-141.
- TAGHDISI, M., SASOOLI, H., AND RAMEZANI, A. 2012. A study of level the nurse's knowledge of the CCHF disease in the Sistan. *Zahedan J. Res. Med. Sci.* 13(1): 65.
- WHITEHOUSE, C. A. 2004. Crimean-Congo Hemorrhagic Fever. *Antivir. Res.* 64: 145-160.
- WHO. 2008. Epidemiology of Crimean-Congo haemorrhagic fever virus: Albania, Bulgaria, Greece, Islamic Republic of Iran, Kosovo, Russian Federation, Turkey. http://www.euro.who.int/communicablediseases/outbreaks/20080806_1.
- YILMAZ, R., OZCETIN, M., ERKORKMAZ, U., OZER, S., AND EKICI, F. 2009. Public knowledge and attitude toward Crimean Congo Hemorrhagic Fever in Tokat Turkey. *Iranian J. Arthropod-Borne Dis.* 3(2): 12-17.